Comments about the AVISO msla & madt data sets released April 2014

Report v01

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This report contains comments about the AVISO msla & madt data set issued by AVISO in April 2014 plus the response to the comments given by AVISO (Nov. 27, 2014)

1) The product is claimed to be a two satellite merged product. However, looking at the attribute "platforms" in the netCDF-files one eventually finds periods in which 3 satellites were used in parallel.
Question: Were actually really 3 satellites used and was this done on purpose, for example, to have a smooth overlap between different satellite sensors?
Answer: In the computation of the maps at day D, we take into account a window of [D-42;D+42] days of data. For two-sat-merged when there is a junction between two satellites so-called "secondary mission" during this interval, let's say at day E, we have to take one mission between [D-42;E] and the other one between [E; D+42],
giving 2 secondary missions in the list. The same can occur
on the "reference mission", around the junction between Topex-Poseidon and Jason-1, or between Jason-1 and Jason-2.

2) The attributes list satellite sensors at times when these were either not yet in orbit or already dead. Examples for this are:
ERS2 is listed starting in April 3 1995; its launch was April 21 1995. Envisat extended period (why extended period by the way?) ends on May 20 2012 but contact to Envisat was lost on April 8 2012.
SARAL/Altika is included starting February 1 2013 but its launch was
February 25 2013.
Reply: The solution is given by 1): we take into account a window of [D-42;D+42] days.

3) The sea ice cover is obviously wrong in some places of the Arctic, e.g. the Kara Sea or the Bering Sea in January-March2009 or 2010.
Question: Which kind of sea ice mask has been used?
Answer: We don't use any sea-ice mask. What we do is the following: we take along-track data for each satellite and apply an editing which eliminates the points on ice (it is a flag applied on lat>50° with a criterion on the waveform which eliminates echos returned by ice instead of ocean). So the along-track points don't contain such ice points normally. The mapping procedure calculates for each grid points the data in the temporal window and spatial window and propagates the values in some pixels, so it can be extrapolated into some regions where it should not.

4) It seems to me that the land mask used is kind of a bathymetry isoline (perhaps -100 m?) because many Islands are too small and/ or interrupted, e.g. the Northern Island of New Zealand.
In addition there is a flickering of the land mask and/or near coastal pixels in front of the coast of Chile year round - and maybe also along other coastlines.
Question: Which land mask is used?
Answer: The Along-track values are eliminated over land and as said in 3) some points may cover the coasts because of the mapping. A mask based on the costal distance is applied afterwards. The threshold used allows one or two pixels to enter in the coast. In some places, the mask applied is not perfect.

5) The "only" uncertainty which comes with the product is the so-called "formal mapping error" in the daily msla product.
Question: Do other error contributions exist and if so which and which influence is the dominating one. Is there a chance to obtain uncertainty estimates for the other parameters (madt, u and v) and also the monthly values and climatologies?
Answer: The formal mapping error given with the msla is estimated within the mapping process (Optimal Interpolation) using the Bretherton et al. (1976) formula. It is an estimation of the errors based on covariance of the signal observed and estimated. Its value is strongly sensitive to the altimeter sampling (i.e. depending on the number of altimeters available and characteristics of the orbits). Other parameters contribute to its value, as for instance the variability of the signal, the errors prescribed for the different measurement, correlation scales of the signal we map, etc.

There is no such formal mapping error available for geostrophic current, because we do not deduce it from a mapping procedure like for sla, but by deriving it from the map of SLA in zonal and meridian direction (using Stencil width methodology as described by Arbic et al, 2012).

The estimation of the errors is a very complex topic. Indeed, the error impact different spatial and temporal scales (from uncorrelated (or noises), to large and long scales (e.g. bias & drift)). We are working in order to better estimate the errors on the map products. At this time, we estimated the two-sat-merged maps errors by comparing the maps with independent along-track SLA, i.e. not used for the map computation, and focused on the meso-scales (i.e. wavelength ranging 50-500km).

The error budget depends on the area considered. The mean error values are the following:

Low variability areas (Variance < 200 cm^2 and costal distance > 200 km): Mean error = 2.2 cm
High variability areas (Variance > 200 cm^2 and costal distance > 200 km): Mean error = 5.6cm