



Sea Level CCI project Phase II

Project Status





1. Products status
2. Algorithm Improvement status
3. Status of Climate Research Group assessment
4. Sea Level error characterisation
5. Applications-Uses of the SL ECV
6. Common issues between ECVs

Status on the algorithm improvement



- **New tides (model) corrections:**
 - GOT4.10 ocean tide model was evaluated
 - FES2014 ocean tide model: evaluation in progress

- **New orbit solutions**
 - Work on further improving orbits of TOPEX/Poseidon (1992-2005) and Jason-1 (2002-2013) by using new improved models.
 - New CNES orbit GDR-E solutions: evaluation in progress

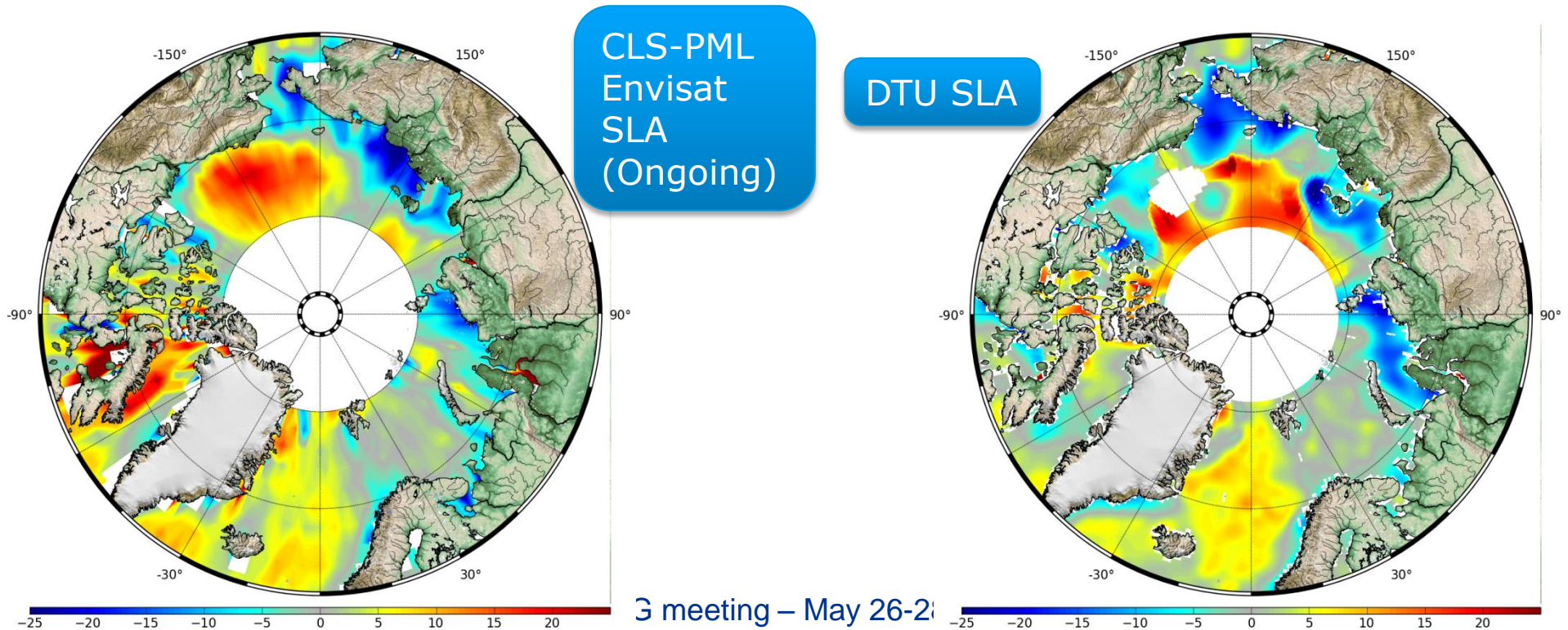
- **New ionospheric correction,**
 - production & validation of new Ku band ionospheric instrumental correction after reversing the S-band PTR waveform.

- **Impact of atmospheric fields for the dynamic atmospheric corrections**
 - Impact of the use of a new atmospheric reanalysis (JRA-55) on the computation of atmospheric corrections. Comparison with ERA-Interim
 - Extension of GPD correction for Jason and Envisat started

New product for Arctic



- On going work
- New monthly Arctic products based on Envisat data only : preliminary results are very encouraging
 - Very good coverage over leads and SLA quality seems good
 - Continuity between open and ice covered ocean (thanks to new retracking)



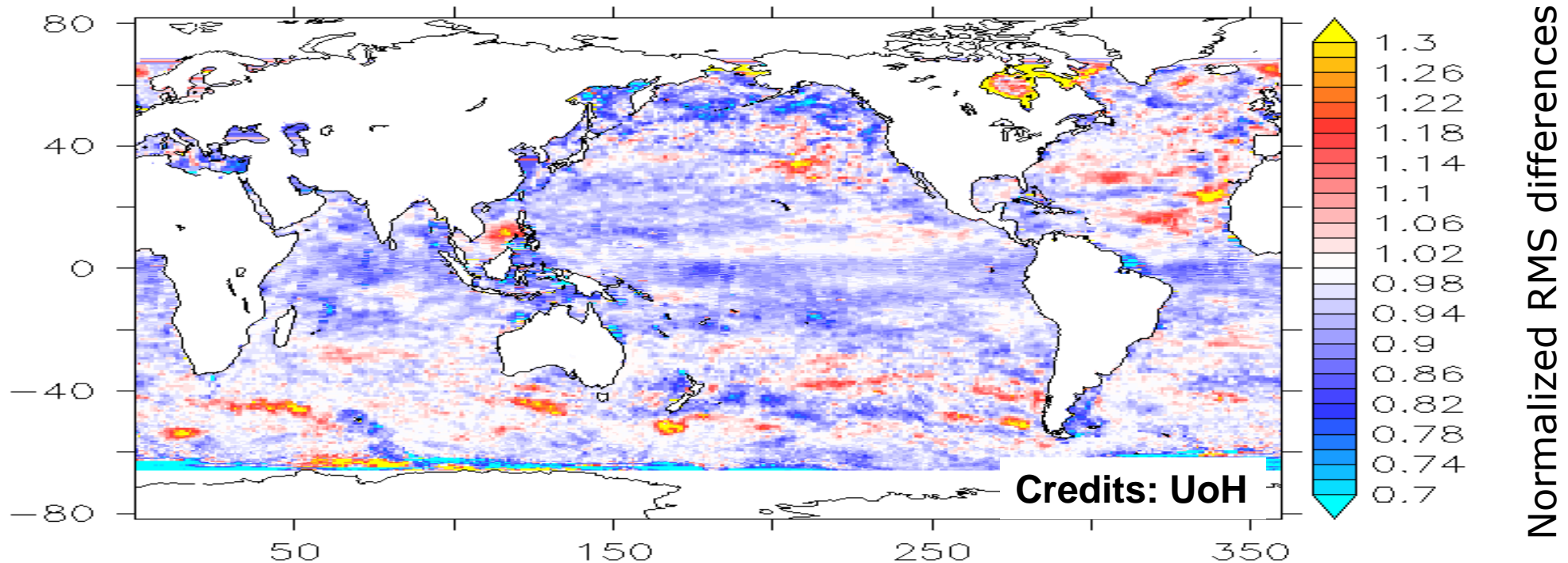
Assessment by CR group



- **ECV assessment by climate users:**

⇒ SL_cci products used for assimilation in models and for validation

⇒ Improvements are visualized when assimilating the previous SL_cci version (V0) and the new release (V1.1) into the self consistent GECCO2 model and afterwards comparing both model outputs to the two data sets (V0 and V1.1) itself.



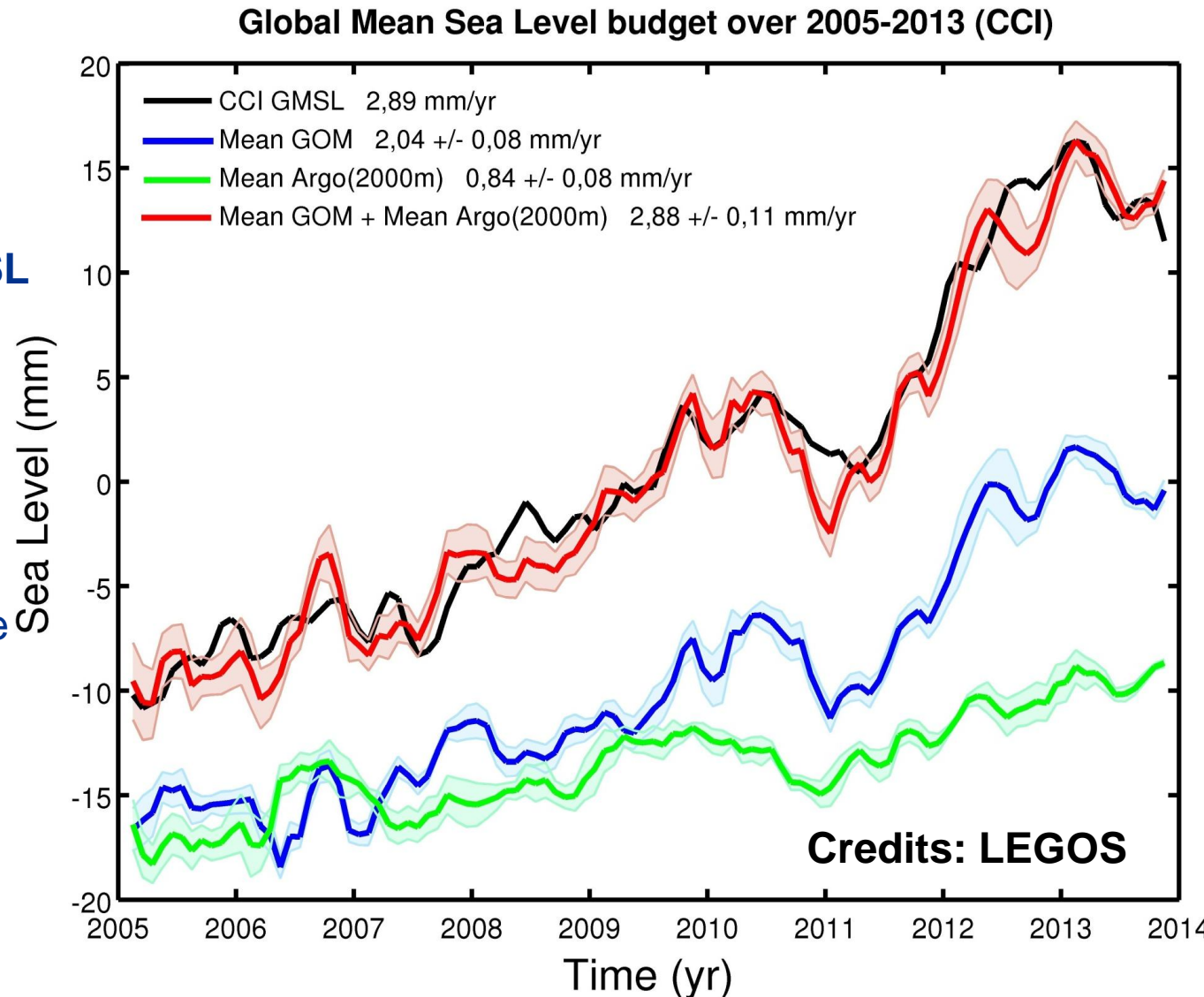
Assessment by CR group



- **Assessment of SL_cci ECV products via sea level budget studies at inter-annual scales (LEGOS) :**

⇒ **Differences with other GMSL products** from international groups have been analyzed

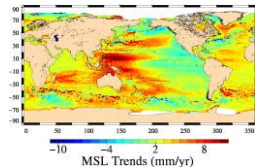
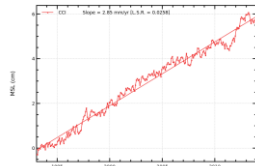
⇒ **Better agreement** found between GMSL and the **sum of mass and steric components** when using the **SL_cci** (over the 2005-2013 time span where GRACE and Argo data are available)



Sea-level error characterisation



- Altimetry measurement errors at climate scales have been characterized (Ablain et al, 2012) (CCI phase I) → work continue in phase II

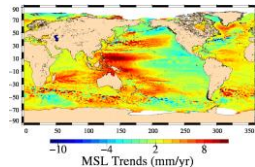
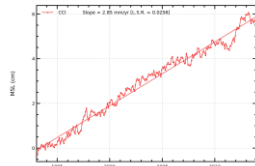


Spatial Scales	Temporal Scales	User Requirements	Altimetry errors CCI products
Global Mean Sea Level (10-day averaging)	Long-term evolution (> 10 years)	0.3 mm/yr	< 0.5 mm/yr
	Inter annual signals (< 5 years)	0.5 mm over 1 year	< 2 mm over 1 year
	Periodic signals (Annual, 60-days,...)	Not defined	Annual < 1 mm 60-day < 5 mm
Regional Mean Sea Level (2x2 deg boxes and 10-day averaging)	Long-term evolution (trend)	1 mm/yr	< 3 mm/yr
	Inter annual signals (> 1 year)	Not Defined	Not evaluated
	Periodic signals (Annual, 60-days,...)	Not Defined	Annual < 1mm 60-day < 5 mm

Sea-level error characterisation



- Altimetry measurement errors are different depending of the period

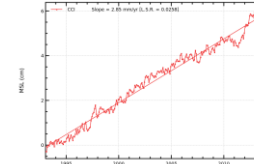


Spatial Scales	Temporal Scales	Altimetry errors [1993-2002]	Altimetry errors [2003,2013]
Global Mean Sea Level (10-day averaging)	Long-term evolution (> 10 years)	0.7- 0.8 mm/yr	< 0.5 mm/yr
	Inter annual signals (< 5 years)	< 5 mm over 1 year	< 2 mm over 1 year
	Periodic signals (Annual, 60-days,...)	Annual < 1 mm 60-day < 5 mm	Annual < 1 mm 60-day < 2 mm
Regional Mean Sea Level (2x2 deg boxes and 10-day averaging)	Long-term evolution (trend)	< 4 mm/yr	< 2 mm/yr
	Inter annual signals (> 1 year)	Not evaluated	Not evaluated
	Periodic signals (Annual, 60-days,...)	Not evaluated	Not evaluated

Confidence Envelop : cumulated errors for error trend signal



Generate a set of
GMSL time-series
with equivalent
qualities



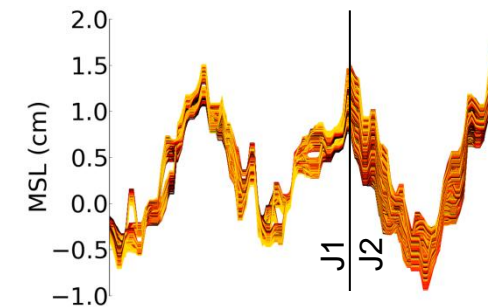
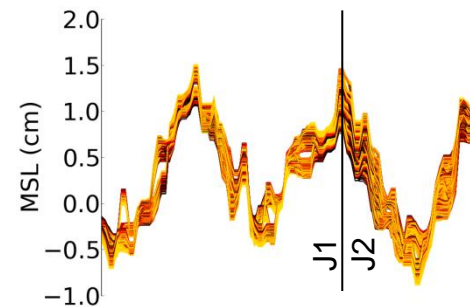
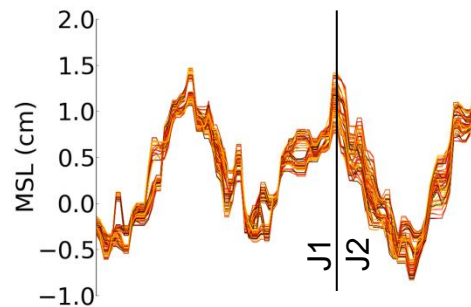
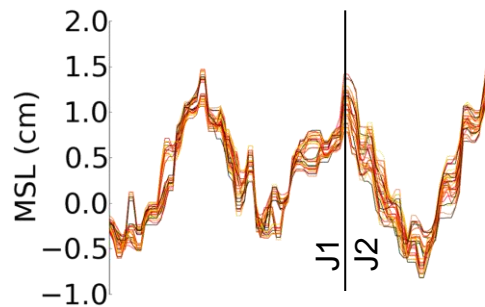
4 uncertainty families are tuned

Standards

Data Selection

Average Mesh
Grids

Missions Linking



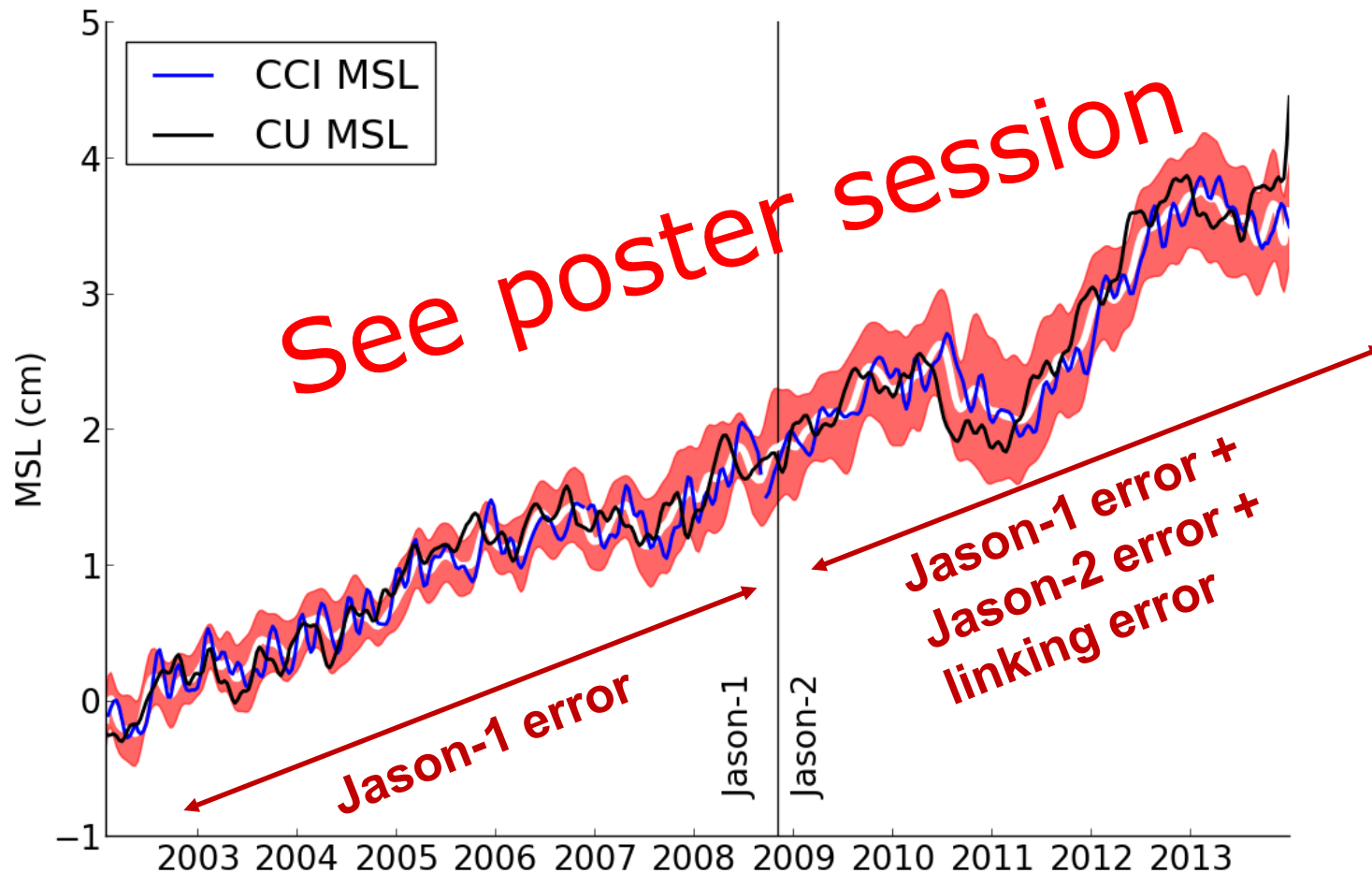
More than 18000 time-series are produced in the
set, allowing a significant statistical approach

Confidence Envelop : cumulated errors for error trend signal



→ The resulting envelop allows to verify CCI GMS time series products stay within envelop error

→ It is also the case for other products: AVISO, University of Colorado, ...



Next Steps



Could Sentinel-3 be a reference mission ?



Study objective: Sensitivity of the MSL calculation changing the orbit of the reference mission: Sentinel-3 instead of Jason missions

1. Linking Sentinel-3 to the reference Global MSL record makes it impossible to meet global trend User Requirements ($<0.3\text{mm/yr}$). It is important to remain consistent in the errors we commit to minimize sources of uncertainty.
2. The different sampling of oceanic variability –induced by the difference of ground tracks- prevents from meeting regional trend User Requirements ($<1\text{mm/yr}$)

Recommendation:

It is necessary to conserve the historical TOPEX/Jason ground track to compute MSL time series and MSL trend maps

International intercomparison exercise



→ Lead by LEGOS

→ Not yet started

→ 3 steps:

- contact the definition the potential group that may participate: Legos, colorado university, noaa, csiro, Nasa/GFSC
- definition of the intercomparison protocol
- the intercomparison exercise



Project website:

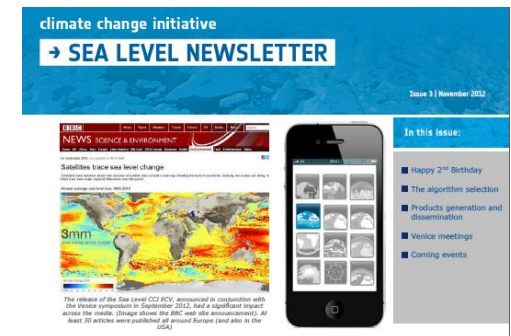
⇒ An **overall refresh** has been performed at the beginning of phase II (2014)

<http://www.esa-sealevel-cci.org/>

- **7th newsletter:** published at the 2015 EGU meeting

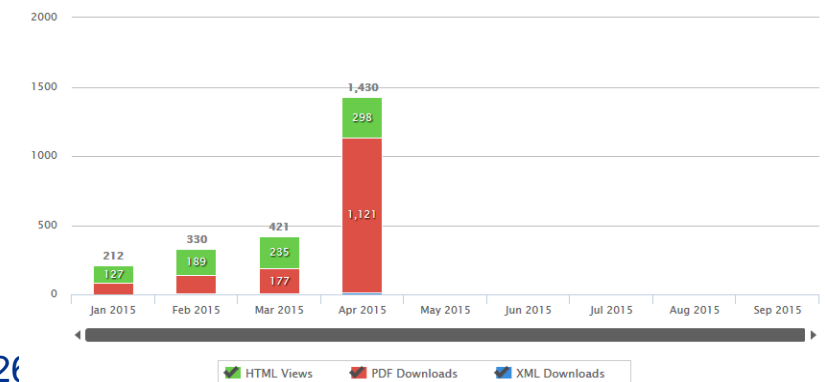
⇒ Content: Preparation of the ECV v2 reprocessing; Validation of the ECV; Technical dev.: focus on the sea level estimation in Arctic; publications and events (conferences)

⇒ **8th newsletter:** After the selection meeting / AGU content: Selected algorithms + ECV extension



- **Ablain et al., Ocean Science** Ocean Sci., 11, 67-82, 2015, doi:10.5194/os-11-67-2015. Published January 13, 2015

Cumulative Views and Downloads (calculated since 13 Jan 2015, article published on 13 Jan 2015)

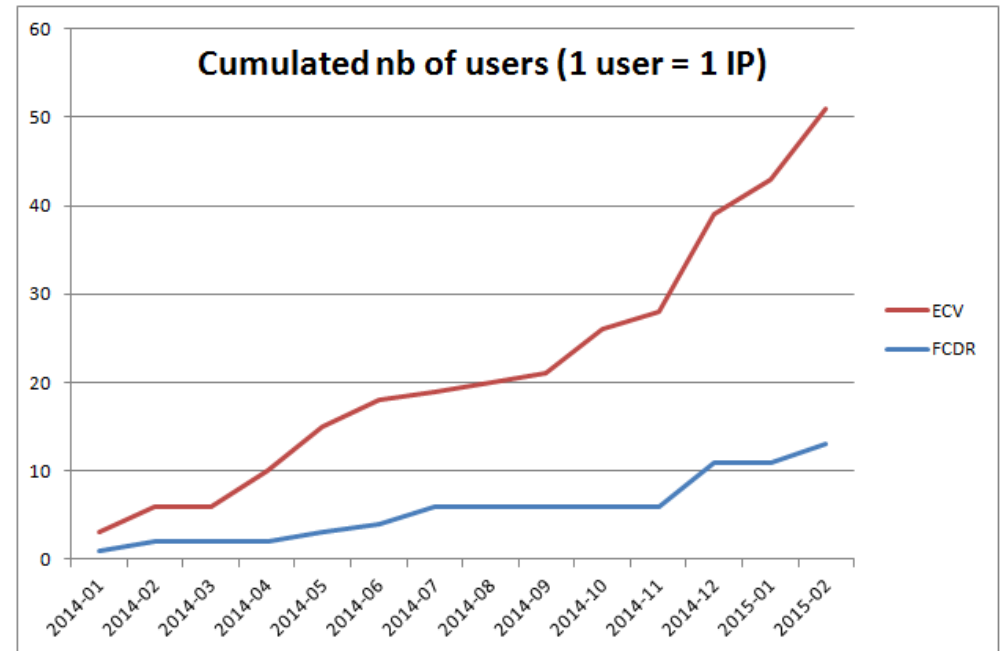
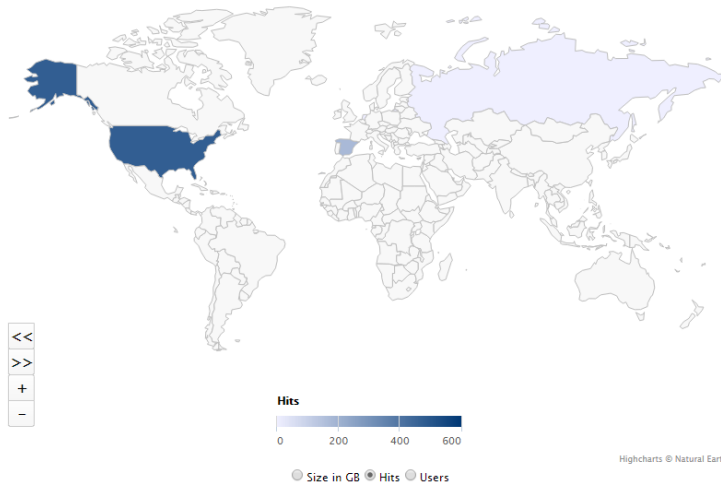


Outreach and promotion:



More effort needed to do the promotion of the SL ECV

Map of the distribution of downloads on SL-CCI broadcast services for the month of February 2015



Issue between ECV



- No issues but collaboration through “*Sea Level closure budget studies*”
 - ISSI, Bern, 2-5 Feb. 2015: « Sea level and associated climate components at global & regional scales as inferred from the ESA Climate Change Initiative (CCI)”
more here: <http://www.issibern.ch/workshops/sealevelbudget/>
 - Representatives from Sea Level, SST, Glaciers, Sea Ice, Ice sheets ECV
 - Opportunity for a new CCI project within the current CCI programm or within the extension of the CCI (CCI+)

- Link with Climate models: Initiative to compare sea level estimates from climate models with observations from CCI sea-level: *see in the agenda, the SSH side meeting on Wednesday the 27th of May*



Thank you