The Geoid,Mean sea surface and mean dynamic topography

Splinter summary & recommendations

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The Session.

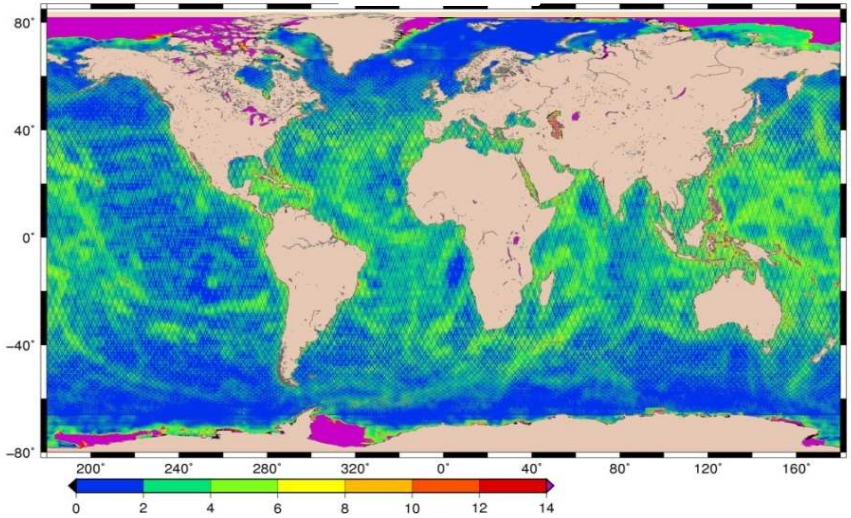
- **5 oral presentations**
  - **2 on gravity/geoid**
  - **2 on MDT**
  - **1 on MSS**

- **1 Posters (on MDT)**

Nice and well attended session…..

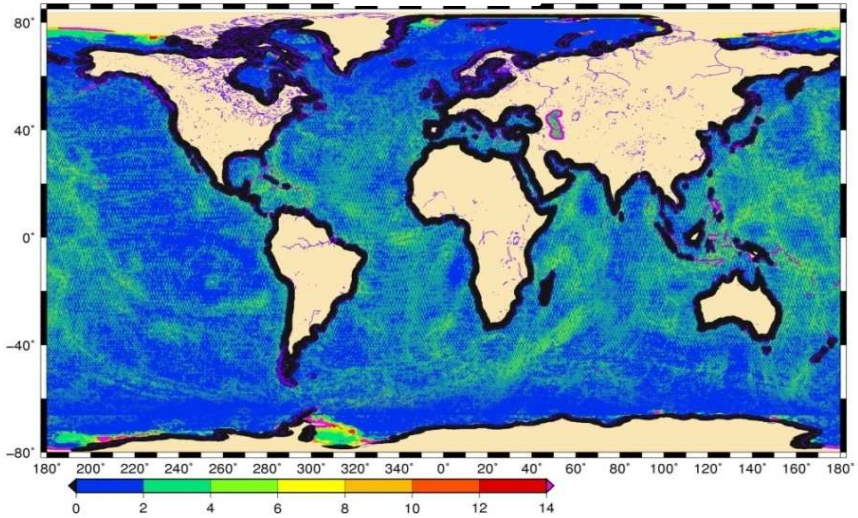
Improving the accuracies (since 2001)

CLS2001

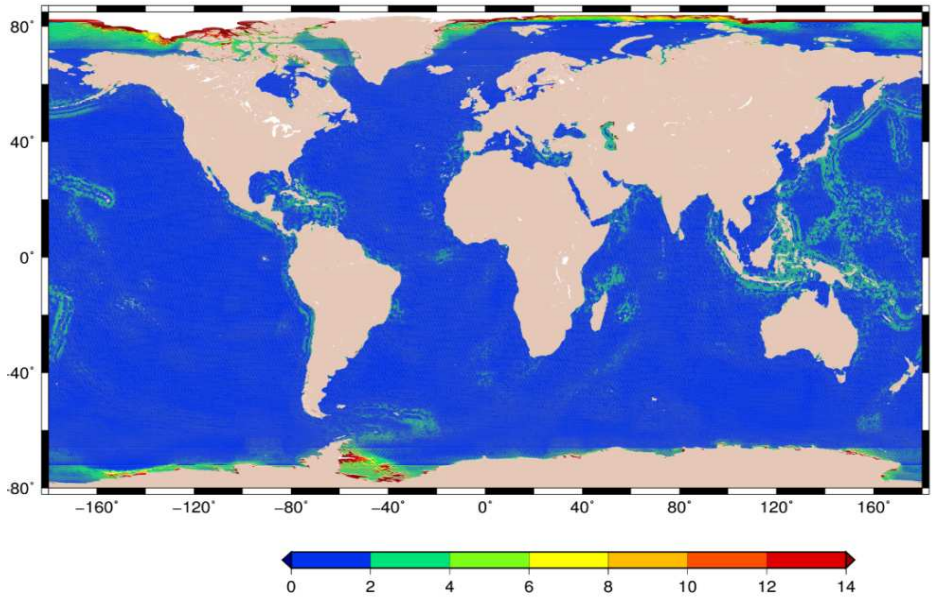


Error (cm)

CNES_CLS2011



CNES_CLS2015



Error (cm)	average	std
CLS01	2.9	3.7
CNES_CLS11	1.9	2.1
CNES_CLS15	1.4	1.3

- The reduction of the average is greater than 100 %, and close to 200 % for the std !
- Improvement of the error uniformity suggest better homogeneity concerning the accuracy of the new MSS !

Remember that error is adjusted on crossover statistics

Recommendations: Jason-2 EoL

RECOGNIZE the great achievement that J-2 is IN SUCH GOOD HEALTH

RECOGNIZE the value of J1-GM for high quality of current MSS/Geoid i.e., to the benefit of operational use of i.e. Cryosat-2 and SARAL/AltiKA, HY-2A

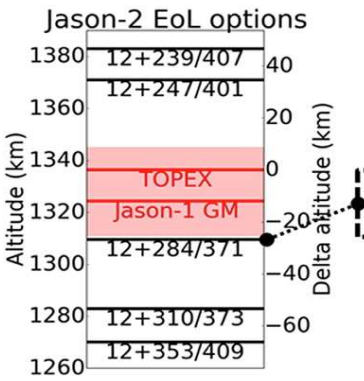
RECOGNIZE that accuracy of current altimeter product are affected by remaining error in MSS.

RECOGNIZE that Jason-2 is unique in potentially providing a 4 or 2 km "exact" sampled MSS

RECOMMEND to have AT LEAST 2 interleaved repeat GM lasting 2.2 years.

RECOMMEND to follow the suggestion of Dibarboure with an orbit 27 km lower than Jason-3 as it ALSO gives the highest value to Oceanography.

Jason-2 Extension of Life Orbit: -27 km



					A	B	C	D	
Altitude (km)	Delta Altitude (km)	Number of Revs per day	Sub-cycles (days, negative is westard)		Mesocale sampling uniformity (Jason-2 EoL + Jason-3)	Geodetic sampling uniformity (Jason 2 EoL + Jason1 GM)	Overlap event uniformity	Satellite debris (collision risk)	Tentative Priority
1383.0	46.7	12+239/407	-2, 5, -17, -63, -172, 407		Excellent	Good	Very Good	Medium	3
1371.0	34.7	12+247/401	3, -5, 13, 138, 401		Very Good	Good	Excellent	Good	2
1309.5	-26.8	12+284/371	-4, 17, 81, 145, 371		Excellent	Very Good	Very Good	Very Good	1
1282.9	-53.4	12+310/373	-6, -77, -148, 373		Good	Very Good	Very Good	Very Good	2
1277.3	-59.0	12+322/381	-6, 13, -71, 155, 381		Good	Very Good	Very Good	Very Good	2
1270.0	-66.3	12+353/409	-7, 22, -73, 168, 409		Very Good	Medium	Excellent	Very Good	3

G. Dibarboure and R. Morrow, 2016: Value of the Jason-1 Geodetic Phase to Study Rapid Oceanic Changes and Importance for Defining a Jason-2 Geodetic Orbit. J. Atmos. Oceanic Technol., 33, 1913–1930, doi: 10.1175/JTECH-D-16-0015.1.

The **best option** in this list is arguably 12+284/371 at 1309 km (-27 km):

1. **It has a 17-day sub-cycle that is good for mesoscale monitoring because it blends well with the 10-day cycle of Jason-3.**
2. It has a 145-day sub-cycle and a 371-day repeat cycle that are good for geodesy: the final grid is close to the Jason-1 GM grid. If Jason-2 EoL was to die after only half the repeat cycle, it would still provide a coarser but globally homogeneous dataset for geodetic users.
3. It has a 4-day sub-cycle that is favorable for sea state applications (e.g. assimilation in operational wave models) and that blends well with Jason-3's 3-day sub-cycle.
4. It generates overlap events with Jason-3 that are well distributed at all time scales. There are no empty bins for the 10-day criterion, and only 3 empty bins for the 1-day criterion. This orbit yields a high probability of collecting an overlap sample in any region, season, and for any time difference.
5. IT HAS A BENEFITIAL SUBCYCLE IN CASE OF EARLY FAILURE

Recommendations: Jason-2 EoL

RECOMMEND that (if possible) the GM is extended into 4 years (2 km)

RECOMMEND to further study the impact of 4 years extended GM (2 km)

Nominal 1 Hz noise

Sampling	Variant	Error RMS (cm)	Variance difference with 2016 simulation
2012	Cryosat (1yr) + ERS1 + Geosat	1.88	+53%
2016	Cryosat (4yr)	1.71	+27%
2016 (main)	Cryosat (4yr) **+ Jason-1 GM (1yr)**	1.52	0%
2020	Cryosat (**8yr**) + Jason-1 GM (1yr)	1.47	-6%
2020	Cryosat-2 (8yr) + Jason-1 GM (1yr) **+ AltiKa (1yr)**	1.42	-13%
2020 (main)	Cryosat-2 (8yr) + Jason-1 GM (1yr) + AltiKa (1yr) **+ Jason-2 GM (2yr)**	1.19	-39%
2020	Cryosat-2 (8yr) + Jason-1 GM (1yr) + AltiKa (1yr) + Jason-2 GM (**4yr**)	1.04	-53%

(Dibarboure, 2016)

Recommendations: Jason-2 EoL

RECOMMEND that the timing is not being linked to the launch of i.e. S-3B

as this might potentially compromise the GM – i.e. by delay of S-3B launch.

RECOMMEND to move J-2 to a GM mission RELATIVELY SOON while J-2 is still healthy and while 2 years of GM can be "safely" ensured. Two Years GM is considered THE MINIMUM to ensure significant MSS improvement – 4 years the preferred.

RECOGNIZE that an EARLY improved MSS will ALSO lead to Improved SSH values as well as global bathymetry and gravity and that improved MSS will highly benefit SWOT and enhance the value of (SARAL+C2) in operational/climate use.