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| **DATE:** | 22-23 November 2012 |  |

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| **PLACE:**  | ESA/ESRIN Frascati, Meeting Room E | **PROJECT:** | CP4O |

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| **OBJECTIVE:** | First Progress Meeting |

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| ORGANISATIONS | ESA /ESRIN | SatOC  | CLS  | CNES | DTU Space  |
| Names | J. Benveniste | D Cotton | T Moreau | N Picot | Ole Andersen  |
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|  | B.Lucas |   |   |   |   |
|  | T. Parrinello |   |   |   |   |
|  | C. Bouzinac |   |   |   |   |
|  | P.Femenias |  |  |  |  |
| isardSAT (by phone) | NOC | Starlab | TU Delft | U Porto | ESA/ESTEC  |
| M Roca | C Gommenginger | M-P Clarizia | M Naeije | J Fernandes | M Fornari  |
| P Garcia | P Cipollini | M Caparrini | R Scharroo (Altimetrics) | A Nunes |  |
| C Martin-Puig | L West |  |  |  |   |

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| DISSEMINATION | COPIES | MEANS |
| ESA (JB, SD, NB, BL, MF) | 1 | e-mail |
| SatOC (DC) | 1 | e-mail |
| CLS (TM, SlB) | 1 | e-mail |
| CNES (NP, FB) | 1 | e-mail |
| DTU Space (LS, OA) | 1 | e-mail |
| isardSAT (MR, PG, CMP) | 1 | e-mail |
| NOC (CG, LW, PC, HS) | 1 | e-mail |
| Noveltis (MC) | 1 | e-mail |
| Starlab (MPC, MC) | 1 | e-mail |
| TU Delft (MN, RS)  | 1 | e-mail |
| U Porto (JF, AN) | 1 | e-mail |

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| APPROVAL |

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| --- | --- | --- | --- | --- | --- |
| Signature (s) |   |  |  |  |  |
| Date |  |  |  |  |  |
| Surname(s) | J. Benveniste | D. Cotton |   |  |  |
|  | ESA | SatOC |   |  |  |

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| Meeting started 09:00 |  |  |  |
| 1. Welcome (ESA and SatOC)
	1. JB welcomed all participants to the meeting and introduced the ESA team members and their duties in this project
	2. DC thanked all for attending, and outlined the objectives
	3. The agenda was agreed and adopted
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| 1. CP4O Project Overview and Actions update (SatOC)

(*CP4O\_Prog1\_SatOCv2.ppt slides 1-9, and CP4O\_AIs\_Nov2012.xls)** 1. DC gave an overview of the objectives of the CP4O project, the timing of the work packages, the key deliverables and the meetings.
	2. The action list was reviewed and updated (see Action List)
	3. JB and DC are drafting a letter to invite the participation of the Expert Group in the review of outputs from WP4000, and in the Mid-Term Review
	4. The proposals for additional activities should be maintained and updated as an annex to the Project Plan (already an action)
	5. DC to circulate the CNES report on data quality (see *CryosatDuacs.pptx*)
	6. Noted that the parallel Cryosat Plus project on land applications is likely to be delayed and to remain delayed with respect to CP4O. Maintaining links with the land project to be part of business as usual for SatOC management of CP4O. This closes action A1\_39
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| 1. Scientific Requirements Consolidation (Starlab)

*(CP4O\_PM1\_WP1000\_STARLAB\_MPC.ppt)** 1. MPC presented the ppt listed above, summarising the work and results from WP1000
	2. Requirements Baseline Deliverable (D1.1) was provided to ESA in early November for review.

**WP1100 User Requirements Survey*** 1. Key findings
	+ Most users still use and prefer offline data, but there is a clear shift of the demand towards data with shorter latency (NRT and RT).
	+ The along-track posting rate mostly used is 1Hz, but a clear preference emerges for 20 Hz. Some users express the wish to have FBR data available.
	+ The users express a need for a better along-track resolution for the future.
	+ Users want the products to have the best possible accuracy and precision for height, SWH, and sigma0 measurements;
	1. JB – It is important to know how many people responded so suitable weighting can be added to comments
	2. SD – What is meant by “Better resolution”? Answer > 1Hz
	3. JB noted that all users who have used RAIES data (individual echoes) say that they would like information at even better resolution than 20Hz.
	4. SD reports that some of the users at the recent altimetry meetings requested more documentation on Cryosat, especially because it is a new type of altimeter. The need for more documentation should be therefore included in the requirements.

**WP1200 Limitations / Drawbacks*** 1. Key findings – Open Ocean
* Cryosat-2 alone is not suitable for ocean observation in NRT and model assimilation. However Cryosat-2 data with improved along-track resolution might improve forecasts for some regional and local models in specific areas;
	+ Conventional altimetry suffers from correlated errors at scales between 10 and 80 km, producing the so-called spectral “bump” in SLA spectrum. Preliminary studies show that such errors is much mitigated in SAR altimeters;
	1. Key findings – Coastal Ocean
* Current operational Cryosat-2 L2 SAR and LRM products are unable to meet requirement for all historical Crysoat-2 data in the coastal zone; However, retracked Cryosat-2 pseudo-LRM (and SAR soon!) ocean data are available from RADS and from CNES SALP/DUACS,, but only at 1Hz.
* Cryosat-2 SAR mode is unlikely to meet the strict current demand for height accuracy, due to the lack of correction for sea state bias in SAR mode, particularly in the coastal zone. The retrieval of sigma0 in SAR mode, fundamental for the development of SSB correction for SAR altimetry, has been recommended as an additional activity in CP4O;
* The demand for instrumental and geophysical corrections to be included in the Cryosat-2 SAR products is only partially met by operational products at present.
	1. Key findings – Polar Ocean
* The Cryosat-2 mode mask is not kept constant in time in the perimeter of the Polar Ocean. Large and unresolved jumps of magnitudes between LRM and SAR data are seen in the ESA GDR (L2) products.

**WP1300 Scientific and Operational Requirements*** 1. Key findings see ppt slides, plus:
* Coastal Zone – need for processing all historical data and for appropriate flags and geophysical corrections
* Polar Ocean - need to deal with the problem of “gappy” data – caused by non-ocean echoes (from sea ice) interspersed with ocean echoes.
* Sea Floor altimetry – need for SAR mode coverage and more accurate tide models
* Data format – SD understood from users at Venice that better documentation was needed.
	1. Conclusions
	+ D1.1 (Requirements Baseline) has been submitted to ESA for review. It provides the basis for the impact assessment and scientific roadmap.
	+ JB encourages all members of the consortium to review deliverables
 | ***A2\_1*** | ***All to review D1.1 and provide comments to STARLAB***  | ***07/12/12*** |

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| 1. WP2000 – Preliminary Analysis of State of the Art (TU Delft)

(*CP4O\_WP2000\_TUDnov2012* *)****Overview**** 1. MN presented an overview of the activities of WP2000 and a summary of work so far
	2. CG noted that a reference point was required to establish the “State of the Art”. This was agreed to be, for ESA Cryosat products
	+ “Baseline B” (IPF1: Vk1.0, IPF2 Vj1.2) as operational from February 2012,
	+ FDM as will be operational from January 2013 (L1b FDM vk2.o),
	+ SAR and RDSAR retracking algorithms - OSTST 2012.
	1. Key initial finding is the ESA LRM L2 product is not usable for CP4O, and as the processing chain will not be modified until early 2014, alternatively generated level 2 data must be used (as will be described in WP3000 and WP4000). Note that there is a link to information on the different versions of the IPF at
	2. Changes were proposed to the schedule for WP2000, as follows
* Early Dec 2012 Draft PAR and DVP templates with main conclusions
* mid-late Dec internal draft circulated for review
* Short Executive Summary for ESA with major conclusions/findings before Christmas
* Jan-Feb Final agreed draft to ESA
	1. It was agreed these changes would not impact the planned start of WP3000 and WP4000, and changes were approved by ESA
	2. CLS noted the expectation on them to lead sub-tasks 2200 and 2400, and need to review necessary effort
	3. The availability of a new Cryosat Product Handbook (at https://earth.esa.int/web/guest/missions/esa-operational-eo-missions/cryosat) was noted
	4. MN pointed out that adjustments in ESA FBR data are needed. These are known anomalies in FBR data, like time tag bias. TUDelft should provide info about such anomalies to Starlab, who should then include these anomalies in the RDSAR software

***NOC Contribution to WP2000**** 1. NOC described their contribution to WP2000, this now includes SAR FBR analysis instead of L2 SAR analysis. (this closes action A1\_45) (*CP4O\_WP2000\_NOC\_PM1\_cipoadditions.ppt*)
	2. SD requested to provide information on the source of the L1b geo-corrections (i.e. where they come from each geo-correction) and if the L2-geocorrection are the same of L1b geo-corrections.
	3. SD requested that a comment is included on the D Sandwell retracker (He believes it to be a specific case of SAMOSA3 model)
	4. It is not clear if all the necessary information is available on how sigma-0 is derived for LRM
	5. All partners requested to advise NOC/SatOC of relevant initiatives that should be included in this review (LRM and SAR data over coastal and open ocean)

***Starlab Contribution to WP2000**** 1. STARLAB described their contribution to WP2000 (CP4O\_PM1\_WP2000\_STARLAB\_Contribution\_MPC.ppt)
	2. Starlab has completed a list of documents on Cryosat products and will circulate to all partners with request to review and update
	3. SD advises Starlab to check if STARLAB’s RDSAR Software needs source code modification to work on real CS-2 data.
	4. Open ocean areas for SAR to be selected (see discussions later in meeting.

***U Porto Contribution to WP2000**** 1. U Porto described their contribution to WP2000 and WP4000 (CP4O\_PM1\_UPorto.pptx).
	2. U Porto will compute Wet Troposphere Correction by data combination of all available datasets.
	3. Analysis of available data and Cryosat orbit is encouraging, indicating that for collocation criteria of 3 hours and 100km, only 0.9% of points would have no image data, the vast majority would have 3 or more sources.
	4. Overview of plans for WP4000 – will use Jason-2 as reference. ERA interim is perhaps the most stable reference
	5. Discussion
	+ RS - need to make a decision on best balance between number of images / time /distance.
	+ SD - can you generate some statistics / quality indicator on derived correction? JF -Yes, the formal error provided by the objective analysis (OA) plus additional information such as the number of used images and/or GNSS data. This can only be provided together with the final product, that is, at the end of WP4000.. SD suggested that information such as the number of used images in the computation of each point should also be added and that was agreed)
	+ SD – can correction be calculated at 20Hz? JF – Can be provided
	+ by interpolating to 20 Hz from 1 Hz (so there is no additional information to be added at a high resolution).
	+ CG –Are you going to provide this product locally? Yes
	+ CG – but same product for global and coastal? Yes, but near coasts will have input from GNSS stations so will have better correction

***Altimetrics Contribution to WP2000**** 1. RS provided an assessment of the current Cryosat Products, and their use at NOAA (CP4O\_PM1\_WP2000\_Altimetrics.pptx).
	2. Described processing scheme implemented in RADS, LRM and PseudoLRM. Starts from ESA FDM and LRM Level 1b, applies RADS geophysical corrections. Doppler and timing error corrections applied
	3. Looked at SLA, SWH, Sigma0
	4. Pseudo LRM data noisier than LRM
	5. Described how to calculate correct sigma0, gets bias of 3 dB
	6. Discussion
* MR – do you take into account any internal Cal?
* Marco – says this is included in the drift.
* Remko to write a document on what he does to generate a correct sigma0 . ESA (MF?) to find documentation on the algorithm that is in the IPF. (NB it is calculated differently for different modes and IPF versions)
	1. Mispointing: - mispointing from star trackers (based on the information available in the FBR products) as input to MLE3 re-tracker. Retracking significantly improves LRM (and Pseudo LRM) L2 data, seen in cross-over analysis
	2. Conclusions:
	+ PDS LRM L2 data virtually unusable (for oceanographic applications) as is.
	+ Retracked LRM L1B data
		- Retracking can be performed with MLE3 with a priori off-nadir angle from star-tracker information.
		- Retracked L1B data shows excellent quality.
		- Crossovers with Jason-2 shows sea level variance only slightly higher than Jason-1, due to lack of radiometer and dual frequency.
	+ Retracked Pseudo-LRM data
		- After stacking SAR echoes, same retracking.
		- No apparent bias with LRM data.
		- Higher levels of 20-Hz noise, as expected.
		- However, data quality is comparable to LRM data.
	+ RADS
		- Started distributing PLRM data through RADS following the release of the new ESA data policy on FBR data.
	1. Discussion
	+ CG - is increased noise in RDSAR data a problem for users? – Relevant to plans to implement SAR globally in S-3.
	+ Agree we need to address this before S-3.
	+ Maybe need to process the FBR data in various ways to find the optimum solution.
	+ No plans to process SARIN data.

***ESA (SD) Presentation comparing CPP to ESA Product****(Analysis of one CPP Product@CP40\_PM.ppt)** 1. SD presented results from comparing a CPP product against ESA product: CPP product with CPP retracker, CPP product with SAMOSA retracker, EOP-SER product with SAMOSA retracker, and Kiruna PDGS with SAMOSA retracker.
	2. Results 1: *Recommend using CPP products for open ocean theme in CP4O*
	+ The SAMOSA Retracking and the CPP Retracker (run in as much similar conditions as possible) return pretty equivalent performances in term of noise.
	+ It still possible to do slightly better accounting for the mispointing in input and the exact number of accumulated looks (EOP-SER Case).
	+ The SSH from the Kiruna product exhibits a higher level of SSH/SWH noise and misfit.
	1. Results 2: *Recommend investigating trend in height*
	+ There is no trend in height between SAMOSA and CPP Retracker, the trend in SWH is quite limited, biases are present but they are relatively low.
	+ There is a not negligible trend between the Kiruna and CPP product (due allegedly to the different approach between the two teams in stacking operation/doppler correction) and the mean bias in range is high (8 cm)
	1. Recommendations and open issues
	+ Investigate the source of the trend in height and bias between Kiruna and CPP
	+ Could be possible to add mispointing in CPP product ?
	+ Could be possible to add Misfit in CPP product ?
	+ Could be possible to not cut off transitories in CPP product ?
	+ CAL/VAL Team to add proper instrumental and geo corrections
	+ Both teams are getting 1 cm at 1 Hz for range noise for SWH=2 m.. How to reach the theoretical 0.8 range noise precision ?
	+ Is the Doppler Correction applied correctly on the stack and in same way at Kiruna PDGS and at CPP Chain ?
	1. Discussion
	+ Height trend may not be real, only looking at short segment of data
	+ CG - Does CPP use a constant mispointing value in retracking?
	+ FB – Yes, but in future actual mispointing will be injected into retracker (compensating for bias). CNES will use mispointing estimates derived from STR Telemetry not the one included in FBRs
	+ Could the EOP SER product be used? Don’t have the capacity to do it on large scale.
	+ FB Could still be good to investigate the different approaches to building L1B products.
	1. Regarding recommendation to use CPP – needs to be carefully considered how to present this e.g.:
	+ Hamming function distorts the SAR Echo leading edge and introduces unwanted unpredictable biases; the SAR Echo’s over-sampling scheme, as implemented in Kiruna PDGS IPF1, truncates the waveform tails (in order to limit the size of the waveform data set to 128 gates).
	+ This last operation was applied for sea ice applications to address problem of under-sampling
	+ Beginning to indicate need for different processing chains for ice and ocean applications as well as inland water.
 | ***A2\_2******A2\_3******A2\_4******A2\_5******A2\_6******A2\_7******A2\_8******A2\_9******A2\_10******A2\_11******A2\_12******A2\_13******A2\_14******A2\_15******A2\_16*** | ***TU\_Delft / SatOC Statement on quality of ESA CS-2 products*** ***CLS to review effort to lead WP2200 & 2400*** ***NOC to include comment on Sandwell retracker******MF To provide algorithm on generation of sigma-0*** ***All advise NOC/SatOC of initiatives to be included in review******All to review CS-2 document list******Starlab to check if RDSAR code needs changing******TUD provide ESA with WP2000 exec summary******SD to provide information on the source of the L1b geo-corrections******DC to update PMP******RS to produce document on 0 calculation******ESA to source 0 algorithm in IPF******SatOC/ESA to provide details on the IPF evolutions as this could impact the FBR and the CalVal analysis******CNES to respond to requests to modify CPP product in 4.33******SD / DC (and all) to produce agreed statement on decision to use CPP data in CP4O (see A2\_2)*** | ***07/12/12******07/12/12******07/12/12******TBD******07/12/12******TBD******07/12/12******21/12/2012******14/12/2012******07/12/2012******07/12/12******07/12/12******TBD - ongoing******TBD******14/12/12*** |
| 1. WP3000 – Data Set Requirements (isardSAT)

(*isardSAT\_CP4O\_PM1\_ESRIN\_20121122\_WP3000)** 1. Although this presentation was made after parts of WP4000, it is included here to preserve continuity of Work Packages
	2. PG presented an overview of the activities of WP3000
	3. A spreadsheet has been created with the data requirements and status (*WP3000\_byPartners*). All to provide updates to isardSAT who will place latest version in CP4O ftp site
	4. Noted new mode mask
	+ The large SAR area in the Pacific has been resized (relevant to Open Ocean Theme) – unfortunately has removed an area that could have been used for sea floor mapping
	+ New areas in N Pacific relevant to sea floor mapping theme – *but will need one complete 369 day cycle of data*
	+ New SARIN zone over the Caribbean – relevant to the SARIN coastal ocean sub-theme.
	+ Archive and spreadsheet in ftp site (*Crysat-2 Historic Geographical mode mask.rar .xls*)
	1. Publication of data: All the data sets to be used will be listed on the CP4O website, with information on how to access them (ftp addresss, directories, …)
	2. CNES can provide 2 months of CPP data over all SAR regions for WP5000. A smaller set can be provided for WP4000 on request
	3. FB asked CP4O team to note that CPP processing chain will be periodically improved, with the risk this could affects comparisons. FB will track SW changes
	4. Question on who will run SAMOSA re-tracker on CPP Data: NOC for coastal ocean, Starlab for open ocean. SD can provide reading routine for CPP Product. Need to consider how to deal with mis-pointing (preferred option to derive mis-pointing from star trackers and feed it as input to L2 SAR re-tracker after compensating for biases) . Note that STARLAB has a reliable SAR retracker. implemented soon after the theoretical model had been developed, and has been used to generate all the results that can be found in the SAMOSA TNs and other documents, produced by Starlab. As far as RDSAR is concerned, STARLAB does not have an in-house Brown retracker implemented to retrack pseudo-LRM waveforms produced as output of RDSAR. The plan in WP4100 of CP4O is to produce pseudo-LRM waveforms using RDSAR and using real data, and hand them to another partner for Brown retracking. As presented at KOM, during the WP4100 activities description (and discussed at this meeting), either NOC, CLS and TUDelft will be in charge of such re-tracking.
	5. TM noted that CLS would not be able to provide geophysical corrections
	6. U Porto requested confirmation that all the CS-2 data needed for the Wet Tropo Correction would be available in RADS.
	7. It is necessary to know precisely where the satellite is at each record (predicted locations not sufficient). Ideally need an orbit file with lat, long time and surface type.
	8. For the WP4000 sea-floor topography theme will need one complete 369 cycle. Therefore will not be able to complete this activity until after October 2013. DTU will need re-tracked data, NOC may be able to provide support – to be discussed at next Progress meeting
	9. Data for WP5000.
	+ Global data needed for LRM analysis, CLS is aware and can meet requirements
	+ SAR, RDSAR – will need regional geophysical corrections - the areas where Noveltis can provide regional corrections is already specified.
	1. FBR status availability at ESRIN (*Cryosat2 FBR Status at EOP-SER.pptx*)
	+ Current archive covers Jan 2011-October 2012. Nominal acquisition from ESA server from May 2012, (some of) back-log retrieved from from NOAA, land data is filtered out by NOAA. Gap from Feb-April 2012?
	+ SARIN data from ESRIN server only from May 2012
	+ Distributed KMZ file with all tracks
	+ To access the data email to Bruno – can also provide corresponding L1, L1B products.
	+ CS-2 Ground segment plans to have all FBR archive online for a limited time (Q1 2013). To access these data need to be a PI with FBR access
 | ***A2\_17******A2\_18******A2\_19******A2\_20******A2\_21******A2\_22*** | ***All to update data requirements spreadsheet******ALL to advise isardSAT/ CNES on requirements for CPP SAR data in WP4000******FB to advise when above can be made available******RS and FB to discuss mispointing in CPP*** ***JF and RS to confirm WTC need******SD, MF to provide CS-2 orbit files*** | ***14/12/12******30/11/12******14/12/12******TBD******14/12/12******TBD*** |
| 1. WP4000 Product Development and Validation (NOC)

*Overview (CP4O\_WP4000\_NOC\_Overview\_PM1.ppt)** 1. CG gave an overview of the whole work package according to the stages and eleven sub-themes (see presentation for details).
	2. The original timetable was for this WP to end in September 2013, but as discussed above, an extension will be required for the Sea floor altimetry sub-theme, to allow for accumulation of one full cycle of data.
	3. There was some discussion on the relative scopes of WP4000 and WP5000. WP4000 covers the development and validation (including error analysis) of products under each of the sub-themes. For some (SAR and RDSAR for Open Ocean) a number of parallel approaches will be developed and validated. WP4000 would not cross-compare these approaches.
	4. It was noted that early work from all partners contributing in WP4000 is required to specify the data sets required and the processing approaches to be used.
	5. The order of the presentations for the various sub-themes was changed for practical reasons. They are re-arranged below to provide a more logical progression

*Sentinel SPS Simulator (CNES)**2012-11-22&23\_CNES\_status\_on\_SPS.ppt** 1. NP gave an overview of the status of the Sentinel 3 SPS
	2. Operation is very CPU intensive. 100second scene with 20m pixel size requires 110 SPU hours.
	3. Nb of different simulations with different sea states, attitudes / mispointings have been prepared. Some blocking anomalies require industry support to address. But output is ready from those scenarios without mispointing.
	4. PC noted, from SAMOSA experience, that current pixel size of 20 meter would not be enough small to resolve wave field realistically for low SWHs
	5. NP noted that the CPU time is already large : over 110 hours for only 100 seconds which is required to have a good noise reduction factor. If we have to increase the resolution to 1meter, we may face blocking anomalies (related to the memory management) and this would increase the CPU time by a factor of 20\*20 = 400 !
	6. SD -Does the simulator generate in output FBR data as intermediate step ? NP: No but we will investigate
	7. SD suggested that SAR waveforms from the simulator could be used to compare retracking solutions CNES foresees the delivery of the simulation L1B data and will look at the possibility to extract raw echoes as well.

*Retrieval of Mispointing on Cryosat-2 (CNES)**2012-11-22&23\_CNES\_Retrieval\_of\_mispointing\_information\_from\_Cryosat\_Mission.ppt* * 1. Mispointing on Cryosat-2 can have a large impact on accuracy of retracking (especially SAR). Total mispointing is a combination of roll and pitch (but RS notes the elliptical antenna pattern means a simple sum of squares is not strictly correct). Mispointing varies geographically and is not constant along an orbit. CNES uses the raw STRs files not the information provided in FBR products.
	2. There is an evident relative bias between the three star trackers measurements of platform roll/pitch angles. This bias seems to be stable
	3. CNES found out that applying new rotation matrices (calculated in a post-launch calibration) the relative biases between the star trackers disappear
	4. More noise is found in the pitch angle than the roll
	5. CNES POD team is generating ascii files with time, location, roll, pitch and yaw angles, every 10s without averaging, using these new rotation matrices. Request that this is made available to CP4O
	6. *Recommendation that the information on which star trackers are in use should be made available (esp important for SARIN applications). An ESA action should be open to help CNES to implement this. Also it should be valuable to explain the source of the observed geographical patterns*
	7. Note that may be still a bias (in roll and yaw) between what is estimated by CNES and the true effective values of platform Roll/Pitch
	8. Request NOAA and to CNES iterate their analyses of mispointing and report back to CP4O team on recommendations regarding processing.

*RDSAR Open Ocean (Starlab)* *(CP4O\_PM1\_WP4000\_RDSAR Open Ocean\_STARLAB\_MPC\_v1.00)** 1. Two approaches will be developed in parallel and validated separately by Starlab and CNES. Note the presentation suggests a cross comparison between the two approaches in WP4000, resulting in the identification of the better scheme. Subsequent discussion confirmed this will NOT take place within WP4000.
	2. Some further specification of the different processing approaches and geographical location (NE Atlantic?) and time / duration of test data sets is needed.

*SAR Open Ocean (Starlab)* *(CP4O\_PM1\_WP4000\_SAR Open Ocean\_STARLAB\_MPC\_v1.0)** 1. Similar situation as for RDSAR above. Separate approaches to be developed by CLS and Starlab.
	2. Note that for the final activity (WP4400 – production of validation data set to be used in WP5000) Starlab will not be able to process large amounts of SAR data and so data set may be constrained
	3. The same coverage of data (time and space) for RDSAR and SAR activities is presumed and advised to make cross-comparison between SAR and RDSAR results

*SAR and RDSAR Open Ocean (CLS)* *(PM1\_WP4000\_Moreau.pptx)** 1. TM described the numerical SAR retracker and RDSAR processing methodology (which is already implemented in the CPP processing chain)
	2. Validation for RDSAR will be against LRM data from CS-2 and other satellite missions, and for SAR against collocated CPP RDSAR.
	3. The same coverage of data (time and space) for RDSAR and SAR activities is presumed

*SAR Coastal Ocean-NOC (CP4O\_WP4100\_NOC\_Coastal\_PM1.ppt)** 1. CG presented the plans for the Coastal Ocean (SAR), and some results of applying SAMOSA3 re-tracker to SAR multilooked L1b waveforms (Baseline A and Baseline B)
	2. Outstanding SAR retracking issues:
	+ Quality of ESA CS-2 L1B SAR products for ocean, coastal & sea floor mapping?
		- Excessive spreading of the SAR leading edge is detrimental to CS-2 SAR retrieval accuracy - could explain why we observe only a factor of 1.5 improvement with CS-2 SAR
		- Is Hamming filter applied in Baseline A and B ? SD - Yes, Hamming Weighting is applied in Baseline A and B.
	+ Echo’s Over-sampling and Truncation of waveform trailing edge in Baseline B
		- Does it change sensitivity of retrieved SSH to mispointing?
		- Maybe positive impact on coastal applications (better sampling of peaky echoes and mitigation of land signals) ?
	+ Sensitivity of SAR retrieval to other parameters (e.g. satellite navigation)
	1. Other issues:
	+ Effect of long waves on SAR SSH and SWH
		- Evidence that long waves increase noise on SAR SSH (CNES comment – could be difficult to asses with metrics that are available)
		- Future analyses of SSH noise near directional wave buoys
	+ Is there a bias in SAR SSH due to long waves?
		- Need collocated information on SSH, ocean wavelength and wave direction
		- A comparison to RDSAR should also be performed
	+ What Sea State Bias correction should be applied for SAR?
	1. Noted how well SAMOSA 3 re-tracker maintained track over coast and even land.
	2. Issues specific to coastal areas:
	+ Preliminary analyses indicate that SAM3 retracker performs well right up to the coast
	+ More in situ data for validation… but validation in coastal regions will need adapted geophysical corrections
		- What is SSB in coastal zone?
	+ Will need some strategy to mitigate land contamination when close proximity of land across-track

*SARIN Coastal Ocean-isardSAT (isardSAT\_CP4O\_PM1\_ESRIN\_20121122\_WP4000.ppt)** 1. MR presented the plans for the SARIN Coastal Ocean (SAR), and results from some initial analyses.
	2. Analysis will be carried out on tracks close to the Chilean Coast (tracks parallel to coast) and the Cuban Coast (tracks perpendicular to the coast)
	3. Noticed that when phase waveform is much cleaner there are clear retracking points (or vice versa)
	4. Discussions:
	+ SD: Please, notice that in the CryoSat L2 Intermediate Products is stored the cross-track angle measurement of the first reflection ; please give a look to it.
	+ SD: Are you going to re-track waveforms ?
	+ MR – Don’t have effort to do that, but will do some case studies, and specific investigations. May need some novel approaches – further detail to be provided in due course.

*Polar Ocean – DTU Space (Andersen\_PM1\_PolarOcean.ppt)** 1. OA presented the plans for the Polar Ocean and results from some initial analyses. Objective is to generate mean sea surface and mean dynamic topography – building a SAR data set from CS-2 L1B waveforms.
	2. Initial Analysis has looked at ESA L1b waveforms and L2 GDR from whole 2.4 year data set currently available. Needed to look at alternative re-trackers as L2 product does not include output from specialised ice re-trackers.
	3. Established that current L2 dataset cannot be used for oceanographic research
	4. Known issues / problems
	+ Jumps at mode shifts (LRM – SAR – SARIN)
	+ Differences between baseline A and B processors.
	1. Initial look at RADS RDSAR suggests it could be used, but so far only provides limited coverage, but SARIN mask excludes most coastal regions.

*Sea Floor Topography – DTU Space (Andersen\_PM1\_SeaFloor.ppt)** 1. The presentation was not given, because of time constraints, and identification above that this work could not start until one whole cycle of data over useful region had been accumulated.
 | ***A2\_23******A2\_24******A2\_25******A2\_26******A2\_27******A2\_28*** | ***CNES, ESA, SatoC and NOC to discuss how output from SPS could be incorporated into WP4000******Recommendation to ESA that be provided information on which star tracker is used*** ***CNES to make mispointing file available to CP4O and communicate the estimated values of new biases in Roll and Pitch******CNES and NOAA to iterate mispointing analyses and report to CP4O******CLS, Starlab to provide specification of test data set coverage & processing validation approach for RDSAR and SAR (Open Ocean)******Starlab to clarify what SAR Open Ocean validation data set can be provided*** | ***27/01/13******07/12/12******14/12/12******TBD******14/12/12******TBD (06/13?)*** |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. WP5000 Impact Assessment – CLS (PM1\_WP5000\_Moreau.pptx)

* 1. TM presented the overview of WP5000, largely as described in the Kick Off meeting
	2. The exact metrics to be used, geographical coverage of data, etc are to be refined and agreed within the team. It is expected that 2 months of data will be sufficient for the assessment, to provide data from different seasons.
	3. Identified specific areas with different characteristics, SSH dynamics (i.e. low and high sea state), seasonal wave height variation, blooms etc to investigate effect on products
	4. Ideally the geographical coverage would be as large as possible but there will be a tension between the need for a large volume of data to generate meaningful statistics, and the resources available to the partners to generate these data.
	5. Comparisons will be performed in terms of:
* Cartographies (to visualize geographyically correlated mean error)
* Histograms
* Spectral analysis (allowing to identify the energy/error levels at different spatial wavelengths)
* Time series analysis
* Dependencies analysis (correlations between parameters)
	1. The following risks were identified
	+ Not enough data to assess each algorithm
	+ No clear conclusion coming out from this assessment
	1. Note the data sets to be generated for WP5000 will have to be agreed (and created) in WP4000.
	2. Discussion
	+ CG: Why will you not apply SSB to LRM?
	+ TM: May be revised in due course.
	+ FB: some people at QWG reported that the internal path delay is different between SAR and LRM. But RC doesn’t believe they can be different. (From QWG presentation from Aresys). Need some reliable and firm information on this (Thales should know).
 | ***A2\_29******A2\_30******A2\_31*** | ***All: Provide feedback to CLS on proposed assessment metrics for WP5000*** ***DTU: Provide feedback to CLS on proposed approach to polar ocean and sea floor*** ***SatOC? to liaise with CB to find information on internal path delay*** | ***14/12/12******14/12/12******07/12/12*** |
| 1. WP7000 Outreach Promotion and Publication (SatOC)

*(CP4O\_KO\_SatOC.ppt slide 26)** 1. All encouraged to submit abstracts to relevant forums, publications for outreach activity and to promote CP4O project and results. Advise SatOC who will keep a bibliography. Relevant meetings are:
* AGU
* Cryosat users Workshop.
* Living Planet,
* EGU,
* ESA workshops,
* OSTS,
* Coastal Altimetry,
* In 2014 COSPAR and the Liege Colloquium
	1. SatOC will maintain listing of all relevant publications on the project web site.
 | ***A2\_32*** | ***All – submit abstracts to relevant meetings and advise SatOC*** | ***ongoing*** |
| 1. AOB
	1. First Payment Milestone now expected February 2013. If earlier payment is needed advise SatOC and ESA. It may be possible to negotiate acceptance of draft deliverables at this stage.
 |  |  |  |
| 1. Date and Venue of Next Meeting
	1. Next meeting is scheduled to be in May / June 2013, and should be mid –term review, with participation of Expert Group to review draft deliverables from WP4000
	2. Recommendation from ESA to follow approach of CCI project and hold scientific workshop on adjacent day, inviting attendees from inside and outside ESA to present related work.
	3. U Porto suggested as venue, but may be necessary to hold in ESRIN.
	4. Provisionally week of 3-7 June identified. May be necessary to revise depending on expectation of having sufficiently advanced drafts of ATBDs and PVRs in time
 | ***A2\_33*** |  ***ESA and SatOC to liaise on timing and venue requirements for next meeting*** | ***Spring 2013*** |

**ACTIONS:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Who*** | ***What*** | ***When*** |
| A2\_1 | All | Review D1.1 (Requirements Baseline) and provide comments to STARLAB | 07/12/12 |
| A2\_2 | TU Delft/ SatOC | Need to agree a statement from the whole CP4O team that can be relayed to the Cryosat Mission management regarding the quality of ESA Cryosat products and the consequent problems in using these products in the Cryosat Plus project. | 07/12/12 |
| A2\_3 | CLS | CLS to review effort needed to lead WP2200 and 2400 and decide if they can do this | 07/12/12 |
| A2\_4 | NOC | Include comment on Sandwell retracker in WP2000 review | 07/12/12 |
| A2\_5 | MF | To be confirmed: To provide algorithm on generation of sigma-0? | 07/12/12 |
| A2\_6 | All | Advise NOC/SatOC of relevant initiatives that should be included in WP2000 review (LRM and SAR data over coastal and open ocean) | 07/12/12 |
| A2\_7 | ALL | Review Crysoat-2 document list when provided by Starlab | TBD |
| A2\_8 | Starlab | Check if RDSAR needs modification to work on real C-2 data. | 07/12/12 |
| A2\_9 | TU Delft | To provide an Executive Summary of WP2000, including key findings / conclusions, before Christmas | 21/12/12 |
| A2\_10 | SD  | To provide information on the source of the L1b geo-corrections (i.e. where they come from each geo-correction) and if the L2-geocorrection are the same of L1b geo-corrections. | 14/12/12 |
| A2\_11 | DC | To update Project Management Plan to take into account timetable changes (to WP2000 and WP4000) as accepted by ESA | 07/12/12 |
| A2\_12 | RS | Produce document on σ0 calculation implemented in RADS | 07/12/12 |
| A2\_13 | ESA (SD, MF)? | Source documentation on σ0 calculation implemented in IPF | 07/12/12 |
| A2\_14 | SatOC/ESA | Provide updated information on IPF evolutions as they may impact analyses within the project | TBD / Ongoing |
| A2\_15 | CNES | CNES to respond to requests to modify CPP product as described in 4.33 | TBD |
| A2\_16 | ESA/SatOC/ All | Produce agreed statement on decision to use CPP data in CP4O (links to A2\_2) | 14/12/12 |
| A2\_17 | All | To updated data requirements spreadsheet | 14/12/12 |
| A2\_18 | All | Advise isardSAT / CNES (cc SatOC) on requirements for CPP SAR data in WP4000. Specify location (polygon) and time period. | 30/1112 |
| A2\_19 | FB  | Advise when (and if!) requested CPP data for WP4000 can be made available | 14/12/12 |
| A2\_20 | FB, RS  | Identify best approach to allow for mispointing in CPP products retrieved for WP4000 | TBD |
| A2\_21 | JF, RS  | To discuss U Porto need for RADS data to calculate WTC, and confirm availability | 14/12/12 |
| A2\_22 | ESA (SD, MF)  | Provide (historic) Cryosat-2 orbit file with time, lat, long (and if possible surface type) | TBD |
| A2\_23 | CNES, ESA, SatOC, NOC | Discuss how output from SPS could be incorporated into WP4000 | 27/01/13 |
| A2\_24 | ESA (SD?)  | Request that information on which star trackers are in use be made available (important for SARIN applications) | 07/12/12 |
| A2\_25 | CNES  | CNES to make mispointing file available to CP4O | 14/12/12? |
| A2\_26 | CNES, RS  | CNES and NOOA to iterate mispointing analyses and report back to CP4O team on recommendations for processing / retracking. | TBD |
| A2\_27 | Starlab, CLS  | Provide specifications of test data set coverage and approaches for product processing and validation for RDSAR and SAR Open Ocean themes in WP4000 | 14/12/12 |
| A2\_28 | Starlab | Clarify what SAR Open Ocean validation data set can be provided in WP4400 | TBD (06/13?) |
| A2\_29 | All | Provide feedback to CLS on proposed assessment metrics for WP5000  | 14/12/12 |
| A2\_30 | DTU | Provide feedback to CLS on proposed approach to polar oceanography and sea floor altimetry in WP5000 | 14/12/12 |
| A2\_31 | SatOC | Liaise with CB to find information on internal path delay (for LRM and SAR)  | 07/12/12 |
| A2\_32 | ALL | Advise SatOC of relevant abstracts submitted for AGU and Cryosat users Workshop. Prepare and submit abstracts for other relevant meetings: Living Planet, EGU, ESA workshops, OSTS, Coastal Altimetry, and in 2014 COSPAR and the Liege Colloquium | 30/11/12 |
| A2\_33 | ESA/SatOC | Liaise on timing and venue requirements for next meeting  | Spring 2013 |

Cryosat Plus For Oceans – CP4O - 1st Progress Meeting

Date: Thursday 22nd November 09:00 – 17:30

 Friday 23rd November, 09:00 – 13:00

Location: ESRIN, Frascati

Objectives

* Review Progress since Kick Off. Complete WP1000
* Review and consolidate planned activities to Second Review Point
* Refine Data Requirements
* Identify and critical dependencies and major risks

##### **Agenda - Day One**

|  |  |  |
| --- | --- | --- |
|  | 09:00 | Open |
| 1 | 09:00 | Welcome, adoption of the agenda (SatOC / ESA) |
| 2 | 09:10 |  CP4O - Project Overview and status, Review of action items (SatOC) |
| 3 | 09:30 | WP1000 Scientific Requirements Consolidation (STARLAB)Description of activity, presentation of final report and recommendations.Discussion |
|  | 10:30 | Coffee |
|  |  | WP1000 Continued |
| 4 | 11:30 |  WP2000 State of the Art Analysis (TU Delft + support from partners)* Overview of Work Package and progress so far
* Any changes to work programme
* Work to be done
 |
|   | 12:00 | Quality of Cryosat-2 data for oceans (Remko Scharoo) (input for WP2000) |
|  | 12:30 | Lunch |
|   | 13:30 | Overview of SAR L1b processing chain, results from comparison of ESA and CNES (CPP) SAR L1b products (SD)Overview of ESRIN FBR Archive Ser |
|  | 14:00 | Discussion * Requirements to feed in to later Work Packages
* Identification of risks and critical issues
 |
| 5 | 14:15 |  WP3000 Data Set Requirements – * Overview of Work Package and known requirements (isardSAT)
* Overview of ESRIN FBR Archive Service (BL)
* Data requirements for WP4000 (NOC)
* Data requirements for WP5000 (CLS)
* Expected Cryosat availability from reprocessing (ESA)
* Conclusions
	+ Which Cryosat data sets to use?
	+ What data sets are needed, and when, in the next period (until May 2013, for WP4000?)
 |
| 6 | 15:15 | Items to inform plans for WP4000* Tentative use of SPS simulations and associated planning (CNES)
* Retrieval of mispointing information from Cryosat Mission (CNES)
 |
| 7 | 15:45 | WP4000 – Product Development and Validation (overview of activities, required contributions and inputs, processing approach, timing, deliverables, risks) 15-20 mins per item below* Overview (NOC) – clarification of boundary between WP4000 and WP5000
* LRM for Open Ocean (TU Delft)
* SAR for Open Ocean (Starlab, CLS)
* SAR for Coastal Ocean (NOC)
* SAR for Sea Floor Mapping (DTU Space)
* SAR for Polar Ocean (DTU Space)
* SARIN for Coastal Ocean (isardSAT)
* RDSAR for Open Ocean (STARLAB, CLS)
* Geophysical Corrections (U Porto, Noveltis, TUDelft)
 |
|  | 17:30 | Close |

**Day Two.**

|  |  |  |
| --- | --- | --- |
|  | 09:00 | Open |
|  | 09:00 | WP4000 continued |
| 8 | 10:00 | WP5000 Impact Assessment (CLS)(overview of activities, required contributions and inputs, deliverables, risks) |
|  | 10:30 | Coffee |
| 9 | 11:00 | WP7000 Outreach, Promotion and Publication (SatOC)* Identification of key meetings in 2013, and proposals of presentations
	+ Cryosat Users workshop – 12-14 March, Dresden
	+ ESA Living Planet Symposium. Edinburgh 9-13 September 2013
 |
| 10 | 11:30 | Other issues* Membership and remit of Expert Group (ESA)
* Situation re additional work proposed in Technical Proposal
 |
| 11 | 12:00 | AOB, Next Meeting |
|  | 13:00 | Close |

**Papers:**

CP4O Project Management Plan
Technical Kick Off minutes

Action List
WP1000 Deliverable: Requirements Baseline

WP3000 Data Requirements: Initial Document

**Confirmed attendees:**

David Cotton (SatOC),

Christine Gommenginger, Luke West (NOC)

Remko Scharoo (Altimetrics)

Maria Paola Clarizia (Starlab)

Marc Naeije (TU Delft)

Francois Boy, Nicolas Picot (CNES)

Joana Fernandes, Alexandra Nunes (U Porto)

Ole Andersen (DTU)

Thomas Moreau (CLS)

**By Phone:**

isardSAT and Noveltis