GLOBCURRENT
ACCEPTANCE TEST PROCEDURE DOCUMENT

Customer	ESA
Author	Consortium
Distribution	Consortium and ESA
ESA Contract Number	AO/1-7472/13/I-LG
Document Reference	ATPD
SoW Deliverable Reference	D-210
Version/Revision	3.1
Date of issue	12 March 2015

Issued by (NERSC)	Marie-Hélène Rio Ifremer Project Scientist	
Approved by (NERSC)	Johnny A. Johannessen NERSC Project Manager	Johnny A. Johannessen Vice Director
Approved by (ESA)	Craig Donlon ESA Technical Officer	Digitally signed by Craig Donlon DN: cn=Craig Donlon, o=European Space Agency, ou=ESTEC, email=craig.donlon@esa.int, c=NL Date: 2015.05.01 09:58:36 +02'00'

Revision Change log

Issue	Date	Type	Change description
1.0	23 March 2014	Initial draft	
1.1	24 November 2014	Initial draft	Reformat and first test proposal
2.0	20 January 2015	Draft revision	Update of most test procedures
3.0	12 March 2015	RIDS revision	
3.1	28 April 2015	Revision	Alignment with TN-2 nomencl.

Table of contents

Table of Illustrations

Table of tables

1. Introduction

1.1. Purpose and scope

The Acceptance Test Procedure Document (ATPD) specifies the testing that shall be carried out and documented by Qualification and Acceptance Review reports to confirm that the system a) meets its technical specification, b) fulfils its requirements baseline, c) is an acceptably robust system as a whole, d) whose output products are individually fit to be released to users, and e) eventually using independent information and GlobCurrent User Group assessments of usability and value.

The GlobCurrent project architecture that shall be tested (Fig. 1) consists of automated and interactive components, including data ingestion, formatting, quality control, and processing to L2 and L4 products (blue), a data management system for all data within the project (i.e. the input EO and in situ data, products, validation reports, etc; brown), validation (purple) coupled to user-led case studies (dark green), and a data delivery and communication system interfaced to users (light green). The Interface Control document describes the connections of this architecture in some detail.

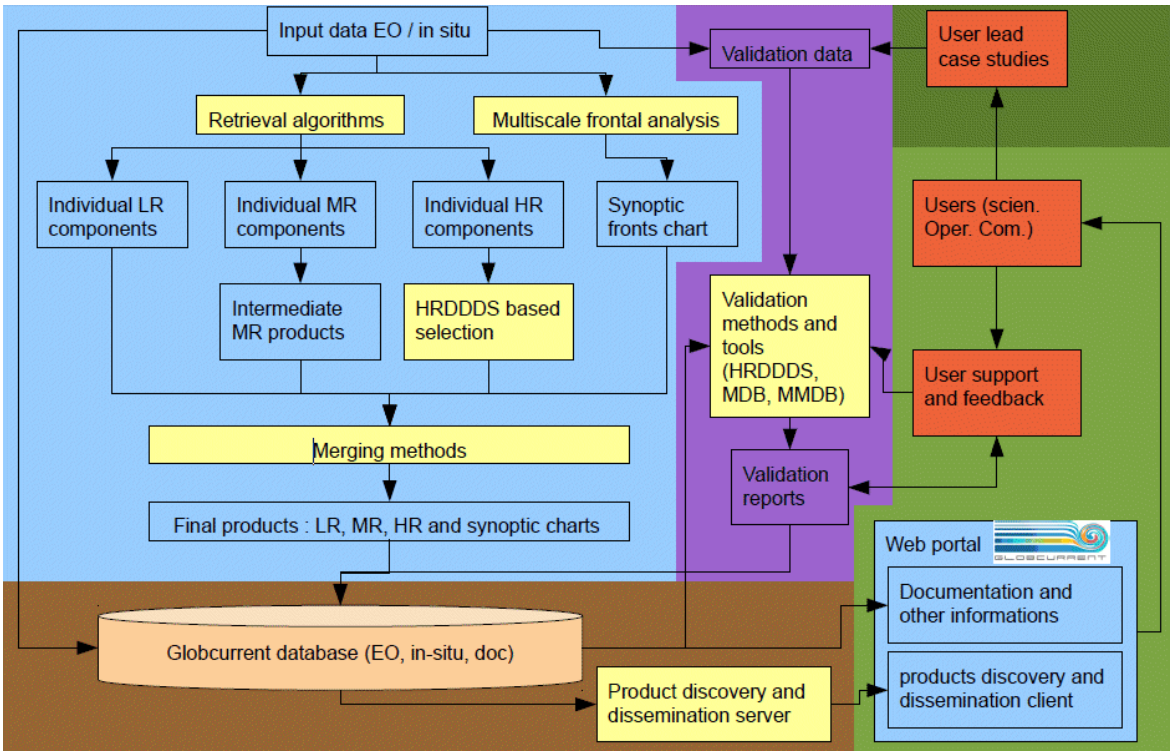

Figure 1: Overview of the data flow and processing components of the full GlobCurrent system. Coloured regions are the key subsystems and arrows denote data flows within and between the ingest, processing, and product delivery subsystems.

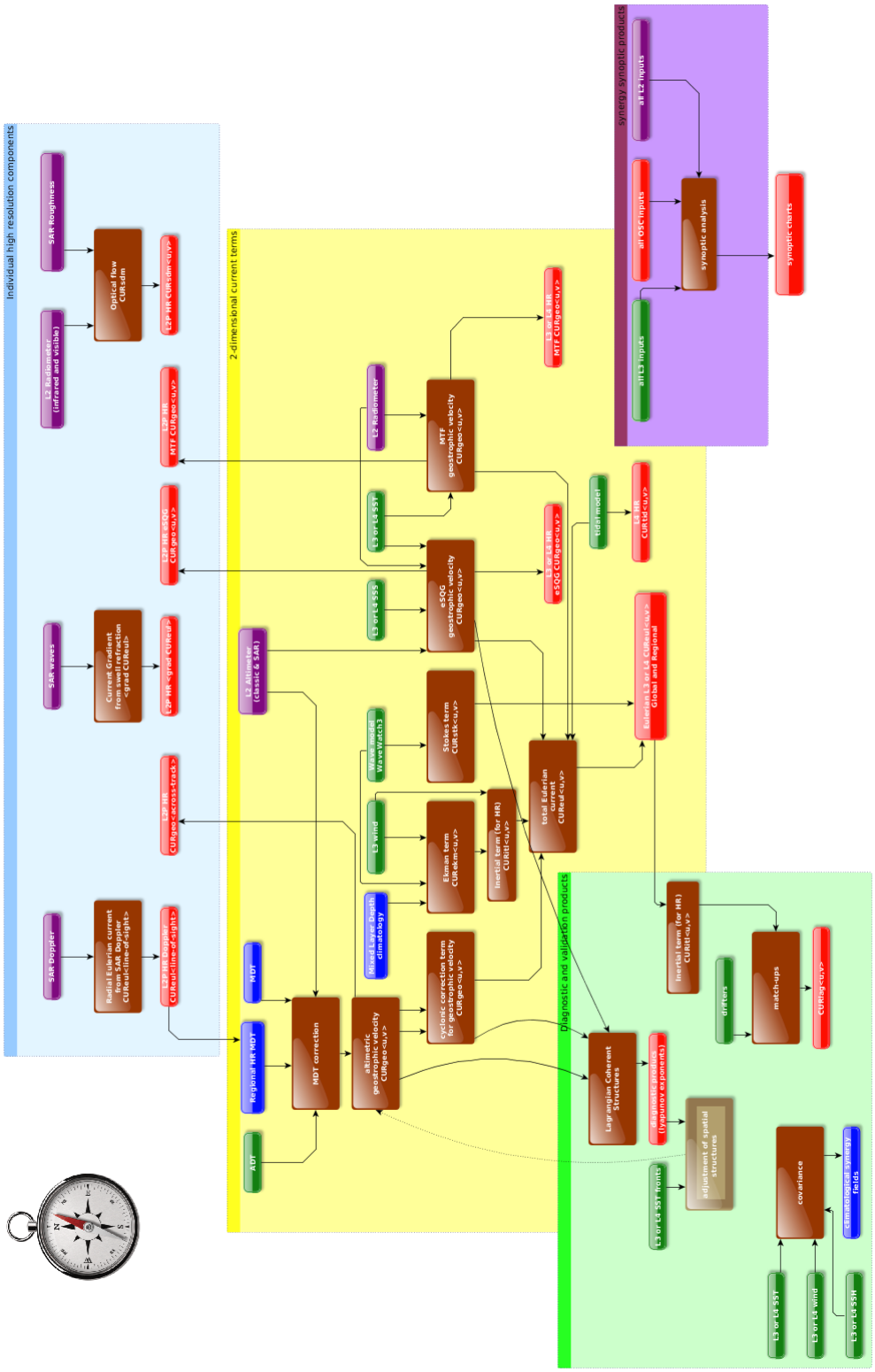

Figure 2: Boussole diagram exposing the core components of the GlobCurrent data processing system. Arrows identify data flow from input data at L2 (purple), L3 or L4 (green) and time-invariant/climatological grids (blue) to processors (brown) that yield output data (red).

Core components of the GlobCurrent processing system are depicted in Fig. 2 by a Boussole diagram, whose main components involve a processing of high-resolution data (light blue),

ocean currents (yellow), diagnostic and validation data (green), and synoptic outputs (purple). This document defines tests of the automated and interactive processing steps that are depicted above and are described in more detail in the project's Technical Specification and Algorithm Theoretical Baseline documents. Input data for these processing steps are defined in the Data Access Requirements document.

1.2. Document structure

This document is organized into the following sections:

- Section 1 (this section) defines the document scope and structure and provides an overview of the GlobCurrent processing system
- Section 2 provides guidelines of the test procedures and a set of acceptance checklists
- Section 3 describes the approach to testing and validation
- Section 4 focuses on product testing and validation
- Sections 5-6 report on validation against the requirements baseline and technical specifications, respectively
- Annexes A and B provide the acceptance test cases and a test report template

1.3. Required content

[SOW] section 5.2.3 defines the information to be provided in this document. Table 1 shows where this required content is supplied.

Required Content	Sections
Include a full specification of all acceptance tests to be carried out during the system Qualification Review **including validation of the system against both the RB and the TS, the input test data required to perform tests and expected outputs** from the GlobCurrent system.	All sections and Annex A
Define the performance and other criteria to be used for acceptance of the system.	Section 2.7 (Table 2): top-level acceptance
Include acceptance criteria for each GlobCurrent product describing how each data set will be verified as fit for purpose prior to release to users.	Section 2.7 (Table 5) and Section 4
Clearly **define and explain how the GlobCurrent System and associated demonstration services shall be validated** by exploiting independent information and assessed by the GlobCurrent User Group in respect of usability and value.	Sections 3,4

Table 1: Location in this document of the content required by [SOW].

1.4. Applicable Documents

[SOW] Statement of Work for DUE GlobCurrent project, EOP-SM/2450, Issue 2, 26 March 2013

[RB-1] Requirement Baseline document for GlobCurrent (project deliverable D-040) issued on 17 August 2014

[TN-1] Technical Note on an analysis and interpretation framework for GlobCurrent (project deliverable D-140) issued on 9 January 2015

[ATBD-1] Algorithm Theoretical Baseline Description (project deliverable D-160) issued on 5 December 2014

[ICD-1] Interface Control Document (project deliverable D-190) issued on 24 November 2014

[TN-2] Technical Note on product format and content for GlobCurrent (project deliverable D-150) issued on 16 April 2015

1.5. Reference documents

The following are the publications and web sites relevant to this document.

1.5.1. Publications

[RD-1] Bonjean F. and G.S.E. Lagerloef, 2002: Diagnostic Model and Analysis of the Surface Currents in the Tropical Pacific Ocean, *J. Phys. Ocean.*, 32, 2938-2954.

[RD-2] Larnicol, G., Guinehut, S., Rio, M.-H., Drevillon, M., Faugere, Y., and Nicolas, G. 2006: The global observed ocean products of the French Mercator project, in: Proceedings of the "15 years of progress in radar altimetry" ESA Symposium, ESA, Venice, 2006.

[RD-3] Madec G. 2008: NEMO ocean engine, Note du Pole de modélisation, Institut Pierre-Simon Laplace (IPSL), France, No 27 ISSN No 1288-1619.

[RD-4] Stoffelen, A., 1998: Toward the true near-surface wind speed: Error modeling and calibration using triple collocation, J. Geophys. Res., 103(C4), 7755–7766, doi:10.1029/97JC03180.

[RD-5] Rio, M.-H., S. Mulet, and N. Picot, 2014: Beyond GOCE for the ocean circulation estimate: Synergetic use of altimetry, gravimetry, and in situ data provides new insight into geostrophic and Ekman currents, Geophys. Res. Lett., 41, doi:10.1002/2014GL061773.

[RD-6] Hansen, M.W.; Collard, F.; Dagestad, K.; Johannessen, J.A.; Fabry, P.; Chapron, B., 2011: Retrieval of Sea Surface Range Velocities From Envisat ASAR Doppler Centroid Measurements, IEEE Trans. Geosci. Remote Sens., vol.49, pp. 3582-3592, doi: 10.1109/TGRS.2011.2153864.

[RD-7] Poje, A.C., T.M. Özgökmen., B. Lipphart, Jr., B. Haus, E.H. Ryan, A.C. Haza, G. Jacobs, A.J.H.M. Reniers, J. Olascoaga, G. Novelli, A. Griffa, F.J. Beron-Vera, S. S. Chen, P. Hogan, E. Coelho, A.D. Kirwan, Jr., H. Huntley, A.J. Mariano, 2014: Submesoscale dispersion in the vicinity of the Deepwater Horizon spill, Proc. Nat. Acad. Sci., vol. 111, pp. 12693-12698.

1.5.2. Web sites

[WEB-1] GlobCurrent external web site
http://www.globcurrent.orghttp://www.globcurrent.org

[WEB-2] GlobCurrent internal web site
http://globcurrent.nersc.nohttp://globcurrent.nersc.no

[WEB-3] DUE web site http://due.esrin.esa.inthttp://due.esrin.esa.int http://due.esrin.esa.int

1.6. Acronyms and abbreviations

AATSR	Advanced Along Track Scanning Radiometer (of ENVISAT)
ADB	Actions Data Base
AMSRE	Advanced Microwave Scanning Radiometer – E (of EoS Aqua)
AQUARIUS	Salinity mission (of NASA/CONAE)
ASAR	Advanced Synthetic Aperture Radar (of ENVISAT)
ASCAT	Advanced SCATterometer (of MetOp)
ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High Resolution Radiometer
CDR	Critical Design Review
DIR	Directory (of project participants)
DMSP	Defense Meteorological Satellite Program (of the USA)
ENVISAT	Environnent Satellite (http://envisat.esa.int)
ESA	European Space Agency
EO	Earth Observation
EU	European Union
FR	Final Report
Hs	Significant Wave Height (also SWH)
ITT	Invitation To Tender
KO	Kick-Off
MR	Monthly Report
MTR	Mid-Term Review
NOP	Numerical Ocean Prediction
NWP	Numerical Weather Prediction
OSC	Ocean surface current
PAR	Preliminary analysis report
PM	Progress meeting
PMP	Project Management Plan
PMR	Passive Microwave Radiometry
RA-2	Radar Altimeter 2 (of ENVISAT)
RB	Reference Baseline
RD	Reference Document
SAR	Synthetic Aperture RADAR
SAR	Scientific Assessment Report (of *SOS*)
SAP	Scientific Analysis Plan
SIAR	Scientific and Impact Assessment Report
SMOS	Soil Moisture and Ocean Salinity (mission)
SOS	Surface Ocean Salinity and Synergy (project)
SoW	Statement of Work
SRR	System Requirements Review
SSH	Sea Surface Height
SSM/I	Special Sensor Microwave Imager (of DMSP)
SST	Sea Surface Temperature
SR	Scientific Roadmap
STSE	Support to Science Element
TBC	To Be Confirmed
TBD	To Be Determined
TDP	Technical Data Package
TDS	Test Data Set
TN	Technical Note (short report 10-50 pages)
TOA	Top of Atmosphere

TR	Technical Report (long report > 50 pages)
UCM	User Consultation Meeting
UM	User Manual
URD	User Requirements Document
URL	Universal Resource Locator
WP	Work Package

2. Acceptance Procedure

2.1. Overview of Acceptance Procedure

The procedure taken to allow acceptance by ESA of GlobCurrent outputs is as follows:

- An updated ATPD (this document) will be delivered to ESA for review three weeks before a Qualification Review. This delivery will mark the end of an Internal Readiness Review (IRR) that is held prior to ATPD delivery.
- The Qualification Review (QR) will be held between the consortium members and ESA at the Contractor's premises. The aim of this review is to confirm readiness for acceptance by ESA at the Acceptance Review.
- The Acceptance Review (AR) will constitute a formal review of the QR outputs to accept the state of the GlobCurrent system at that time. The objective of the AR is to confirm ESA's acceptance of this system and/or raise any corrective actions to address outstanding issues captured in SPR.

The remainder of this chapter describes these stages of acceptance in more detail.

2.2. Internal Readiness Review

The purpose of the IRR is a) to preview the system to be delivered at the Acceptance Review, b) to agree on any changes that this ATPD may require in advance of the Q/AR meeting, and c) to finalise the procedure for the Acceptance Review. This meeting is held a few weeks before each Q/AR (proposed dates are 5 May 2015, 5 October 2015, and 10 June 2016).

2.3. Qualification Review

The purpose of the Qualification Review (QR) is to implement acceptance tests set out below. Any non-conformity will be documented as Software Problem Reports (SPR). The system will be updated to resolve the SPRs, and all the acceptance tests performed again. This cycle will be repeated until all SPRs are resolved. The results of the QR will be documented in a Qualification Review Report (QRR) and delivered three days after the completion of the QR.

2.4. Acceptance Review

Based on the results of the QR, an Acceptance Review (AR) will be conducted to review the readiness of the system for data production and accept the delivery of the system as fit for purpose. If the Qualification Review has been successful the AR will be held immediately after the QR. The results of AR will be documented in an Acceptance Review Report (ARR) and delivered two weeks after the completion of the AR.

2.5. Planning and Procedure

Three Q/AR meeting will be held on consortium premises (8 June 2015 at Ifremer, 19 October 2015 at NERSC, and 24 June 2016 at TBD). Their objectives are to:

- Demonstrate the GlobCurrent system as it will appear to users
- Present the assessment of compliance against the acceptance criteria and requirements baseline

- Present the assessment of compliance against the technical specifications
- Perform an agreed subset of tests with ESA as witnesses
- Discuss and agree with ESA dispositions for any non-compliance or anomalies.

2.6. System review reports

The key documents to be accepted following each Q/AR are the Qualification and Acceptance Review Report (QRR+ARR). These reports will follow the format of the ATPD (this document) and describe the Q/AR results and conclusions.

2.7. Acceptance checklists

2.7.1. Top level acceptance criteria

Table 2 provides a top level summary of requirement acceptance criteria. Additionally at AR, proof is provided that the detailed requirements (from [RB]) have been met. Table 2 and subsequent checklists are verified at Q/AR and copied to the corresponding reports, where the Status and Disposition fields are then completed:

- the **Status** field notes whether each criteria is compliant (*C*), partially compliant (*PC*), or non--compliant (*NC*) and
- the **Disposition** field is filled following discussion at the AR and notes whether the test has been either *Accepted* (no action needed), *Accepted subject to action*, or *Not accepted*.

ID	Acceptance Criteria	Status	Disposition
AC-01	The following global gridded products are available for 2010-2012 at 0.1-degree, 3-hourly resolution and 0-m and 15-m depths: the gridded geostrophic, Ekman, Stokes, and tidal current components (i.e., L4 CURgeo, CURekm, CURstk, CURtid)	To be given in ARR	To be agreed at AR
AC-02	A global combined current product is available for 2010-2012 at 0.1-degree, 3-hourly resolution and 0-m and 15-m depths (i.e., CUReul)	To be given in ARR	To be agreed at AR
AC-03	Each data product is accompanied by a product handbook, which contains the required contents and is available on the website	To be given in ARR	To be agreed at AR
AC-04	A regular user can download products by ftp or OpenDAP (via a THREDDS server) and subsetting is possible	To be given in ARR	To be agreed at AR
AC-05	A regular user can visualize products online using a project tool	To be given in ARR	To be agreed at AR
AC-06	A regular user can access the required contents of the project website and register to receive all project updates and submit feedback on products and services	To be given in ARR	To be agreed at AR
AC-07	An endorsed champion user can access available processing tools and project data on the Nephelae platform	To be given in ARR	To be agreed at AR

Table 2: Top level acceptance checklist

2.7.2. Detailed acceptance criteria

Table 3 provides a detailed requirement acceptance checklist. The QR commences with a presentation that provides evidence that requirements are satisfied. More definitive inspections (INSP) are then provided on request. Tests (Section 2.7.3) are then performed.

ID	Name	Requirement Description	*Verify by*	*Status*	*Disposition and Notes*
GC-RB_1-DATA-REQ-1	Satellite data	The GlobCurrent project shall make use of the platform data listed in bold in Table 1 (**ENVISAT-ASAR, MetOp-A-ASCAT, ERS-2-RA, ENVISAT-RA-2, JASON-1-POSEIDON-2, JASON-2-POSEIDON-3, CRYOSAT-2-SIRAL, GOCE-EGG, GRACE-SuperSTAR, Metop-A,B-AVHRR-2, ENVISAT-AATSR, ENVISAT-MERIS, Aqua-2-AMSR, SMOS-MIRAS**) for the purposes of constructing and validating the year-1 ocean current dataset, and either experiment with in year 1, or prepare for use in years 2 and 3, the platform data listed in normal type.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-DATA-REQ-2	In situ data	The GlobCurrent project shall make use of the source in-situ data listed in bold in Table 2 (**drifting buoys and Argo buoys at the surface**) for the purposes of constructing and validating the year-1 ocean current dataset and either experiment with in year 1, or prepare for use in years 2 and 3, the source data listed in normal type.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-DATA-REQ-3	Analysis data	The GlobCurrent project shall make use of the source analysis data listed in bold in Table 3 (**AVISO-SSH, GHRSST-SST, ECMWF-wind, IFREMER-MLD**) for the purposes of constructing and/or validating the year-1 ocean current dataset and either experiment with in year 1, or prepare for use in years 2 and 3, the source data listed in normal type.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-PROD-DEF-REQ-1	Current definition	*The GlobCurrent* measurements of Combined Current will be given at a specified time (t), location (x,y) and measurement depth level (z). They will be provided as vector components of the form: ($\boldsymbol{u}[t,x,y,z]$, $\boldsymbol{v}[t,x,y,z]$) where ***u*** is a vector component which is positive when directed eastward (negative westward) and ***v*** is a vector component which is positive when directed northward (negative southward).	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-PROD-DEF-REQ-2	Product Level definition	GlobCurrent shall use definition of the different product levels: L2 : swath or along track geophysical products L2p : intercalibrated L2	INSP: Table 7	To be given in ARR	To be agreed at AR

		L3 : gridded product from a single instrument L4 : gridded product from multi-instruments sources It should be brought to attention that this in the specific case of the altimeter data, the above definition differs from the CNES definition that is classically used for the AVISO products (L2p is not used, and instead, L3 refer to intercalibrated along-track monomission products).			
GC-RB_1-PROD-REQ-1	Geograph. coverage	The GlobCurrent shall: Produce a baseline global coverage product for Year 1 Provide at least 5 regional AOI for Year 1 among : • Agulhas (strong current and natural laboratory) • Med sea (diurnal variability, SAR MDT, coastal) • Orkneys (strong tidal currents) validate SAR component • Black sea (enclosed playground basin, SAR MDT) • Norwegian Coastal Current Include at least 10 regional AOI for Year 2 among : • Agulhas (strong current and natural laboratory) • Iroise sea (strong tidal current) • Central equatorial atlantic • Med sea (diurnal variability, SAR MDT, coastal) • Orkneys (strong tidal currents) to validate HR SAR Doppler component • Black sea (enclosed playground basin, SAR MDT) • Gulf stream (stong western boundary clean signal in sst (winter) • Kuroshio (stong western boundary clean signal in sst (winter) • Loop current (potential availability of high drifters density) • Norwegian Coastal Current (coastal and availability of SAR/HF radar) • Sargasso sea (meso/submesoscale soup low current region) • Circumpolar (where the current bifurcates) • East autralian current (coastal) • China coastal current (availability of GOCI) GlobCurrent L2 products shall include coastal areas where appropriate.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-PROD-REQ-2	Period coverage	The GlobCurrent project shall: Provide a 3 years (2010-2012) global product for Year1 which correspond to the best years to have at the same time SMOS and AMSRE-E / ENVISAT /cryosat data) Produce a 10-year global historical output (2006-2014 data set addressing GlobCurrent Requirements for Year2	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-	Spatial resolution	The targeted spatial resolution for the GlobCurrent products will differ from regional to	INSP: Table	To be given	To be agreed at

PROD-REQ-3		global coverage. The target for global products is < 25km while GlobCurrent regional coverage L4 products shall be produced at the highest spatial resolution possible. The spatial resolution of gridded products will be set as the best resolution of all surface current components.	7	in ARR	AR
GC-RB_1-PROD-REQ-4	Temporal resolution	The targeted GlobCurrent L4 products temporal resolution is daily. GlobCurrent L4 products shall be produced at sub-daily intervals where feasible. In the case of use of tide information coming from tidal models, the temporal resolution of the combined current shall be hourly. Temporal resolution of each component (see REQ-460) will be provided at the best temporal resolution	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SAR-REQ-1	Radial current estimate	The GlobCurrent project (within the Year 1 phase) shall: Process the Doppler shift from ENVISAT ASAR wide swath over the AOI with sufficient coverage (ie Agulhas, Med Sea, Black Sea …) with the best possible sea state correction in order to retrieve radial component of surface current.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SAR-REQ-2	Mean current estimate #1	The GlobCurrent project (within the V1 phase) shall: Construct a high resolution mean current analysis from reprocessed ENVISAT ASAR data with the best sea state correction (10m wind analysis and CDOP or model stokes drift), for the Agulhas region and compare this to MDT derived geostrophic currents following Johannessen et al. (2008).	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SAR-REQ-3	Mean current estimate #2	The GlobCurrent project (within the V2 phase) shall: Extend the construction of high resolution mean current analyses using SAR Doppler centroid anomaly data to include other regions of interest (e.g., the case study domains) for which there is a favourable imaging geometry (where current orientation is mostly in the line-of-sight direction). Comparison with corresponding mean currents based on drifting buoys shall address the different reference height to which the two estimates apply (e.g., allowing for a stonger signal of Stokes and wind drift in the SAR current estimate than that of drogued drifters).	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SAR-REQ-4	Mean current estimate #3	The GlobCurrent project (within the V3 phase) shall: Explore (by means of replacement and smoothing, if not by more sophisticated analysis methods) a set of regional modifications to MDT based on the high resolution mean current analyses that were constructed using SAR in previous years. This method of mean current estimation shall then become part of the main GlobCurrent processing chain.	INSP: Table 7	To be given in ARR	To be agreed at AR

GC-RB_1-HRGEO-REQ-1	SAR altimetry #1	The GlobCurrent project (within the V1 phase) shall provide Cryosat-2 across track currents over 3 regions (AoI) over a year (May 2012 - March 2013): Agulhas ; North West Med; Orkney The two SAR groups (isardSAT and CLS) will process 2 regions each and one in common. This common data set (Agulhas region) will allow accurate comparisons between both approaches. For both regions isardSAT shall concentrate on for V1: - Optimization of L1 processing for the benefit of ocean currents observations - Adaptation of the L2 to configuration chosen in L1 - Develop de-noising techniques for the derivation of the geostrophic component - Derivation of the geostrophic component CLS starts the processing from the L3 SLA products derived from the CNES SAR prototype (CPP products). The efforts are therefore focused on calculation of the geostrophic current.thanks to optimisation of the SLA filtering approach.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-HRGEO-REQ-2	SAR altimetry #2	The GlobCurrent project (within the V2 phase) will: -Process the remaining AOI by both teams. -Work on the improvement of the SAR altimetry currents in coastal strip thanks to L2 processing (MSS adapted to C2 coverage) and refinement of the current calculation. -Perform the same analysis as in V1 now revisiting what has been done in V1 and improving any configuration as needed, but also accounting for coastal regions. -Refine the validation with other data sources when possible Furthermore, in preparation for S3 we aim at adapting all configurations to Sentinel-3.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-HRGEO-REQ-3	SAR altimetry #3	The GlobCurrent project (within the V3 phase) shall: improve results as delivered in V1 and V2 adding data from the Sentinel-3 mission and cross-calibrating results of CryoSat and Sentinel-3 Provide absolute currents for Cryosat-2 associated with the regional MDT over the Agulhas region	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-HRGEO-REQ-4	High resolution geostrophy #1	Transfer function shall be estimated between SAR altimeter along track sea level anomaly spectral decomposition and intersected infrared SST. The transfer function will be variable in time and space and will be used to estimate geostrophic current at the resolution of the IR SST field.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-HRGEO-	High resolution geostrophy #2	Geostrophic component of surface current daily at the best possible resolution shall be derived from surface density (estimated from IR SST and SSS) field to sea level height using a spectral decomposition, effective Brunt Waissala	INSP: Table 7	To be given in ARR	To be agreed at AR

REQ-5		frequency and mixed layer depth (from in situ observations) using eSQG model described in the TN-1			
GC-RB_1-HRSWELL-REQ-1	SAR swell parameters	Field of surface current vorticity shall be estimated from the radius of curvature of swell propagation rays as retrieved from SAR data also used to estimate the SAR Doppler derived radial surface currents providing the presence of significant swell such as is usually the case in the Agulhas current region.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VIR-REQ-1	Visible and infrared approach #1	The GlobCurrent project (within the V1 phase) shall: - Implement and investigate the performance for two test regions of MCC as applied to visible spectrum GOCI data from the Korea Ocean Satellite Center, and also to AVHRR high-resolution data received by Dundee. - Evaluate the application of the method in the selected regions, using independent validation data, and provide a measure of uncertainty.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VIR-REQ-2	Visible and infrared approach #2	The GlobCurrent project (within the V2 phase) shall: Implement and investigate the performance for Korean waters of established feature space based tracking methods for tracking eddies as applied to visible spectrum GOCI data, and making use of the openCV library. Evaluate the method in the area of GOCI coverage, using independent validation data, and provide a measure of uncertainty Implement ideas for projecting across-track altimeter currents along the directions inferred from 2-D thermal/visible imagery, and evaluate their accuracy.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VIR-REQ-3	Visible and infrared approach #3	The GlobCurrent project (within the V3 phase) shall: Implement projection of geostrophic currents from single-pass altimetry along frontal directions derived from thermal/visible imagery, and evaluate their accuracy (for particular locations) by comparison with in situ current meters	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VIR-REQ-4	Geolocation	We shall independently verify the quality of the GOCI geolocation for a subset of the GOCI dataset using independent datasets (e.g. high spatial resolution coastline datasets and fixed locations). The results of this will be presented in the relevant ATBD document	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-L4-REQ-1	L4 product	GlobCurrent L4 products shall be provided at different depths: surface (hs depth) and 15m (drifter depth) GlobCurrent L4 products shall contain the following components : Tidal (from model) Stokes drift (provided but not added to other components since it has a nul eulerian mean) Ekman drift	INSP: Table 7	To be given in ARR	To be agreed at AR

		Geostrophy from altimetry, eSQG and MTF. Inertial (due to Ekman) GlobCurrent L4 products shall contain ancillary data and Flags for interpretation purpose at least : Integrated wave parameters (surface depth) Neutral 10m Surface Wind Estimate of ABL stability Mixed layer depth (from ARGO) GlobCurrent L4 products shall be built from GlobCurrent L2P and L3 products. The source L2P/L3 product must be traced into the L4 and source L3 products will be provided within the L4 products as components. At V1, The GlobCurrent shall produce a baseline global coverage product based on the SURCOUF current products (Larnicol et al, 2005, Rio et al, in preparation) calculated as the sum of the geostrophic component and the Ekman component at two different depths (hs and 15m). In the subsequent versions, both the geostrophic and the Ekman components will be improved as described in sections 3.2.8.1 and 3.2.8.2. Also more components will be added to build the combined current as described in sections 3.2.8.3 to 3.2.8.5			
GC-RB_1-GEO-REQ-1	Altimetry #1	The GlobCurrent project (within the V1 phase) shall provide geostrophic surface currents derived applying the geostrophic approximation on Absolute Dynamic Topography (ADT) maps obtained by adding a Mean Dynamic Topography (MDT) and multimission maps of Sea Level Anomalies (SLA). - For the SLA, the latest version of the multimission maps from the SSALTO DUACS production chain (to be distributed on the AVISO website in April 2014). These are daily, global, ¼° maps. - For the MDT, the CNES-CLS13 MDT will be used. It is a global field (including the Mediterranean Sea) on a regular ¼° grid. As it is representative of the 1993-1999 period, it will first be readjusted to the SLA reference period (1993-2012) - Geostrophic currents will be derived from the absolute heights using a 9-point stencil method (Arbic et al, 2012). - At the equator, the altimeter velocity anomalies are calculated from the SLA using a β-plane approximation. The mean geostrophic velocities are directly obtained from the drifter observations. - Methods will be tested to incorporate centrifugal acceleration when deriving ocean velocities from altimetry products. For an	INSP: Table 7	To be given in ARR	To be agreed at AR

		axisymmetric eddy, the correction is proportional to the square of the initial solution and inversely proportional to the radial distance from the eddy center. In the general case, an iterative method will be assessed			
GC-RB_1-GEO-REQ-2	Altimetry #2	The GlobCurrent project (within the V2 phase) shall provide geostrophic surface currents derived applying the geostrophic approximation on Absolute Dynamic Topography (ADT) maps obtained by adding a Mean Dynamic Topography (MDT) and multimission maps of Sea Level Anomalies (SLA) for an extended, 10 year period. This may include the use of Jason3 and Sentinel-3 data. This will also include Altika data from 2013. This product corresponds to the AVISO product.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GEO-REQ-3	Altimetry #3	The GlobCurrent project (within the V3 phase) shall: • Work on the calculation of a regional MDT (Agulhas) based on a new GOCE model (R5), drifters and ARGO floats • Work on the comparison/combination of the obtained MDT with SAR MDT • Provide absolute currents associated with the regional MDT over the Agulhas region	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GEO-REQ-4	eSQG	Geostrophic component of surface current daily at 25km resolution shall be derived from surface density (estimated from microwave SST and SSS) field to sea level height using a spectral decomposition, effective Brunt Waissala frequency and mixed layer depth (from in situ observations) using eSQG model described in the TN-1. - For the SLA, the latest version of the multimission L2P from the SSALTO DUACS (or RADS or PODAAC) production chain shall be used.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GEO-REQ-5	MTF	Geostrophic component of surface current daily at 25km resolution shall be estimated using local (in time and space) transfer functions estimated between altimeter along track sea level anomaly spectral decomposition and intersected microwave SST and SMOS SSS. The transfer function are then applied to the microwave SST and SMOS SSS to retrieve geostrophic surface currents	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GEO-REQ-6	Geostrophy	The GlobCurrent project (within the V2 phase) will assess and select the best sources of geostrophic surface currents (eg from altimetry eSQG and MTF) and provide geostrophic surface currents for an extended, 10 year period. This will also include Altika data from 2013	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-EK-REQ-1	Ekman #1	The global parameters needed to estimate the Ekman component shall include: surface winds (NWP and satellite-derived products), sea state information (NWP Hs and stokes and satellite-derived products), stability (from satellite SST and NWP surface air temperature), mixed layer depth	INSP: Table 7	To be given in ARR	To be agreed at AR

		(in situ low resolution estimates), GlobCurrent eulerian surface current without Ekman current. Comparisons with in situ velocities from drifter trajectories shall be performed to evaluate impact of the different uncertainties, and to test empirical and semi-empirical formulations			
GC-RB_1-EK-REQ-2	Ekman #2	The GlobCurrent project (within the V2 phase) shall: Work on the use of scatterometer winds versus ECMWF reanalysis Investigate the impact of Stokes drift on the estimation of the Ekman model parameters using drifter velocities Provide an improved Ekman model by taking into account those effects. Work on error estimation of the Ekman currents	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-EK-REQ-3	Ekman #3	The GlobCurrent project (within the V3 phase) will: Work on a specific Ekman model for the Mediterranean Sea Work on error estimation of the Ekman currents in the Mediterranean Sea	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-STO-REQ-1	Stokes drift	Stokes drift will be computed at surface (hs depth) and 15m depth using WaveWatch3 model for the surface and wind sea wavelength dependant exponential decay for the depth. The same model input 10m wind will be used for the wind drift.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-INERT-REQ-1	Inertial current	Inertial current component shall be estimated only where the diameter of inertial oscillations exceeds the target resolution of the L4 products.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-TIDES-REQ-1	Tidal current	Tidal currents shall be estimated from model outputs at hourly resolution	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-DIAG-REQ-1	Covariance analysis	Covariance analysis shall be performed - Between microwave and IR SST and Globcurrent advected microwave previously observed SST. Advection period shall be controlled by the IR down to 5km - between HR fronts and deformation field : The deformation field from the Okubo Weiss indicator will be computed on any L2/L3/L4 Globcurrent products and compare to the HR frontal position	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-DIAG-REQ-2	Lagrangian coherent structure	Rate of separation between virtual drifters estimated from Globcurrent product shall be compared to the separation rate from real drifters.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-	Drifter	The GlobCurrent project (within the V1 phase)	INSP:	To be	To be

RB_1-DRF-REQ-1	validation dataset #1	shall: • prepare a dataset of drifting buoy velocities based on the data provided by the SD-DAC (Surface Drifter Data Assembly Center) at http://www.aoml.noaa.gov/phod/dac/index.php Data are available until September 2012. Both drogued and undrogued data will be considered, and provided in two independent files. The methodology by Rio, 2012 shall be applied to provide an estimate of the wind slippage at each time step. An estimation of the Ekman currents at 15m depth shall be calculated and collocated along the drifter trajectories in case of drogued data An estimation of the Ekman currents at the surface shall be calculated and collocated along the drifter trajectories in case of undrogued data An estimation of the Stokes drift shall be calculated and collocated along the drifter trajectories The geostrophic component of the current as measured by altimetry shall be collocated along the drifter trajectories Wind stress values from the ERA INTERIM reanalysis shall be collocated along the drifter trajectories	Table 7	given in ARR	agreed at AR
GC-RB_1-DRF-REQ-2	Drifter validation dataset #2	The GlobCurrent project (within the V2 phase) shall: • Update the dataset of drifting buoy velocities based on the data provided by the SD-DAC (Surface Drifter Data Assembly Center) at http://www.aoml.noaa.gov/phod/dac/index.php • Compare the datasets of Argo float surface velocities provided by Coriolis (ANDRO dataset) and IPRC (YOMAHA dataset) • Enrich the surface dataset with the surface velocities from Argo floats	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-DRF-REQ-3	Drifter validation dataset #3	The GlobCurrent project (within the V3 phase) shall: • Update the dataset of drifting buoy velocities based on the data provided by the SD-DAC (Surface Drifter Data Assembly Center) at http://www.aoml.noaa.gov/phod/dac/index.php and the dataset of surface velocities from Argo floats	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SYN-REQ-1	Frontal detection	Globcurrent shall implement front detection methods (or collect existing outputs from other projects) to generate a front delineation database in homogeneous format from all possible HR datasets (SAR roughness, sun glitter, IR SST, ocean color).	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SYN-REQ-2	Synoptic charts	Globcurrent analyst shall derive weekly synoptic charts of surface currents based on the multisensor front database and all available Globcurrent L2,L3 and L4 products with indication of the major currents path, the identification of	INSP: Table 7	To be given in ARR	To be agreed at AR

		eddies and persistent oceanic fronts for each case studies in WP5 and for a time period to be agreed with the end user leading the case study.			
GC-RB_1-GLOP-REQ-1	GLOP provision	GlobCurrent shall provide an operational (meaning near real time) system (GLOP) able to ensure both automated operations and supervised operations for all computational tasks of GlobCurrent	TEST: GC-TC-010	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-2	GLOP delivery	The data collection shall be able to handle various kinds of deliveries : • FTP • OpenDAP • HTTP	TEST: GC-TC-020	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-3	GLOP ingestion	The input data shall be registered into the GlobCurrent database, fulfilling the following requirements : • each input dataset (collection) shall be properly described and registered in a central catalogue • GlobCurrent shall provide a format model for each type of data (trajectory for in situ, along-track, swath, grid for satellite, climatological or model data). Each collected data shall be formatted to match the GlobCurrent data model at the ingestion step. • GlobCurrent shall provide a unique data repository for all input data. It should homogenize and make consistent the data organization. • Each incoming data file in the system shall be properly identified and indexed. • All data shall be available on disk to GlobCurrent partners through common protocols and access means	INSP: Table 7 and TEST: GC-TC-320	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-4	GLOP feedback	The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data collection monitoring. Detected issues should be raised to users whenever relevant	TEST: GC-TC-030	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-5	GLOP automation	The system shall therefore be able to perform automated processing in the following modes : • data driven : new incoming data triggers a specific processing chain • periodic (cron) : processing chains at triggered at a specific time frequency to generate periodic products (L4, reports, quality checks, …) reprocessing : given a list of input data (data driven) or date/times (periodic), the system is able to run processing chains over the whole range of specified inputs, load balancing the processing on the available resources and reporting to the GLOP operators on progress and status (errors, etc...).	TEST: GC-TC-040 and GC-TC-320	To be given in ARR	To be agreed at AR
GC-	GLOP deploy	The workflow system shall be able to integrate and deploy any processor provided by a	TEST: GC-	To be given	To be agreed at

RB_1-GLOP-REQ-6		GlobCurrent project member. In order to minimize integration effort it shall provide recommendation on processor design and interfaces (preferred language, input arguments, …).	TC-050	in ARR	AR
GC-RB_1-GLOP-REQ-7	GLOP chain	The workflow system shall be able to sequence and run any chain of successive processing steps, each one being implemented through a standalone processor.	TEST: GC-TC-060	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-8	GLOP input format	The project shall provide recommendations to the project partners on the processor's input formatting and design so that input sources can be easily interchanged	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-9	GLOP workflow	The workflow system shall implement source control configuration of processors and processing chain configurations, and implement proper version track management. It shall be able to easily integrate new processors or configurations.	TEST: GC-TC-070	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-10	GLOP concurrent runs	The workflow system shall be able to run concurrently different versions of the processors and processing chains	TEST: GC-TC-080	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-11	GLOP reporting tools	The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data processing monitoring. Detected issues should be raised to users whenever relevant	TEST: GC-TC-090	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-12	GLOP dissemination	A GlobCurrent dissemination system shall be implemented to disseminate data (products and higher level information) to the user community	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-13	GLOP free	The GlobCurrent dissemination system shall make the data available to any users without any restrictions or any cost. Preliminary (free) registration may required to track user profiles	TEST: GC-TC-100	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-14	GLOP netCDF	The GlobCurrent products shall be disseminated in widely used data formats. The preferred format for ocean community shall be NetCDF4, complying to standard recommendations such as Climate and Forecast (CF) for format and metadata	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-15	GLOP grib2	The dissemination system shall be able to format GlobCurrent products to suitable format for a given application: in particular it shall be able to deliver relevant products in grib2 format	TEST: GC-TC-110	To be given in ARR	To be agreed at AR

GC-RB_1-GLOP-REQ-16	GLOP subset	The GlobCurrent dissemination mechanism shall be able to subset data on demand for specific users. Other tailoring functions shall be added on user demand	TEST: GC-TC-120	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-17	GLOP images	The GlobCurrent dissemination mechanism shall be able to deliver data as images (GeoTiff, png,...).	TEST: GC-TC-130	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-18	GLOP on demand	Other tailoring functions shall be added on user demand.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-19	GLOP requests	The GlobCurrent dissemination mechanism shall be able to automatically perform these operations on a routine basis and make the tailored data available on a FTP repository or sent by email	TEST: GC-TC-140	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-20	GLOP dissemination monitoring	The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data dissemination monitoring. Detected issues should be raised to users whenever relevant, through RSS feed and email	TEST: GC-TC-150	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-21	GLOP help desk	The users shall have a proper way to report issues with the data access to a help desk with fast reply to any reported issue	TEST: GC-TC-160	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-22	GLOP product discovery	The dissemination system shall provide a user-friendly discovery tool for GlobCurrent product collections (catalogue) and data (index of products).	TEST: GC-TC-170	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-23	GLOP visualization	The dissemination system shall provide a user-friendly visualisation tool to display and intercompare the GlobCurrent products	TEST: GC-TC-180	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-24	GLOP match-ups	GlobCurrent shall provide tools to produce cross-sensor matchups (MDB : match-up databases), such as satellite to in situ matchups, or multi-sensor match-up databases (MMDB) over predefined sites (similar to the concept of HR-DDS sites defined in GHRSST). This may be based for instance on tools such as felyx (http://www.felyx.org).	TEST: GC-TC-190	To be given in ARR	To be agreed at AR
GC-	GLOP	GlobCurrent shall provides tools to intercompare	TEST:	To be	To be

RB_1-GLOP-REQ-25	visual comparison	various sources of OSC (or ancillary) data, in particular to support decision making on supervised synoptic product generation. This may be based for instance on synergy tools such as Syntool	GC-TC-200	given in ARR	agreed at AR
GC-RB_1-GLOP-REQ-26	GLOP validation diagnostics	GlobCurrent shall provide diagnostic and validation tools to assess the dynamic quality of the calculated currents and produce quality indicators and reports. Such diagnostic tools may for instance include production of Lagrangian Coherent Structures (such as Lyapunov exponents).	TEST: GC-TC-210	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-27	GLOP supervised data collection	GlobCurrent project shall liaise with providers to get any relevant dataset that may not be readily available and format it to a usable form and content for GlobCurrent.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-GLOP-REQ-28	GLOP supervised product generation	GlobCurrent project shall provide a system to deliver synoptic products from multiple sources of data. This process may be supervised through expert interaction	TEST: GC-TC-220	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-1	Data collection	The *GlobCurrent* system ***shall*** include a database of near contemporaneous *in situ* data for validation purposes including: HF-RADAR In-Situ Ocean Surface Current measurements Satellite measurements including lower level- 1 information Any other data required by *GlobCurrent* validation The in-situ OSC validation data shall be collected from a range of globally distributed validation sites covering different ocean regimes and sampling different seasons. These data should be provided to the GlobCurrent users (if the in-situ data providers agree).	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-2	L2 errors and flags	GlobCurrent L2P products shall include uncertainty estimates and flags for every grid-point in the data file. Among the individual L2 current components that GlobCurrent will produce (i.e., from Fig. 2: Doppler line-of-sight, geostrophic, current gradient, and optical), none provide estimates of combined current at 15-m depth. However, after smoothing over a few inertial timescales (or in an error-weighted mean sense for Doppler; cf. Hansen et al. 2011), the drifter data provide a common first-order reference for these L2P products. Differences can be computed directly, although by including a corresponding model estimate, a more accurate calculation of observational bias and standard deviation can be obtained (Stoffelen 1998). Comparison to HF radar, when available, should allow for refined error estimates of Doppler and	TEST: GC-TC-230	To be given in ARR	To be agreed at AR

		current gradient estimates. Ekman current components may need to rely on error estimates of the model parameters (GC-RB_1-EK-REQ-2) and perhaps also on variance in the wind stress inputs (e.g., ECMWF versus scatterometer winds).			
GC-RB_1-VAL-REQ-3	L4 errors and flags	GlobCurrent L4 products shall include uncertainty estimates for every grid-point in the data file. Uncertainty estimates shall include those from the data and those from the analysis system. Eulerian (u and v component) and Lagrangian (FTLE or LCS) metrics will be employed for L4 validation. We will primarily use drifting buoys (usually drogued) as the ocean current reference because these and the SSES values obtained from them should be relatively consistent globally and over the decade 2002-2012 (about 13 million positions were collected since 1979). The remaining validation data (HF radar, moored buoys, ADCP, and gridded model output) should permit either a higher resolution validation, a better reference for a given current component, or an independent validation of errors, but with a reference error bias and standard deviation that may differ from that obtained relative to drifters.	TEST: GC-TC-240	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-4	Intercomparison	Validation shall be performed by: • Inter-comparison of Level-2 satellite OSC products with in-situ data (this Category-1 comparison is discussed in GC-RB_1-VAL-REQ-2 above) • Between different EO products (this Category-2 comparison shall address the complementary near-geostrophic current retrieval methods of altimetric and eSQG). In-situ data that has been used for calibration of a satellite OSC retrieval algorithm shall not be used to validate that retrieval. GlobCurrent L2 and L4 data products also shall be inter-compared to other existing products (e.g. OSCAR) on a regular (target daily) basis. The focus of this activity is on identifying differences between GlobCurrent and existing products at L4, so regular differences are performed at this level and where a diagnosis of differences would be enlightening, attribution of analysis method or L2 differences are explored. Existing products (like OSCAR) are *not* assumed to consist of independent data.	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-5	Long-term stability of the products	Validation ***shall*** characterise the long-term stability of the satellite OSC data sets. The focus of this activity is on removing jumps in the OSC reanalysis that are caused by large changes in observational quality or coverage. Users shall be informed if such jumps are traced either to an unexpected impact, or to a problem	INSP: Table 7	To be given in ARR	To be agreed at AR

		with L2 observations or processing, of a given instrument or platform. Eulerian metrics shall be employed.			
GC-RB_1-VAL-REQ-6	Product uncertainty validation	Satellite OSC product uncertainty estimates ***shall*** be validated. This shall employ independent reference data for validation, such as the use of similar and independent buoy data (e.g., ARGO buoys and undrogued drifters).	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-7	Validation Reports	Validation reports must be written and made available through the web portal. The metrics that are employed to characterize L2 and L4 data quality will be provided in a series of report updates that document the evolution of GlobCurrent products	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-8	Product validation	The *GlobCurrent* Portal ***shall*** provide automated performance metrics for each product. A time series of *GlobCurrent* Metrics for the product performance ***shall*** be provided. This activity shall automatically document standard (e.g., current component) metrics applied to each product and thereby highlight uncontrolled errors in the creation of GlobCurrent products that would be detrimental for user applications. Note: the intention of this requirement is to provide users with an early warning of issues and problems and to help demonstrate the reliability of the system (as requested by many users).	TEST: GC-TC-250	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-9	System validation	The *GlobCurrent* Portal ***shall*** provide automated performance metrics for each service A time series of *GlobCurrent* Metrics for the processing and delivery system(s) shall be provided. This activity shall identify uncontrolled failures in the provision of GlobCurrent services that would be inconvenient to users. Note: the intention of this requirement is to provide users with an early warning of issues and problems and to help demonstrate the reliability of the system (as requested by many users).	TEST: GC-TC-260	To be given in ARR	To be agreed at AR
GC-RB_1-VAL-REQ-10	Validation areas of interest	Regions employed for validation will target the GlobCurrent areas of interest (i.e., year one will include 5 areas and global; years two and three will include 10 areas and global)	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-1	Inform and update	Provision and updates of information on definition of GlobCurrent products, including their origin and applied retrieval methods, as well as how to access the products and use the web tools via the different communication lines identified above.	TEST: GC-TC-270	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-2	Maps	*GlobCurrent* ***shall*** provide maps of ocean current vectors for all products suitable for use on the *GlobCurrent* web portal and for download by users *Note: Versions of these maps may also provide a*	TEST: GC-TC-280	To be given in ARR	To be agreed at AR

		data product quick-look capability *GlobCurrent* ***shall*** provide animations of products with dynamic visualisation capability similar to that used by the NOAA/GLERL Great Lakes Surface Currents Map project (http://www.glerl.noaa.gov/res/glcfs/currents/ and F. Viegas and M. Wattenberg (http://hint.fm)			
GC-RB_1-COM-REQ-3	Time series	*GlobCurrent* ***shall*** provide tools for extracting time series of products over a given geographical location, as well as statistics of match-ups with in-situ and other (*e.g.,* model output) data held by *GlobCurrent*. Other tools ***shall*** be defined and implemented based on user requirements as required	TEST: GC-TC-290	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-4	Handbook	The *GlobCurrent* project ***shall*** develop and maintain tailored versions of EO product handbooks for each *GlobCurrent* product and service. Product handbooks ***shall*** include: i. Glossary of terms, a table of acronyms ii. Introduction and summary of product use in typical user applications iii. Relevant background material describing the product, iv. Description of the precise algorithms applied to generate the product with links to ATBD and other reference material, v. A description of the Processing Model that explains how data were processed end-to-end for each *GlobCurrent* product. vi. Range of product accuracy, precision and links to validation information and validation evidence, vii. User guidance on the application of products by example application, viii. A description of strengths and weakness of each data product, ix. A comprehensive description of the derivation of uncertainties for each *GlobCurrent* Product and their validity. x. An example of how to use uncertainty information provided with the product. xi. Relevant scientific and engineering journal paper and report references, xii. Detailed description of product format, xiii. CDL dump of an example product, xiv. Estimates of typical file sizes, xv. Description of where and how to access/order products, xvi. Contact points for each product, xvii. Full visualisation (*e.g.,* images, line plots	INSP: Table 7	To be given in ARR	To be agreed at AR

		etc.) of an example product, xviii. Example read software and links to actual software code available on the *GlobCurrent* web portal, xix. A product FAQ tailored to *GlobCurrent* applications. xx. A feedback form and contact details to submit feedback allowing users to report problems and request further information. xxi. Any other material required by beginner users to successfully understand, read and apply the product. xxii. Appendices detailing any web sites, software tools, read software *etc*. *GlobCurrent* product handbooks ***shall*** be maintained and updated based on user feedback and product/service evolution for the duration of the *GlobCurrent* project.			
GC-RB_1-COM-REQ-5	Web portal access	All project documents shall be available to the GlobCurrent users via the GlobCurrent Web Portal. All *GlobCurrent* documents ***shall*** accessible to the user community in an open and transparent manner. No restriction on public access to all *GlobCurrent* deliverable documents ***shall*** be allowed. This requirement excludes *GlobCurrent* project management reports to ESA.	TEST: GC-TC-300	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-6	Web portal content	The *GlobCurrent* web Portal ***shall*** conform to the following specification: ● Be operated in a robust manner with an availability of >95%. ● All data and information accessible via the portal ***shall*** by default be provided publicly and without restriction. ● Include a blog. ● All sources of data and information products ***shall*** be fully acknowledged. ● Access to all data products hosted on the web portal ***shall*** require the user to enter their email address, which ***shall*** then be added to the *GlobCurrent* Directory (DIR) ● Contain introductory information about the *GlobCurrent* project, including background, objectives, work plan and schedule, latest project news and news archive, dates/venues/registration link/presentations of all open meetings, list of *GlobCurrent* team members, contacts of the project manager and consortium partners. ● Provide relevant links to related	INSP: Table 7	To be given in ARR	To be agreed at AR

		activities. ● Include a list of *GlobCurrent* Champion users and pages providing User profiles of Key Champion Users and their applications. ● A reference bibliography of relevant scientific papers and reports. ● Description and links to sources all data used in the project. ● Description and links to all satellite data sets used within the project including links to their ATBD and source processing systems. ● Guides on how to access satellite data provided by the space agencies, and information on reprocessing activities. ● An interactive geographical interface to visualise *GlobCurrent* data products. ● Web-accessible tools to manipulate and work with *GlobCurrent* data. ● FTP access to all *GlobCurrent* products. ● Access to all public project documentation. ● A password protected *GlobCurrent* project section containing project internal documentation, such as all draft document deliverables, RIDs, meeting minutes, actions database, monthly reports, project management plan, etc. Access to internal sections of the *GlobCurrent* web portal ***shall*** require registration. Any other service or function required to implement the *GlobCurrent* project			
GC-RB_1-COM-REQ-7	Directory and mailing list	The GlobCurrent project will develop and maintain a directory and mailing list which shall contain contact details of: a. All members of the study team b. All participants to meetings. Users registering on the web portal	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-8	Peer-reviewed papers	The GlobCurrent project will develop and submit scientific peer reviewed papers to appropriate international science journals. The publications shall acknowledge the support of the ESA DUE programme and use of ESA data	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-9	Present results of the study	The GlobCurrent project will present the study and results at relevant international events, including future ESA meetings and other international symposia during the lifetime of the project	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-10	Promote results of the study #1	The GlobCurrent project will actively promote the results of the study and distribute freely all data, reports and experimental output data to: a. User community. b. Other relevant scientific communities. The GlobCurrent project will produce and	INSP: Table 7	To be given in ARR	To be agreed at AR

		distribute on a regular basis newsletters (every 6 months) to communicate on the progress of the project and brochures (every year) before each User Consultation Meeting, to describe the different version of the Globcurrent system			
GC-RB_1-COM-REQ-11	Promote results of the study #2	*GlobCurrent* ***shall*** use of social networking tools (e.g. Twitter, Facebook etc) as part of the project operational, outreach and communication service.	TEST: GC-TC-310	To be given in ARR	To be agreed at AR
GC-RB_1-COM-REQ-12	UCM	The GlobCurrent project shall organise a User Consultation Meeting (UCM-1) within the first year of the project. It will have the following objectives: a. Exchange information on the results of the project with the user community. b. Outreach to other scientific users and researchers. c. Raise awareness of the utility of EO for ocean currents. d. Obtain feedback from users on the v1 products and services. Minutes of the workshop shall be produced and distributed in an electronic format	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-CASE-REQ-1	Case studies	Provision of all GlobCurrent satellite products as well web-tools. On the case-by-case basis the GlobCurrent project team will be available to support and guide the case studies with respect to data handling, processing, collocation, visualization and interpretation	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-DEMO-REQ-1	NRT demo	A Globcurrent analyst together with the steering team, will select a few cruises in agreement with end users (scientific cruise in the Agulhas/circumpolar current or commercial cargo ship from Shanghai to Cape Town, …) . Before cruise : the Globcurrent analyst and the end user will define the required surface current information needed in terms of depth, frequency, resolution, format, compression. During cruise : the Globcurrent analyst will provide synoptic charts, NRT gridded L2 and L4 products, email/telephone interpretation support. After cruise : the Globcurrent analyst will debrief with the end user on the value added and eventually economy made by using Globcurrent surface current information. The now-casting demonstration is aiming at helping a few selected users to start evaluating Globcurrent information for real ship routing (including discussion on the precise need, formatting, compression, delivery, interpretation assistance, and debrief) it should involved one sailing race, one research cruise, and a	INSP: Table 7	To be given in ARR	To be agreed at AR

		commercial vessels (CMA-CGM for instance) preferably over a overlapping period of a few month. This now-casting demonstration shall take place ideally within the second or third year of the project			
GC-RB_1-SCH-REQ-1	Workshop dates	The dates and location of the UCM-1 will be finalised and advertised at least 10 months before the meeting is due to take place	INSP: Table 7	To be given in ARR	To be agreed at AR
GC-RB_1-SCH-REQ-2	Providing datasets in advance	The GlobCurrent project shall provide all v1 data products at least 3 months before the UCM-1.	INSP: Table 7	To be given in ARR	To be agreed at AR

Table 3: Detailed requirement acceptance checklist

2.7.3. Checklists for test cases and product validation

The following test case checklist (Table 4) is made available for documentation at the Q/AR with the result added to the summary report:

Test Case	Description	Test Case Report (ATPD Annex B)	Test Case successful	Anomalies / Non-conformances found
GC-TC-010: GLOP provision (GC-RB_1-GLOP-REQ-1)	GlobCurrent shall provide an operation system (GLOP) able to ensure both automated operations and supervised operations for all computational tasks of GlobCurrent	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-020: GLOP delivery (GC-RB_1-GLOP-REQ-2)	The data collection shall be able to handle various kinds of deliveries (ftp, THREDDS, http)	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-030: GLOP feedback (GC-RB_1-GLOP-REQ-4)	The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data collection monitoring. Detected issues should be raised to users whenever relevant	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-040: GLOP automation (GC-RB_1-GLOP-REQ-5)	The system shall therefore be able to perform automated processing in the following modes : a) data driven : new incoming data triggers a specific processing chain, and b)	To be given in ARR	To be given in ARR	To be given in ARR

	periodic (cron) : processing chains at triggered at a specific time frequency to generate periodic products (L4, reports, quality checks, …), and c) reprocessing : given a list of input data (data driven) or date/times (periodic), the system is able to run processing chains over the whole range of specified inputs, load balancing the processing on the available resources and reporting to the GLOP operators on progress and status (errors, etc...)			
GC-TC-050: GLOP deploy (GC-RB_1-GLOP-REQ-6)	The workflow system shall be able to integrate and deploy any processor provided by a GlobCurrent project member. In order to minimize integration effort it shall provide recommendation on processor design and interfaces (preferred language, input arguments, …).	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-060: GLOP chain (GC-RB_1-GLOP-REQ-7)	The workflow system shall be able to sequence and run any chain of successive processing steps, each one being implemented through a standalone processor	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-070: GLOP workflow (GC-RB_1-GLOP-REQ-9)	The workflow system shall implement source control configuration of processors and processing chain configurations, and implement proper version track management. It shall be able to easily integrate new processors or configurations.	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-080: GLOP concurrent runs	The workflow system shall be able to run concurrently different versions of the	To be given in ARR	To be given in ARR	To be given in ARR

(GC-RB_1-GLOP-REQ-10)	processors and processing chains			
GC-TC-090: GLOP reporting tools (GC-RB_1-COM-REQ-11)	The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data processing monitoring. Detected issues should be raised to users whenever relevant	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-100: GLOP free (GC-RB_1-COM-REQ-13)	The GlobCurrent dissemination system shall make the data available to any users without any restrictions or any cost. Preliminary (free) registration may required to track user profiles	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-110: GLOP grib2 (GC-RB_1-GLOP-REQ-15)	The dissemination system shall be able to format GlobCurrent products to suitable format for a given application: in particular it shall be able to deliver relevant products in grib2 format	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-120: GLOP subset (GC-RB_1-GLOP-REQ-16)	The GlobCurrent dissemination mechanism shall be able to subset data on demand for specific users. Other tailoring functions shall be added on user demand	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-130: GLOP images (GC-RB_1-GLOP-REQ-17)	The GlobCurrent dissemination mechanism shall be able to deliver data as images (GeoTiff, png,...).	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-140: GLOP requests (GC-RB_1-GLOP-REQ-19)	The GlobCurrent dissemination mechanism shall be able to automatically perform these operations on a routine basis and make the tailored data available on a FTP repository or sent by email	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-150: GLOP	The GLOP shall provide the proper feedback	To be given in ARR	To be given in ARR	To be given in ARR

dissemination monitoring (GC-RB_1-GLOP-REQ-20)	mechanisms and reporting tools to the GlobCurrent system operators for data dissemination monitoring. Detected issues should be raised to users whenever relevant, through RSS feed and email			
GC-TC-160: GLOP help desk (GC-RB_1-GLOP-REQ-21)	The users shall have a proper way to report issues with the data access to a help desk with fast reply to any reported issue	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-170: GLOP product discovery (GC-RB_1-GLOP-REQ-22)	The dissemination system shall provide a user-friendly discovery tool for GlobCurrent product collections (catalogue) and data (index of products).	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-180: GLOP visualization (GC-RB_1-GLOP-REQ-23)	The dissemination system shall provide a user-friendly visualisation tool to display and intercompare the GlobCurrent products	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-190: GLOP match-ups (GC-RB_1-GLOP-REQ-24)	GlobCurrent shall provide tools to produce cross-sensor matchups (MDB : match-up databases), such as satellite to in situ matchups, or multi-sensor match-up databases (MMDB) over predefined sites (similar to the concept of HR-DDS sites defined in GHRSST). This may be based for instance on tools such as felyx (http://www.felyx.org)	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-200: GLOP visual comparison (GC-RB_1-GLOP-REQ-25)	GlobCurrent shall provides tools to intercompare various sources of OSC (or ancillary) data, in particular to support decision making on supervised synoptic product generation. This may be based for	To be given in ARR	To be given in ARR	To be given in ARR

	instance on synergy tools such as Syntool			
GC-TC-210: GLOP validation diagnostics (GC-RB_1-GLOP-REQ-26)	GlobCurrent shall provide diagnostic and validation tools to assess the dynamic quality of the calculated currents and produce quality indicators and reports. Such diagnostic tools may for instance include production of Lagrangian Coherent Structures (such as Lyapunov exponents)	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-220: GLOP supervised product generation (GC-RB_1-GLOP-REQ-28)	GlobCurrent project shall provide a system to deliver synoptic products from multiple sources of data. This process may be supervised through expert interaction	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-230: L2 errors and flags (GC-RB_1-VAL-REQ-2)	GlobCurrent L2P products shall include uncertainty estimates and flags for every grid-point in the data file. Among the individual L2 current components that GlobCurrent will produce (i.e., from Fig. 2: Doppler line-of-sight, geostrophic, current gradient, and optical), none provide estimates of combined current at 15-m depth. However, after smoothing over a few inertial timescales (or in an error-weighted mean sense for Doppler; cf. Hansen et al. 2011), the drifter data provide a common first-order reference for these L2P products. Differences can be computed directly, although by including a corresponding model estimate, a more accurate calculation of observational bias and standard deviation can be obtained (Stoffelen	To be given in ARR	To be given in ARR	To be given in ARR

	1998). Comparison to HF radar, when available, should allow for refined error estimates of Doppler and current gradient estimates. Ekman current components may need to rely on error estimates of the model parameters (GC-RB_1-EK-REQ-2) and perhaps also on variance in the wind stress inputs (e.g., ECMWF versus scatterometer winds).			
GC-TC-240: L4 errors and flags (GC-RB_1-VAL-REQ-3)	GlobCurrent L4 products shall include uncertainty estimates for every grid-point in the data file. Uncertainty estimates shall include those from the data and those from the analysis system. Eulerian (u and v component) and Lagrangian (FTLE or LCS) metrics will be employed for L4 validation. We will primarily use drifting buoys (usually drogued) as the ocean current reference because these and the SSES values obtained from them should be relatively consistent globally and over the decade 2002-2012 (about 13 million positions were collected since 1979). The remaining validation data (HF radar, moored buoys, ADCP, and gridded model output) should permit either a higher resolution validation, a better reference for a given current component, or an independent validation of errors, but with a reference error bias and standard deviation that may differ from that obtained	To be given in ARR	To be given in ARR	To be given in ARR

	relative to drifters.			
GC-TC-250: Product validation (GC-RB_1-VAL-REQ-8)	The GlobCurrent Portal shall provide automated performance metrics for each product. A time series of GlobCurrent Metrics for the product performance shall be provided. This activity shall automatically document standard (e.g., current component) metrics applied to each product and thereby highlight uncontrolled errors in the creation of GlobCurrent products that would be detrimental for user applications. Note: the intention of this requirement is to provide users with an early warning of issues and problems and to help demonstrate the reliability of the system (as requested by many users).	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-260: System validation (GC-RB_1-VAL-REQ-9)	The GlobCurrent Portal shall provide automated performance metrics for each service A time series of GlobCurrent Metrics for the processing and delivery system(s) shall be provided. This activity shall identify uncontrolled failures in the provision of GlobCurrent services that would be inconvenient to users. Note: the intention of this requirement is to provide users with an early warning of issues and problems and to help demonstrate the reliability of the system (as requested by many users).	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-270: Inform and	Provision and updates of information on definition	To be given in ARR	To be given in ARR	To be given in ARR

update (GC-RB_1-COM-REQ-1)	of GlobCurrent products, including their origin and applied retrieval methods, as well as how to access the products and use the web tools via the different communication lines identified above			
GC-TC-280: Maps (GC-RB_1-COM-REQ-2)	GlobCurrent shall provide maps of ocean current vectors for all products suitable for use on the GlobCurrent web portal and for download by users Note: Versions of these maps may also provide a data product quick-look capability. GlobCurrent shall provide animations of products with dynamic visualisation capability similar to that used by the NOAA/GLERL Great Lakes Surface Currents Map project (http://www.glerl.noaa.gov/res/glcfs/currents/ and F. Viegas and M. Wattenberg (http://hint.fm)	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-290: Time series (GC-RB_1-COM-REQ-3)	GlobCurrent shall provide tools for extracting time series of products over a given geographical location, as well as statistics of match-ups with in-situ and other (e.g., model output) data held by GlobCurrent. Other tools shall be defined and implemented based on user requirements as required	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-300: Web portal access (GC-RB_1-COM-REQ-5)	All project documents shall be available to the GlobCurrent users via the GlobCurrent Web Portal. All GlobCurrent documents shall accessible to the user	To be given in ARR	To be given in ARR	To be given in ARR

	community in an open and transparent manner. No restriction on public access to all GlobCurrent deliverable documents shall be allowed. This requirement excludes GlobCurrent project management reports to ESA.			
GC-TC-310: Promote results of the study #2 (GC-RB_1-COM-REQ-11)	GlobCurrent shall use of social networking tools (e.g. Twitter, Facebook etc) as part of the project operational, outreach and communication service.	To be given in ARR	To be given in ARR	To be given in ARR
GC-TC-320: Champion user upload	An endorsed champion user uploads a python script to the Nephelae platform and tests it using GlobCurrent data as input	To be given in ARR	To be given in ARR	To be given in ARR

Table 4: Test cases checklist

The following product validation checklist (Table 5) is also documented at the Q/AR, with the result to be included in the Q/AR report:

ID	Description	Data Handbook reference	Processing chain present	Confirm product is output	Validation approach	Validation reference	Checked for ease of use and suitability	Notes
L2-dop	L2P Doppler CUReul	TBD in ARR	TBD in ARR	TBD in ARR	Validation provided	HBK	TBC in ARR	
L2-geo	L2P CURgeo	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	
L2-grd	L2P grad CUReul	TBD in ARR	TBD in ARR	TBD in ARR	Not validated outside case study	HBK	TBC in ARR	
L2-sqg	L2P eSQG CURgeo	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	
L2-mtf	L2P MTF CURgeo	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	
L2-opt	L2P CURsdm	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	
L4-sqg	L4 eSQG CURgeo	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	
L4-mtf	L4 MTF CURgeo	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	

L4-cob	L4 comb CUReul	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation, OSCAR, case study	HBK	TBC in ARR	
L6-dia	Diagnostic products	TBD in ARR	TBD in ARR	TBD in ARR	Validated: SST fronts	HBK	TBC in ARR	
L6-lag	*CURlag matchups*	TBD in ARR	TBD in ARR	TBD in ARR	Validated: collocation	HBK	TBC in ARR	
L6-syn	Synergy synoptic products	TBD in ARR	TBD in ARR	TBD in ARR	Not validated outside case study	HBK	TBC in ARR	

Table 5: Product validation checklist

3. Approach to testing and validation

3.1. Overview

This section gives an overview of our approach to testing and validation. The key objectives of the project have been specified by ESA to be:

- Define a scientific framework (with corresponding nomenclature and symbology) to interpret and use in synergy complementary satellite measurements of OSC;
- Develop, implement and validate innovative methodologies and algorithms to develop/improve OSC satellite measurement products;
- Define, implement and validate common format L2 OSC satellite measurement products;
- Define, implement and validate innovative L4 analysis systems exploiting the synergy between complementary satellite and in situ measurements (with an emphasis on satellite measurement data rather than ocean modelling) and produce L4 OSC products;
- Define implement and validate uncertainty estimates for all GlobCurrent products;
- Define, implement and validate a data processing and data management system to produce and manage GlobCurrent data products;
- Define and implement a validation system and perform validation experiments on a regular basis using in situ, EO and modelling activities for all GlobCurrent products;
- Define, implement and validate data delivery systems and user support for the GlobCurrent user community
- Define and implement a series of coordinated user-led Case Studies that demonstrate the performance and impact of GlobCurrent products and demonstration services in scientific, operational and commercial applications;
- Promote the GlobCurrent project, using scientific peer-review articles, a web-portal, brochures, newsletters and regular user consultation meetings.

These objectives determine our approach to validation: we must test the system and each product in turn.

3.2. Approach to Testing of the GlobCurrent system

The GlobCurrent system consists of different components performing functions such as data ingestion, data processing, data delivery, and web portal interaction. Each of these components will be developed and tested in parallel, but must also be integrated together into the GlobCurrent system and validated as part of the complete system. The results will be recorded in the Acceptance Review Report (ARR).

3.3. Product Validation

Data products developed in this project will be validated as part of their development, as defined in the next section. Only products developed within the project will be validated. (Other products have validation information recorded in the appropriate product handbooks, but validation information for products not developed by this project is not detailed in this document.) It should be noted that checks will still be performed to ensure that the products have been imported correctly.

3.4. User Feedback for Ease of Use and Suitability

Where small updates to the system are made, a prototypical user (or proxy) will be asked to provide feedback. For extensive updates, an online form will be employed so that more than one user has the opportunity to provide feedback.

4. Validation of GlobCurrent products

A subset of the L1 and L2 products that serve as input to GlobCurrent processing chains (Fig. 2) have estimates of accuracy that are specific to that product. For the purposes of combining information at higher levels (L3 and L4), it is useful also to consider a measure of accuracy, and more specifically of precision, that is consistent from one product to another. For this reason (and for the products that lack any measure of precision), a uniform measure of precision is applied to the output products at L2 and above. Such estimates are novel (just like many of the GlobCurrent products themselves) as components of the true ocean surface current do not yet have a framework for component validation.

4.1. General Approach

Most GlobCurrent products estimate one component of the ocean surface current. Thus, it is convenient to employ the concept of a true ocean surface current component (t_c), which we would like to retrieve from satellite observations. A bound on the corresponding precision of our estimates can be assessed in the context of the statistical framework given by Stoffelen (1998). Exact analogues of that study's 10-m wind estimates from buoys, scatterometer, and numerical model are our estimates of the ocean current from three independent platforms:

$$\begin{aligned} \text{buoy (full current)} \quad x &= t_c + t_r + \delta_x \\ \text{satellite (component)} \quad y_c &= t_c + \delta_{yc} \\ \text{satellite (residual)} \quad y_r &= t_r \\ \text{model (full current)} \quad z &= t_c + t_r + \delta_z \end{aligned} \tag{1}$$

These equations include a residual (e.g., ageostrophic) current, defined as the difference between the full current and the component of interest (e.g., geostrophic). With no loss of generality, satellite observations of this residual current are assumed to be perfect (i.e., a residual error can be ignored).

The values x, y_c, and z are known and the objective of this exercise is to estimate the precision of y_c by a bound on $< \delta^2_{yc} >$, the expected mean of the squared error in the satellite component over all available triple collocations. If y_c is actually the full current and t_r is zero, then the system of equations (1) reduces to an uncalibrated system Stoffelen (1998; Appendix A) that is easily solved. Use of the system (1) implies that a) we do not attempt to *estimate* $< \delta^2_{yc} >$, but rather to *bound* it, b) we do not attempt to *calibrate* satellite retrievals of current components (Stoffelen 1998), c) we assume that such components are *essentially unbiased* (because our independent references are the buoy and model *full currents*), and d) our bound on precision is invariant. Subject to these caveats, the resulting estimate of precision for y_c may be useful in downstream applications.

The triple collocation approach is a well known system of approximations for the variance and covariance of three independent types of observations. One assumes that the expected covariation between truth and error ($<t\delta>$) and between either the satellite or buoy observations and the numerical model error ($< x\delta_z >$ and $< y\delta_z >$) is zero. The relations that follow are

$$\begin{aligned}
\langle x^2 \rangle &= \langle t_c^2 \rangle + \langle t_r^2 \rangle + 2\langle t_c t_r \rangle + \langle \delta_x^2 \rangle \\
\langle y_c^2 \rangle &= \langle t_c^2 \rangle + \langle \delta_{yc}^2 \rangle \\
\langle y_r^2 \rangle &= \langle t_r^2 \rangle \\
\langle z^2 \rangle &= \langle t_c^2 \rangle + \langle t_r^2 \rangle + 2\langle t_c t_r \rangle + \langle \delta_z^2 \rangle \\
\langle xz \rangle &= \langle t_c^2 \rangle + \langle t_r^2 \rangle + 2\langle t_c t_r \rangle \\
\langle y_c z \rangle &= \langle t_c^2 \rangle + \langle t_c t_r \rangle \\
\langle y_r z \rangle &= \langle t_r^2 \rangle + \langle t_c t_r \rangle
\end{aligned} \tag{2}$$

Because the values of y_r are not known, it is not possible to estimate the variance of the errors in the surface current component directly. However, the standard estimates of buoy and model precision ($< \delta^2_x >$ and $< \delta^2_z >$) follow directly from (2):

$$\begin{aligned}
\text{buoy (full current)} \quad & \langle \delta_x^2 \rangle = \langle x^2 \rangle - \langle xz \rangle \\
\text{satellite (component)} \quad & \langle \delta_{yc}^2 \rangle < min \begin{cases} \langle y_c^2 \rangle - \langle t_c^2 \rangle & \langle t_c^2 \rangle = 0 \\ \langle y_r^2 \rangle - \langle t_r^2 \rangle + \langle xz \rangle - 2\langle y_c z \rangle & \langle t_r^2 \rangle = 0 \end{cases} \\
\text{model (full current)} \quad & \langle \delta_z^2 \rangle = \langle z^2 \rangle - \langle xz \rangle
\end{aligned} \tag{3}$$

The precision of the satellite component is included in (3) as a bound. It can be quantified by assuming that its unknown (true variance) terms are zero. However, true variance is a

positive quantity, so satellite precision must be smaller than both and the lesser value can be chosen. The physical interpretation of this bound is a measure of the error variance of the component (which we want to estimate) inflated by the true variability of either the component or the residual current (whichever is smaller). In other words, the precision bound that one expects for a relatively minor ocean current component (e.g., Stokes) is inflated by the true variance of that component (e.g., Stokes itself). For a major current component (e.g., geostrophic), the precision bound is expected to be inflated by the true variance of the residual (e.g., ageostrophic) current. To a first approximation, both types of bounds may be appropriate.

Independence among the three sources of information (buoy, satellite, and model) is a necessary condition for robust precision bounds to be obtained. At L2, the main concern is that the model data are independent of collocated satellite and buoy data. Thus, a model forecast that is initiated prior to the time of buoy observation is employed. Surface Velocity Program (SVP) drifting buoy observations are obtained from the Surface Drifter Data Assembly Center (SD-DAC) and collocated (within 50 km and between six hours and three days) with satellite data and model forecasts. Drifters provide a reference for GlobCurrent products at 15-m depth. The so-called YoMaHa07 dataset of Argo buoy velocity also employed as a reference for satellite data that capture current components near the surface, following Rio et al. (2014). Corrections for wind slippage (1-3%) are applied to all buoys. Where appropriate, a lowpass filter with a cutoff of between three and 20 days is applied to highlight the geostrophic component of buoy trajectories. Buoy and model data cover the entire 2010-2012 period.

4.2. Data Products generated within the GlobCurrent project

4.2.1. The individual high resolution components

4.2.1.1. L2P Doppler CUReul

This is a time mean reference for the (geostrophic) MDT, but consistent with the full ocean current (i.e., including the time mean of near surface components as well). A validation is expected to be available to the project following Hansen et al. (2011). Each scene may also require calibration (relative to a fixed position within the scene, if coverage exists).

4.2.1.2. L2P CURgeo

As with other geostrophic estimates, triple collocation shall be applied using SVP drifters that are filtered and either the full or geostrophic model forecast collocations. A robust bound on precision is expected where the number of collocations is high.

4.2.1.3. L2P grad CUReul

The impact of current gradients on wave propagation will be explored by tracking swell, with the expected signal of refraction sought on a scene-by-scene basis. The product is expected to be useful in case studies and possibly validated in part using HF radar data.

4.2.1.4. L2P eSQG CURgeo

As with other geostrophic estimates, triple collocation shall be applied using SVP drifters that are filtered and either the full or geostrophic model forecast collocations. A robust bound on precision is expected where the number of collocations is high.

4.2.1.5. L2P MTF CURgeo

As with other geostrophic estimates, triple collocation shall be applied using SVP drifters that are filtered and either the full or geostrophic model forecast collocations. A robust bound on precision is expected where the number of collocations is high.

4.2.1.6. L2P CURsdm

This retrieval is expected to track the full ocean current (i.e., including near surface components as well), but depending strongly on the persistence and stability of the features being tracked. Triple collocation shall be applied using Argo drifters that are minimally filtered and the full current model forecast collocations. A robust bound on precision is expected where the number of collocations is high.

4.2.2. The 2-D current products

4.2.2.1. L4 eSQG CURgeo

As with other geostrophic estimates, triple collocation shall be applied using SVP drifters that are filtered and either the full or geostrophic model forecast collocations. A robust bound on precision is expected where the number of collocations is high.

4.2.2.2. L4 MTF CURgeo

As with other geostrophic estimates, triple collocation shall be applied using SVP drifters that are filtered and either the full or geostrophic model forecast collocations. A robust bound on precision is expected where the number of collocations is high.

4.2.2.3. L4 comb CUReul

GlobCurrent L2 and L4 data products also shall be inter-compared to other existing products (e.g. OSCAR) on a regular (target daily) basis. The focus of this activity is on identifying differences between GlobCurrent and existing products at L4, so regular differences are performed at this level and where a diagnosis of differences would be enlightening, attribution of analysis method or L2 differences are explored. Existing products (like OSCAR) are not assumed to consist of independent data.

This retrieval is expected to be most similar to the full ocean current (i.e., including near surface components), depending on the assumption of linearity in combining components. Triple collocation shall be applied using Argo drifters that are minimally filtered and the full current model forecast collocations. The precision of the L4 products includes that of the data and that of the analysis system by default.

4.2.3. The diagnostic and validation products

4.2.3.1. The diagnostic products

Finite time Lagrangian exponent (FTLE) and Lagrangian coherent structure (LCS) metrics will be computed using the GlobCurrent L4 combined current to identify analyzed current structures, which can be compared to corresponding frontal structures in SST (for example). Although the geostrophic current is approximately nondivergent, attribution of such structures to the geostrophic component is of interest for validating the cause of these structures. Attribution may also point to the (divergent) Ekman current component (e.g., to

errors in the model parameters; GC-RB_1-EK-REQ-2), to variance in the wind stress inputs (e.g., ECMWF versus scatterometer winds), or strictly to the combined current.

4.2.3.2. CURlag matchups

Lagrangian combined current comparisons between analyses and in situ observations require that wind drift be included (Rio et al. 2014) in order to compare directly to the path of drifters. A time-integrated velocity difference (between real and virtual drifters) shall be employed to gauge dispersion as a metric for improvement in the combined current, as in Poje et al. (2014).

4.2.4. The synergy synoptic products

Synoptic products are meant to be applied and validated during case studies and possibly in collaboration with champion users, but again with validation mainly being performed through their application to events and individual observation campaigns. Validation is thus intended to be documented in notes and correspondence as these activities are being performed. The goal is to document the utility of these products in case study publications.

5. Validation against requirements baseline

5.1. General Approach

The GlobCurrent Requirements Baseline document [RB] captures the requirements that the system and project must fulfil. All RB requirements must be verified using one or more of the following methods:

- Inspection
- Analysis
- Test

The validation approach adopted is:

1. Create test cases for all those requirements to be verified by “test”.
2. Provide an additional checklist of all things which must be verified by “inspection”.
3. List the analysis method that verifies all remaining RB requirements.

Traceability between each RB requirement and where it is tested is also provided below.

5.2. Test Environment

The tests against the requirements baseline done for AR will be performed on the actual system which will be made available to users, as described in [TS]. There will be no specific demonstration environment set up for this purpose.

5.3. Test Data

Test data may be required for specific system testing. Any such idealized test data will be identified during testing and in the Q/AR report.

5.4. Test Cases

Most test cases are identified in red in Table 3 and the remainder are derived from the use cases given in the [TS]. (The latter employ a project member who assumes the role of an interactive user during testing.) All test cases are constructed to ensure that corresponding RB and TS requirements are met. Table 4 lists the full set of test cases, with their descriptions given in Annex A.

5.5. Analysis and Inspection

It is not possible to validate all requirements by testing. Some requirements must be verified by analysis and inspection, with an initial presentation to start with. Here we list what is necessary to validate requirements that can be a) demonstrated during the initial presentation, b) tested by inspection of an existing project interface, or are c) otherwise not planned for testing (yet) are listed in black, red, and grey, respectively.

Requirement	Process for validation
GC-RB_1-DATA-REQ-1: Satellite data	Identify the dependence of current products (e.g., geostrophic component) on ENVISAT-ASAR, MetOp-A-ASCAT, ERS-2-RA, ENVISAT-RA-2, JASON-1-POSEIDON-2, JASON-2-POSEIDON-3, CRYOSAT-2-SIRAL, GOCE-EGG, GRACE-SuperSTAR, Metop-A,B-AVHRR-2, ENVISAT-AATSR, ENVISAT-MERIS, Aqua-2-AMSR, SMOS-MIRAS
GC-RB_1-DATA-REQ-2: In situ data	Identify the dependence of current products (e.g., MDT) on drifting buoys and Argo buoys at the surface
GC-RB_1-DATA-REQ-3: Analysis data	Identify the dependence of current products (e.g., MDT) on AVISO-SSH, GHRSST-SST, ECMWF-wind, IFREMER-MLD
GC-RB_1-PROD-DEF-REQ-1: Current def.	Verify at www.globcurrent.org/products-data that any data handbook defines the combined current as (u,v) as a function of (t,x,y,z)
GC-RB_1-PROD-DEF-REQ-2: Product Level definition	Verify at www.globcurrent.org/products-data that any data handbooks employs the standard L2-L4 definitions
GC-RB_1-PROD-REQ-1: Geographic coverage	Note that global products include all possible AOI
GC-RB_1-PROD-REQ-2: Period coverage	Note that global products cover three years
GC-RB_1-PROD-REQ-3: Spatial resolution	Note that global product spatial resolution is less than 25 km
GC-RB_1-PROD-REQ-4: Temporal resolution	Note that global product temporal resolution is less than daily
GC-RB_1-SAR-REQ-1: Radial current estimate	Note that ENVISAT ASAR Doppler shift processing is being performed
GC-RB_1-SAR-REQ-2: Mean current estimate #1	Show an ENVISAT ASAR mean current (e.g., Agulhas)
GC-RB_1-SAR-REQ-3: Mean current estimate #2	Not checked yet

GC-RB_1-SAR-REQ-4: Mean current estimate #3	Not checked yet
GC-RB_1-HRGEO-REQ-1: SAR altimetry #1	Show a CryoSAT-2 across-track current comparison (e.g., CLS vs isardSAT)
GC-RB_1-HRGEO-REQ-2: SAR altimetry #2	Not checked yet
GC-RB_1-HRGEO-REQ-3: SAR altimetry #3	Not checked yet
GC-RB_1-HRGEO-REQ-4: High resolution geostrophy #1	Demonstrate that the transfer function between SAR altimeter along track sea level anomaly spectral decomposition and intersected infrared SST is variable in time and space and can be used to estimate geostrophic current at the resolution of the IR SST field
GC-RB_1-HRGEO-REQ-5: High resolution geostrophy #2	Demonstrate that a daily geostrophic (eSQG) current product can be derived from surface density (estimated from IR SST and SSS)
GC-RB_1-HRSWELL-REQ-1: SAR swell parameters	Demonstrate that surface current vorticity can be estimated from the radius of curvature of swell propagation rays as retrieved from SAR data
GC-RB_1-VIR-REQ-1: Visible and infrared approach #1	Demonstrate uncertainty in the MCC method for two test regions
GC-RB_1-VIR-REQ-2: Visible and infrared approach #2	Not checked yet
GC-RB_1-VIR-REQ-3: Visible and infrared approach #3	Not checked yet
GC-RB_1-VIR-REQ-4: Geolocation	Demonstrate a validation of GOCI geolocation
GC-RB_1-L4-REQ-1: L4 product	Show that L4 can be built from L2, including flags
GC-RB_1-GEO-REQ-1: Altimetry #1	Confirm that geostrophic currents are derived from the CNES-CLS13 MDT and AVISO SLA (e.g., using stencils)
GC-RB_1-GEO-REQ-2: Altimetry #2	Not checked yet
GC-RB_1-GEO-REQ-3: Altimetry #3	Not checked yet
GC-RB_1-GEO-REQ-4: eSQG	Show that SST/SSS geostrophic currents can be derived from microwave SST/SSS by eSQG
GC-RB_1-GEO-REQ-5: MTF	Show that SST/SSS geostrophic currents can be derived from microwave SST/SSS by MTF
GC-RB_1-GEO-REQ-6: Geostrophy	Not checked yet
GC-RB_1-EK-REQ-1: Ekman #1	Demonstrate that the impact of global Ekman input parameter uncertainty can be quantified
GC-RB_1-EK-REQ-2: Ekman #2	Not checked yet
GC-RB_1-EK-REQ-3: Ekman #3	Not checked yet

GC-RB_1-STO-REQ-1: Stokes drift	Confirm that Stokes drift and wind drift employ the same wind forcing
GC-RB_1-INERT-REQ-1: Inertial current	Demonstrate that inertial currents can be estimated (if oscillations are larger than target L4 grid resolution)
GC-RB_1-TIDES-REQ-1: Tidal current	Show that tidal current temporal coverage is at three-hour intervals (*note: not hourly*)
GC-RB_1-DIAG-REQ-1: Covariance analysis	Show covariance between a) advected and later microwave and IR SST and b) fronts and deformation
GC-RB_1-DIAG-REQ-2: Lagrangian coherent structure	Demonstrate a virtual and real drifter separation rate comparison
GC-RB_1-DRF-REQ-1: Drifter validation dataset #1	Check that drifter validation data includes GlobCurrent current components and ECMWF wind stress (login to cerhouse1, cd to /home/cercache/project/globcurrent/data/sources/insitu/drifters-rio and check the file (or an update corresponding to) buoydata_README.txt)
GC-RB_1-DRF-REQ-2: Drifter validation dataset #2	Not checked yet
GC-RB_1-DRF-REQ-3: Drifter validation dataset #3	Not checked yet
GC-RB_1-SYN-REQ-1: Frontal detection	Show that a frontal database is compiled based on detection in HR data
GC-RB_1-SYN-REQ-2: Synoptic charts	Demonstrate weekly synoptic analysis during case studies
GC-RB_1-GLOP-REQ-3: GLOP ingestion	Show that input data is registered: properly identified, indexed, and then accessible on disk (either login to cerhouse1, cd to /home/cercache/project/globcurrent and identify an input data file from README.GLOBCURRENT.DATATREE.TXT or confirm this via http://cersat.ifremer.fr/data/products/catalogue)
GC-RB_1-GLOP-REQ-8: GLOP input format	Show that processing is non-specific and allows for input data substitution
GC-RB_1-GLOP-REQ-12: GLOP dissemination	Check that processed output data is made available to users (navigate to the THREDDS server at www.ifremer.fr/opendap/cerdap1/globcurrent)
GC-RB_1-GLOP-REQ-14: GLOP netCDF	Check that data products are in a standard netCDF format (navigate to the THREDDS server at www.ifremer.fr/opendap/cerdap1/globcurrent)
GC-RB_1-GLOP-REQ-18: GLOP on demand	Check that user suggestions for processing can be accommodated (via request received using the form at www.globcurrent.org/feedback-contact)
GC-RB_1-GLOP-REQ-27: GLOP Supervised data collection	Demonstrate (e.g., by email documentation) that the project is in communication with data providers if any new input data should be made openly available
GC-RB_1-VAL-REQ-1: Data collection	Show which HF-radar, in situ, satellite, or other data are available for validation (login to cerhouse1, cd to /home/cercache/project/globcurrent and identify validation data from the "sources" directory in

	README.GLOBCURRENT.DATATREE.TXT)
GC-RB_1-VAL-REQ-4: Intercomparison	Demonstrate that independent data (e.g., in situ) and complementary products (e.g., OSCAR) are compared to existing products
GC-RB_1-VAL-REQ-5: Long-term stability of the products	Demonstrate whether any jumps in a long product timeseries can be identified
GC-RB_1-VAL-REQ-6: Product uncertainty validation	Demonstrate that independent data are employed to validate uncertainty estimates
GC-RB_1-VAL-REQ-7: Validation Reports	Check that L2P and L4 validation is placed online (navigate to www.globcurrent.org/products-data)
GC-RB_1-VAL-REQ-10: Validation areas of interest	Show that AOI are individually validated
GC-RB_1-COM-REQ-4: Handbook	Check that handbooks are complete and available online (navigate to www.globcurrent.org/products-data)
GC-RB_1-COM-REQ-6: Web portal content	Check that the project website is complete and functional (navigate to www.globcurrent.org)
GC-RB_1-COM-REQ-7: Directory and mailing list	Show that the project directory exists
GC-RB_1-COM-REQ-8: Peer-reviewed papers	Show that GlobCurrent publications are in peer-reviewed journals
GC-RB_1-COM-REQ-9: Present results of the study	Show that GlobCurrent presentations are given at international meetings
GC-RB_1-COM-REQ-10: Promote results of the study #1	Show that promotional material (brochure and newsletters) is compiled and circulated to user communities (e.g., by email record)
GC-RB_1-COM-REQ-12: UCM	Show that UCM-1 is conducted
GC-RB_1-CASE-REQ-1: Case studies	Show that case studies are conducted
GC-RB_1-DEMO-REQ-1: NRT demo	Show that a NRT demonstration is conducted
GC-RB_1-SCH-REQ-1: Workshop dates	Show that the UCM-1 date and location is set 10 months beforehand (e.g., by email record)
GC-RB_1-SCH-REQ-2: Providing datasets in advance	Show that data products are available 3 months before UCM-1 (e.g., by email record)

Table 7: Checklist for verification by inspection and analysis for GlobCurrent acceptance tests.

6. Validation against Technical Specifications

6.1. Overview

The previous chapter describes the tests performed against the requirements baseline (i.e., tests performed at QR to confirm that the system meets its requirements). This chapter describes the tests performed against the technical specification, which are the tests performed during development to confirm that the system has been implemented correctly.

6.2. Aim of the TS Validation

The aim of the TS validation is to:

- Give builders confidence that their system has been implemented correctly
- Ensure that the system is ready to progress to RB requirement testing

6.3. Component Testing

All components specified in the TS will be tested individually. The tests will be recorded, but will not be included in the formal test plan.

6.4. Interface Testing

The interfaces between the different components of the system will be validated against the TS. These interfaces are captured in [ICD]. All interfaces are tested during development to ensure that they are working, that the correct parameters are being passed between components, and that the correct functionality is triggered as a result. Many interfaces are tested as part of the test cases, such as for example, process scripting and use of the web portal to download data.

6.5. Product Ingestion Testing

Tests will be carried out to confirm that all products and services (e.g., model used to calculate tides) ingested into the system are imported correctly, without any errors or corruption being introduced.

6.6. Testing of Tools

The individual online tools (see [TS]) must also be fully tested. This primarily refers to visualisation and data provision tests that are performed by GLOP tests GC-TC-010 through GC-TC-200 as well as GC-TC-280.

Annex A: Acceptance test cases

Listed below are the procedures that should be followed when examining the test cases of Table 4. Procedures that are tested using a prepared script or not planned for testing (yet) are described in red and grey text, respectively. As with project source code itself, prepared test scripts are maintained under revision control as the project progresses. Each script provides text output automatically (using the same name as the corresponding script, but with "_output" appended). These output files are then included under revision control (and hence also archived for future reference)

A.1. GC-TC-010: GLOP provision

A.1.1. Description

GlobCurrent shall provide an operation system (GLOP) able to ensure both automated operations and supervised operations for all computational tasks of GlobCurrent

A.1.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- either data driven or cron activated processing chains
- detecting files arriving in a pool and to be processed for the data driven mode
- running the related processing tasks on detection of a data driven or cron event
- sequencing the different processing steps in case of complex processing chains
- controlling status of the executed processes at each step
- re-attempting the execution of failed processes
- load balancing the processes on the available servers
- offering the ability to manage heterogeneous environments (running some processes on dedicated targets only)
- offering easy integration of new processings under the system control through simple XML configuration
- reporting to a operation interface the status of the processes, raising alarms and warnings
- computing operation statistics to assess overall system status and performances

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute "python GC-TC-010_test" (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.1.3. Requirements verified

GC-RB_1-GLOP-REQ-1

A.1.4. Notes and Constraints

A.2. GC-TC-020: GLOP delivery

A.2.1. Description

The data collection shall be able to handle various kinds of deliveries (ftp, THREDDS, http)

A.2.2. Procedure

The [ICD] lists two services now operating ftp://gg1f3e8@eftp.ifremer.fr/data/globcurrent/ (ftp) and http://www.ifremer.fr/opendap/cerdap1/globcurrent/ (THREDDS). Both are tested by:

- Navigating to some subdirectory under the global_010_deg subdirectory
- Testing pull a random data file (binary format)
- Report file name, time taken to access data, and any problem (SPR)

(Note that GC-TC-120 provides a duplicate THREDDS test.)

A.2.3. Requirements verified

GC-RB_1-GLOP-REQ-2

A.2.4. Notes and Constraints

A.3. GC-TC-030: GLOP feedback

A.3.1. Description

The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data collection monitoring. Detected issues should be raised to users whenever relevant

A.3.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- reporting to a operation interface the status of the processes, raising alarms and warnings

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-030_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.3.3. Requirements verified

GC-RB_1-GLOP-REQ-4

A.3.4. Notes and Constraints

A.4. GC-TC-040: GLOP automation

A.4.1. Description

The system shall therefore be able to perform automated processing in the following modes : a) data driven : new incoming data triggers a specific processing chain, and b) periodic (cron) : processing chains at triggered at a specific time frequency to generate periodic products (L4, reports, quality checks, …), and c) reprocessing : given a list of input data (data driven) or date/times (periodic), the system is able to run processing chains over the whole range of specified inputs, load balancing the processing on the available resources and reporting to the GLOP operators on progress and status (errors, etc.)

A.4.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- either data driven or cron activated processing chains
- detecting files arriving in a pool and to be processed for the data driven mode
- running the related processing tasks on detection of a data driven or cron event
- sequencing the different processing steps in case of complex processing chains
- controlling status of the executed processes at each step
- re-attempting the execution of failed processes
- load balancing the processes on the available servers
- computing operation statistics to assess overall system status and performances

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-040_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.4.3. Requirements verified

GC-RB_1-GLOP-REQ-5

A.4.4. Notes and Constraints

A.5. GC-TC-050: GLOP deploy

A.5.1. Description

The workflow system shall be able to integrate and deploy any processor provided by a GlobCurrent project member. In order to minimize integration effort it shall provide recommendation on processor design and interfaces (preferred language, input arguments, etc.)

A.5.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- easy integration of new processings under the system control through simple XML configuration

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-050_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.5.3. Requirements verified

GC-RB_1-GLOP-REQ-6

A.5.4. Notes and Constraints

A.6. GC-TC-060: GLOP chain

A.6.1. Description

The workflow system shall be able to sequence and run any chain of successive processing steps, each one being implemented through a standalone processor

A.6.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- sequencing the different processing steps in case of complex processing chains
- controlling status of the executed processes at each step
- re-attempting the execution of failed processes

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-060_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.6.3. Requirements verified

GC-RB_1-GLOP-REQ-7

A.6.4. Notes and Constraints

A.7. GC-TC-070: GLOP workflow

A.7.1. Description

The workflow system shall implement source control configuration of processors and processing chain configurations, and implement proper version track management. It shall be able to easily integrate new processors or configurations.

A.7.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- offering easy integration of new processings under the system control through simple XML configuration

Additional demonstration of the use of git for source control and version tracking will be included; a prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-070_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.7.3. Requirements verified

GC-RB_1-GLOP-REQ-9

A.7.4. Notes and Constraints

A.8. GC-TC-080: GLOP concurrent runs

A.8.1. Description

The workflow system shall be able to run concurrently different versions of the processors and processing chains

A.8.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- offering the ability to manage heterogeneous environments (running some processes on dedicated targets only)

Concurrent processing of different processing versions will be included in the prepared script that tests the above functionality, which is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-080_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.8.3. Requirements verified

GC-RB_1-GLOP-REQ-10

A.8.4. Notes and Constraints

A.9. GC-TC-090: GLOP reporting tools

A.9.1. Description

The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data processing monitoring. Detected issues should be raised to users whenever relevant

A.9.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- controlling status of the executed processes at each step
- re-attempting the execution of failed processes
- reporting to a operation interface the status of the processes, raising alarms and warnings

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute "python GC-TC-090_test" (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

The above checks that processing is monitored and reports are generated automatically

A.9.3. Requirements verified

GC-RB_1-GLOP-REQ-11

A.9.4. Notes and Constraints

A.10. GC-TC-100: GLOP free

A.10.1. Description

The GlobCurrent dissemination system shall make the data available to any users without any restrictions or any cost. Preliminary (free) registration may be required to track user profiles

A.10.2. Procedure

For the THREDDS service at http://www.ifremer.fr/opendap/cerdap1/globcurrent/:

- Navigate to a random subdirectory under the global_010_deg subdirectory
- Test pull of a random data file (binary format)
- Report file name and any SPR if a restriction (e.g., password) is requested

(Note that this test may have been performed already under GC-TC-020.)

A.10.3. Requirements verified

GC-RB_1-GLOP-REQ-13

A.10.4. Notes and Constraints

A.11. GC-TC-110: GLOP grib2

A.11.1. Description

The dissemination system shall be able to format GlobCurrent products to suitable format for a given application: in particular it shall be able to deliver relevant products in grib2 format

A.11.2. Procedure

According to [ICD], this is not demonstrated yet

A.11.3. Requirements verified

GC-RB_1-GLOP-REQ-15

A.11.4. Notes and Constraints

A.12. GC-TC-120: GLOP subset

A.12.1. Description

The GlobCurrent dissemination mechanism shall be able to subset data on demand for specific users. Other tailoring functions shall be added on user demand

A.12.2. Procedure

Two methods are available for accessing data subsets: the miniProd (server-side) and the THREDDS (client-side) method. Both methods are demonstrated (the latter following https://publicwiki.deltares.nl/display/OET/KML+overview+of+OPeNDAP+data#KMLoverviewofOPeNDAPdata-AccessingnetCDF%2FOPeNDAPdatawithPython) by a prepared script that is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute "python GC-TC-120_test" (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.12.3. Requirements verified

GC-RB_1-GLOP-REQ-16

A.12.4. Notes and Constraints

A.13. GC-TC-130: GLOP images

A.13.1. Description

The GlobCurrent dissemination mechanism shall be able to deliver data as images (GeoTiff, png,...)

A.13.2. Procedure

Advanced visualization of current data employs Syntool, but as with other applications (e.g., python via THREDDS), the user must employ a client-side printing tool and output format, as in:

1. navigate to http://globcurrent.oceandatalab.com/
2. select a product and time to display
3. "print screen" (or equivalent)

A.13.3. Requirements verified

GC-RB_1-GLOP-REQ-17

A.13.4. Notes and Constraints

A.14. GC-TC-140: GLOP requests

A.14.1. Description

The GlobCurrent dissemination mechanism shall be able to automatically perform these operations on a routine basis and make the tailored data available on a FTP repository or sent by email

A.14.2. Procedure

Not demonstrated yet

A.14.3. Requirements verified

GC-RB_1-GLOP-REQ-19

A.14.4. Notes and Constraints

A.15. GC-TC-150: GLOP dissemination monitoring

A.15.1. Description

The GLOP shall provide the proper feedback mechanisms and reporting tools to the GlobCurrent system operators for data dissemination monitoring. Detected issues should be raised to users whenever relevant, through RSS feed and email

A.15.2. Procedure

The OP implemented for the Medspiration project (and subsequently tested and developed at Ifremer since 2005 under subsequent projects) is a job controller and sequencer written in python 2.6 that is designed to link system component by performing (among other things):

- controlling status of the executed processes at each step
- re-attempting the execution of failed processes
- reporting to a operation interface the status of the processes, raising alarms and warnings

A prepared script that tests the above functionality is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute "python GC-TC-150_test" (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

As with GC-TC-090, the above checks that processing is monitored and reports are generated automatically

A.15.3. Requirements verified

GC-RB_1-GLOP-REQ-20

A.15.4. Notes and Constraints

A.16. GC-TC-160: GLOP help desk

A.16.1. Description

The users shall have a proper way to report issues with the data access to a help desk with fast reply to any reported issue

A.16.2. Procedure

A fast response to user feedback requires that the issue is transmitted quickly. A test of this follows:

1. navigate to http://globcurrent.ifremer.fr/feedback-contact
2. submit an issue
3. identify the help desk recipient(s) who receives notification directly and if this is not a team member, record the time taken for a team member(s) to be given the message

A.16.3. Requirements verified

GC-RB_1-GLOP-REQ-21

A.16.4. Notes and Constraints

A.17. GC-TC-170: GLOP product discovery

A.17.1. Description

The dissemination system shall provide a user-friendly discovery tool for GlobCurrent product collections (catalogue) and data (index of products).

A.17.2. Procedure

Advanced visualization of current data employs Syntool, but as with other applications (e.g., python via THREDDS), the user must employ a client-side printing tool and output format, as in:

4. navigate to http://globcurrent.oceandatalab.com/
5. select a product and time to display
6. “print screen” (or equivalent)

The project data repository facilitates user assessment of available products is summarized at by navigating to

A.17.3. Requirements verified

GC-RB_1-GLOP-REQ-22

A.17.4. Notes and Constraints

A.18. GC-TC-180: GLOP visualization

A.18.1. Description

The dissemination system shall provide a user-friendly visualisation tool to display and intercompare the GlobCurrent products

A.18.2. Procedure

Advanced visualization for intercomparison employs Syntool, which allows for overlays of current components (and SST, for example):

1. navigate to http://globcurrent.oceandatalab.com/
2. overlay the geostrophic, Ekman, and Stokes vector products at a valid time (it may be necessary to zoom to one vector to see all components)
3. overlay the geostrophic vector and SST products at a valid time

A.18.3. Requirements verified

GC-RB_1-GLOP-REQ-23

A.18.4. Notes and Constraints

A.19. GC-TC-190: GLOP match-ups

A.19.1. Description

GlobCurrent shall provide tools to produce cross-sensor matchups (MDB : match-up databases), such as satellite to in situ matchups, or multi-sensor match-up databases (MMDB) over predefined sites (similar to the concept of HR-DDS sites defined in GHRSST). This may be based for instance on tools such as felyx (http://www.felyx.org)

A.19.2. Procedure

Not demonstrated yet

A.19.3. Requirements verified

GC-RB_1-GLOP-REQ-24

A.19.4. Notes and Constraints

A.20. GC-TC-200: GLOP visual comparison

A.20.1. Description

GlobCurrent shall provides tools to intercompare various sources of OSC (or ancillary) data, in particular to support decision making on supervised synoptic product generation. This may be based for instance on synergy tools such as Syntool

A.20.2. Procedure

Advanced visualization for intercomparison employs Syntool, which allows for overlays of current components (and SST, for example):

1. navigate to http://globcurrent.oceandatalab.com/

2. overlay the geostrophic, Ekman, and Stokes vector products at a valid time (it may be necessary to zoom to one vector to see the components of smallest magnitude)
3. overlay the geostrophic vector and SST products at a valid time

A.20.3. Requirements verified

GC-RB_1-GLOP-REQ-25

A.20.4. Notes and Constraints

A.21. GC-TC-210: GLOP validation diagnostics

A.21.1. Description

GlobCurrent shall provide diagnostic and validation tools to assess the dynamic quality of the calculated currents and produce quality indicators and reports. Such diagnostic tools may for instance include production of Lagrangian Coherent Structures (such as Lyapunov exponents)

A.21.2. Procedure

Not demonstrated yet

A.21.3. Requirements verified

GC-RB_1-GLOP-REQ-26

A.21.4. Notes and Constraints

A.22. GC-TC-220: GLOP supervised product generation

A.22.1. Description

GlobCurrent project shall provide a system to deliver synoptic products from multiple sources of data. This process may be supervised through expert interaction

A.22.2. Procedure

Check that synoptic products are derived from multiple sources of information (with supervision)

A.22.3. Requirements verified

GC-RB_1-GLOP-REQ-28

A.22.4. Notes and Constraints

A.23. GC-TC-230: L2 errors and flags

A.23.1. Description

GlobCurrent L2P products shall include uncertainty estimates and flags for every grid-point in the data file. Among the individual L2 current components that GlobCurrent will produce (i.e., from Fig. 2: Doppler line-of-sight, geostrophic, current gradient, and optical), none provide estimates of combined current at 15-m depth. However, after smoothing over a few

inertial timescales (or in an error-weighted mean sense for Doppler; cf. Hansen et al. 2011), the drifter data provide a common first-order reference for these L2P products. Differences can be computed directly, although by including a corresponding model estimate, a more accurate calculation of observational bias and standard deviation can be obtained (Stoffelen 1998). Comparison to HF radar, when available, should allow for refined error estimates of Doppler and current gradient estimates. Ekman current components may need to rely on error estimates of the model parameters (GC-RB_1-EK-REQ-2) and perhaps also on variance in the wind stress inputs (e.g., ECMWF versus scatterometer winds).

A.23.2. Procedure

L2P uncertainty estimates and flags generally refer to a bound on error variance and to the identification of retrieval contamination (e.g., by land), respectively. The definitions given in project documents are to be summarized in the metadata of the data files themselves. Hence, a verification involves:

1. log in to cerhouse1
2. cd to an L2P subdirectory of /home/cercache/project/globcurrent/
3. execute "ncdump -h globcurrent_L2P_file.nc" and verify that uncertainty and flag grids exist and that their definitions are given in the file metadata

A.23.3. Requirements verified

GC-RB_1-VAL-REQ-2

A.23.4. Notes and Constraints

A.24. GC-TC-240: L4 errors and flags

A.24.1. Description

GlobCurrent L4 products shall include uncertainty estimates for every grid-point in the data file. Uncertainty estimates shall include those from the data and those from the analysis system. Eulerian (u and v component) and Lagrangian (FTLE or LCS) metrics will be employed for L4 validation. We will primarily use drifting buoys (usually drogued) as the ocean current reference because these and the SSES values obtained from them should be relatively consistent globally and over the decade 2002-2012 (about 13 million positions were collected since 1979). The remaining validation data (HF radar, moored buoys, ADCP, and gridded model output) should permit either a higher resolution validation, a better reference for a given current component, or an independent validation of errors, but with a reference error bias and standard deviation that may differ from that obtained relative to drifters.

A.24.2. Procedure

L4 uncertainty estimates and flags generally refer to a bound on error variance and to the identification of retrieval contamination (e.g., by land), respectively. Strict definitions are to be given in the data files themselves. Hence, a verification involves:

1. log in to cerhouse1
2. cd to an L4 subdirectory of /home/cercache/project/globcurrent/
3. execute "ncdump -h globcurrent_L4_file.nc" and verify that uncertainty and flag grids exist and that their definitions are given in the file metadata

A.24.3. Requirements verified

GC-RB_1-VAL-REQ-3

A.24.4. Notes and Constraints

A.25. GC-TC-250: Product validation

A.25.1. Description

The GlobCurrent Portal shall provide automated performance metrics for each product. A time series of GlobCurrent Metrics for the product performance shall be provided. This activity shall automatically document standard (e.g., current component) metrics applied to each product and thereby highlight uncontrolled errors in the creation of GlobCurrent products that would be detrimental for user applications.

Note: the intention of this requirement is to provide users with an early warning of issues and problems and to help demonstrate the reliability of the system (as requested by many users).

A.25.2. Procedure

Product performance metrics generally refer to an expectation of grid average, standard deviation, and/or maximum/minimum value of a current component. A prepared script that tests these checks is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-250_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.25.3. Requirements verified

GC-RB_1-VAL-REQ-8

A.25.4. Notes and Constraints

A.26. GC-TC-260: System validation

A.26.1. Description

The GlobCurrent Portal shall provide automated performance metrics for each service. A time series of GlobCurrent Metrics for the processing and delivery system(s) shall be provided. This activity shall identify uncontrolled failures in the provision of GlobCurrent services that would be inconvenient to users.

Note: the intention of this requirement is to provide users with an early warning of issues and problems and to help demonstrate the reliability of the system (as requested by many users).

A.26.2. Procedure

Service performance metrics generally refer to an independent script that verifies the availability of final products on a regular basis (e.g., daily). A prepared script that tests these checks is executed as follows:

1. log in to cerhouse1

2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute “python GC-TC-260_test” (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.26.3. Requirements verified

GC-RB_1-VAL-REQ-9

A.26.4. Notes and Constraints

A.27. GC-TC-270: Inform and update

A.27.1. Description

Provision and updates of information on definition of GlobCurrent products, including their origin and applied retrieval methods, as well as how to access the products and use the web tools via the different communication lines identified above

A.27.2. Procedure

Handbooks should be updated with the most recent information about the origin and retrieval methods applied. Product access and use of web tools are also documented on the project website. This is tested by:

1. navigate to www.globcurrent.org/products-data
2. open a product handbook and verify that contents include references and information about data origin, retrieval, and access

A.27.3. Requirements verified

GC-RB_1-COM-REQ-1

A.27.4. Notes and Constraints

A.28. GC-TC-280: Maps

A.28.1. Description

GlobCurrent shall provide maps of ocean current vectors for all products suitable for use on the GlobCurrent web portal and for download by users. Note: Versions of these maps may also provide a data product quick-look capability. GlobCurrent shall provide animations of products with dynamic visualisation capability similar to that used by the NOAA/GLERL Great Lakes Surface Currents Map project (http://www.glerl.noaa.gov/res/glcfs/currents/ and F. Viegas and M. Wattenberg (http://hint.fm)

A.28.2. Procedure

Advanced visualization of current data employs Syntool, which also provides for the required dynamic animations:

1. navigate to http://globcurrent.oceandatalab.com/
2. select a range of products and times to validate that products can be visualized
3. select geostrophic streamlines to validate the animation requirement

A.28.3. Requirements verified

GC-RB_1-COM-REQ-2

A.28.4. Notes and Constraints

A.29. GC-TC-290: Time series

A.29.1. Description

GlobCurrent shall provide tools for extracting time series of products over a given geographical location, as well as statistics of match-ups with in-situ and other (e.g., model output) data held by GlobCurrent. Other tools shall be defined and implemented based on user requirements as required.

A.29.2. Procedure

The THREDDS (client-side) method for time series extraction is demonstrated (following https://publicwiki.deltares.nl/display/OET/KML+overview+of+OPeNDAP+data#KMLoverviewofOPeNDAPdata-AccessingnetCDF%2FOPeNDAPdatawithPython) by a prepared script that is executed as follows:

1. log in to cerhouse1
2. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
3. execute "python GC-TC-290_test" (which automatically saves its text output)
4. examine and then archive the script and its output
5. note any problems (SPR)

A.29.3. Requirements verified

GC-RB_1-COM-REQ-3

A.29.4. Notes and Constraints

A.30. GC-TC-300: Web portal access

A.30.1. Description

All project documents shall be available to the GlobCurrent users via the GlobCurrent Web Portal. All GlobCurrent documents shall be accessible to the user community in an open and transparent manner. No restriction on public access to all GlobCurrent deliverable documents shall be allowed. This requirement excludes GlobCurrent project management reports to ESA.

A.30.2. Procedure

Project documents have designated links to the secondary project website (globcurrent.nersc.no), from which the documents are shared "restfully" on the primary website. This sharing is tested by:

1. navigate to http://globcurrent.ifremer.fr/project/documents/item/514-free-access-documents
2. verify that all project documents are available (e.g., by clicking on a document)

A.30.3. Requirements verified

GC-RB_1-COM-REQ-5

A.30.4. Notes and Constraints

A.31. GC-TC-310: Promote results of the study #2

A.31.1. Description

GlobCurrent shall use of social networking tools (e.g. Twitter, Facebook etc) as part of the project operational, outreach and communication service.

A.31.2. Procedure

Social networking employed by the project includes Twitter and a project blog. These are checked by:

1. navigate to https://twitter.com/globcurrent and verify activity
2. navigate to http://www.globcurrent.org/blog and verify activity

A.31.3. Requirements verified

GC-RB_1-COM-REQ-11

A.31.4. Notes and Constraints

A.32. GC-TC-320: Champion user upload

A.33.1. Description

An endorsed champion user uploads a python script to the Nephelae platform and tests it using GlobCurrent data as input

A.33.2. Procedure

This test simply verifies that a script prepared outside the Ifremer cluster can be uploaded, debugged, and executed. It is checked as follows:

1. log in as a champion user to the designated machine inside the Ifremer firewall
2. log in to cerhouse1
3. cd to /home/cercache/project/globcurrent/QAR-1_test_scripts
4. upload “python GC-TC-320_test” from a machine outside the firewall and execute
5. examine and then archive the script and its output
6. note any problems (SPR)

A.33.3. Requirements verified

GC-RB_1-GLOP-REQ-3, GC-RB_1-GLOP-REQ-5

A.33.4. Notes and Constraints

Annex B: Test case report template

The following test report is intended for each step in the GlobCurrent test campaign.

Test ID and number (if > 1)	(ID taken from the ATPD, and number of times, if more than once, this test was performed)
Changes since previous test	(if any)
Tester name, institute, location	
Date	
Test description	(steps carried out and files accessed)
Test deviations	(note any inconsistencies in the steps followed, e.g., versus ATPD)
Problem (SPR)	(note any errors, anomalies, or non-conformance)
Result	(note success or failure)
Other	(if relevant; e.g., test conditions such as platform or bandwidth)