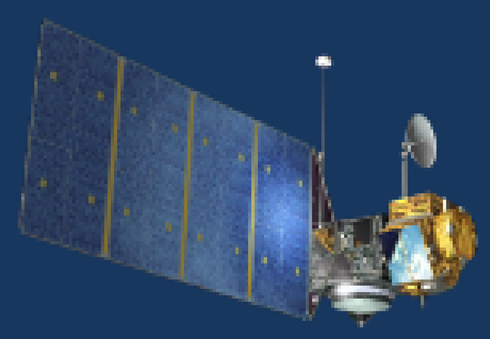
Reprocessing of the Poseidon-1 French Altimeter dataset



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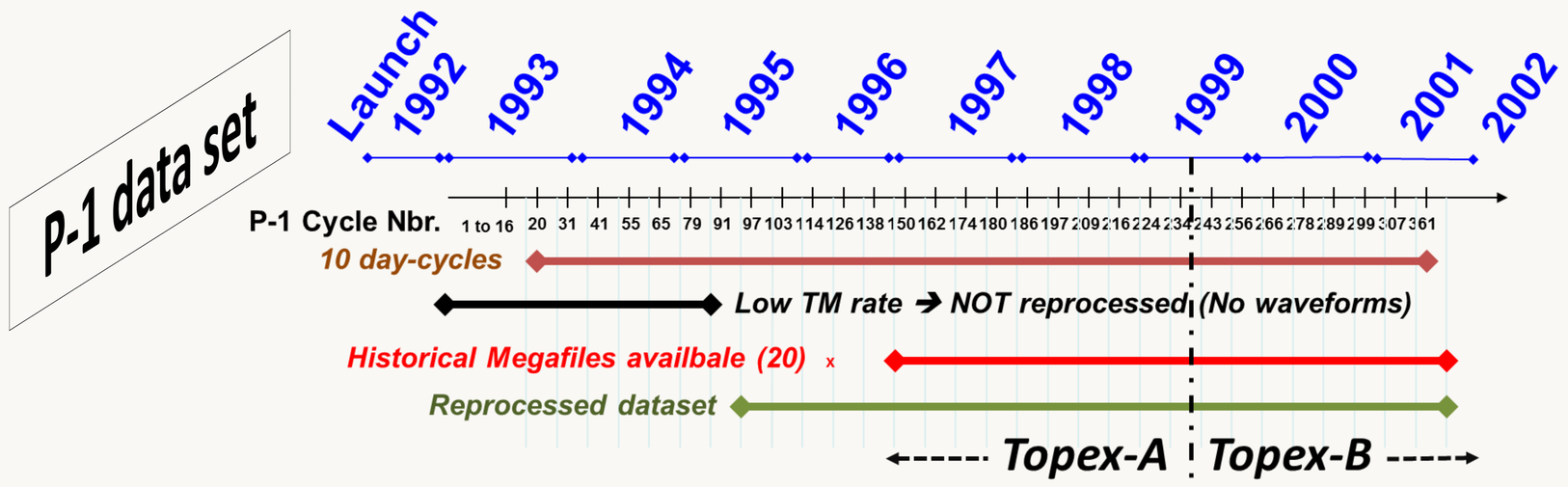
Context

On August 10 1992, the TOPEX/POSEIDON satellite was successfully launched into orbit by an Ariane 42P rocket from the French Guiana launch site. For the next 13½ years, the two radar altimeters on board the platform, the NASA Altimeter (ALT) and SSALT (or POSEIDON-1), successfully collected highly valuable oceanographic data. Since both altimeters operated at the same frequency and used the same antenna, a sharing plan of the antenna was established which allowed operation of the ALT, 90% of the time with the remaining 10% devoted to POSEIDON-1 operation.

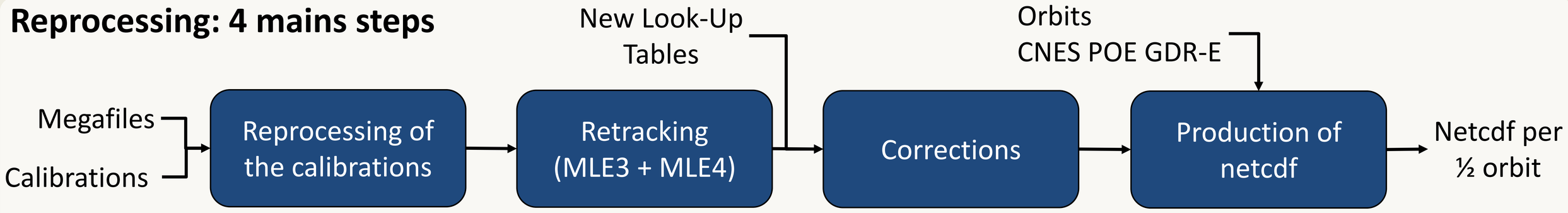
This poster reports on the POSEIDON-1 reprocessing activity, performed by CNES/CLS teams. It included the reprocessing of all **internal calibration sequences**, the **retracking of the waveforms**, update of the **orbit solution,** and the addition of up-to-date **geophysical, and environmental corrections**. POSEIDON-1 proved to have an excellent instrumental stability (drift internal path delay below 0.6 mm/yr) making it valuable to contribute to the TOPEX-A drift on going analysis (on-going Topex reprocessing activity). In addition to being useful for the Global Mean Sea Level determination, this reprocessing also offered the possibility to secure the POSEIDON-1 data set and to enrich the long term altimetry records with homogenized data set.

Parameter	Value
Center Frequency	13.65 GHz
Pulse Duration	105 µs
Bandwidth	320 MHz
Peak Transmitted Power	5 Watts
Pulse Compression Ratio	32000
Pulse Repetition Frequency	1718 Hz
Number of Integrated Pulses	86
Number of Waveform Samples	64
Time Delay Resolution	3.125 ns
Distance Resolution	46.875 cm
Antenna Beamwidth	1.1 deg.
Antenna Diameter and Gain	1.5 m and 43.9 dBi
Mean Altitude	1336 km
Inclination	66 deg
Cycle Duration	9.91 days

Poseidon-1 Main features

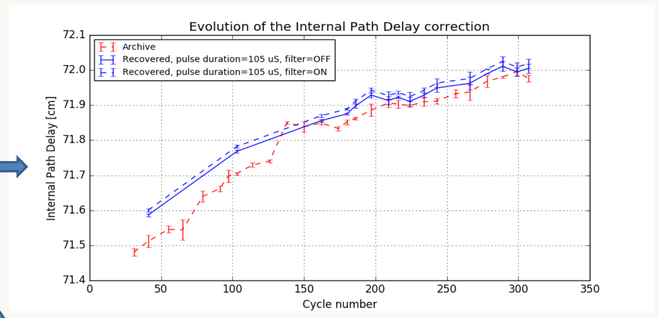


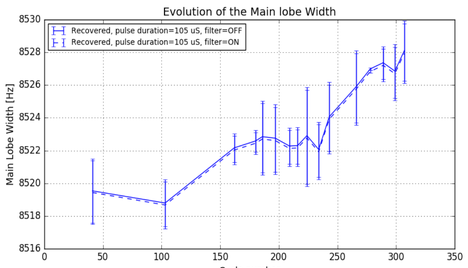
Reprocessing: 4 mains steps

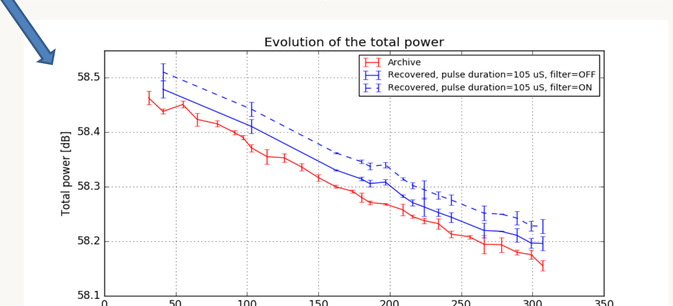


Excellent stability of the Poseidon-1 instrument

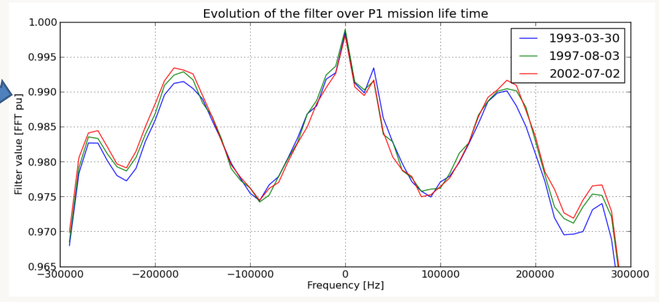
- Poseidon-1 (P1) Point Target Response (PTR) is very stable over the mission life:
- drift below 0.6 mm.yr^{-1} for the internal path delay
- Total power of the PTR very stable
- Width of the main lobe







- Poseidon-1 Low pass filter is very stable as well over P1 lifetime.



Geophysical & Environmental Corrections

Basically, the corrections that are applied are the ones that have been defined for the TOPEX reprocessing

Field name in the table	Definition	Model	1Hz	20Hz
FLAG_SURFACE_TYPE.MODEL.LAND_COVER	Surface type	Coastal correction 10/2001	x	x
FLAG_LAND_SEA.ALTI		CMA LandSeaMask	x	x
DISTANCE_SHORELINE.MODEL.GSHHS	Distance shoreline	GSHHS	x	x
MEAN_SEA_SURFACE.MODEL.CNESCLS15	Mean Sea Surface	CNES CLS 2015	x	x
MEAN_SEA_SURFACE_ACCURACY.MODEL.CNESCLS15			x	x
MEAN_SEA_SURFACE.MODEL.CNESCLS11_REF20		CNES CLS 2011	x	x
MEAN_SEA_SURFACE_ACCURACY.MODEL.CNESCLS11			x	x
MEAN_DYNAMIC_TOPOGRAPHY.MODEL.CNESCLS13_REF20	Mean Dynamic Topography	CNES CLS 2013	x	x
MEAN_DYNAMIC_TOPOGRAPHY_ACCURACY.MODEL.CNESCLS13			x	x
GEOID_HEIGHT.MODEL.EGM2008	Geoid height	EGM 2008	x	x
BATHYMETRY.MODEL	Bathymetry	DTM 2000	x	x
WIND_SPEED.MODEL.ERA_INTERIM_U_COMP	Wind Speed	ERA Interim	x	x
WIND_SPEED.MODEL.ERA_INTERIM_V_COMP			x	x

Field name in the table	Definition	Model	1Hz	20Hz
SOLID_EARTH_TIDE_HEIGHT.MODEL.CARTWRIGHT_TAYLER_71	Solid earth tide height	Cartwright Tayler 71	x	x
OCEAN_TIDE_HEIGHT.MODEL.GOT4V10	Ocean tide height	GOT 4V10	x	x
LOAD_TIDE.MODEL.GOT4V10	Load tide		x	x
FLAG_QUAL.MODEL.GOT4V10_INTERP	Quality flag of the model		x	x
OCEAN_TIDE_HEIGHT.MODEL.FES14B	Ocean tide height	FES 2014 B	x	x
LOAD_TIDE.MODEL.FES14B	Load tide		x	x
FLAG_QUAL.MODEL.FES14_INTERP	Quality flag of the model		x	x
OCEAN_TIDE_EQ_LP.MODEL	Equilibrium long-perdiod tide height	-	x	x
OCEAN_TIDE_NEQ_LP.MODEL	Non-Equilibrium long period tide height	FES 2014 B	x	x
For Pole tide, 2017 recommandation for mean pole location				
POLE_TIDE_HEIGHT.MODEL.DESAI_2015	Pole tide height	DESAI 2015	x	x
POLE_TIDE_HEIGHT.MODEL.WAHR_85	Pole tide height	WAHR 1985	x	x

Field name in the table	Definition	Model	1Hz	20Hz
DRY_TROPOSPHERIC_CORRECTION.MODEL.ERA_INTERIM	Dry tropospheric correction	ERA Interim	x	x
BF_FLUCTUATIONS_CORRECTION.MODEL.ERA_INTERIM	Low frequency fluctuations correction		x	x
WET_TROPOSPHERIC_CORRECTION.MODEL.ERA_INTERIM	Wet tropospheric correction		x	x
HF_FLUCTUATIONS_CORRECTION.MODEL.ERA_INTERIM	High frequency fluctuations correction		x	x
IONOSPHERIC_CORRECTION.MODEL.GIM	Ionospheric correction	GIM	x	x
IONOSPHERIC_CORRECTION.MODEL.NIC		NIC	x	x

Conclusions

- Confirmation of the very good stability of the instrumental features of Poseidon-1 (< 4mm over 7 years; accounted for in the reprocessing)
- Even if the waveforms are short (60 points), the MLE4 retracker provides good results except for waves greater than 8 m. MLE3 and MLE4 output will be delivered in the products as for Jason products
- Some parameters are missing for recomputing the sigma0 and thus the SSB (original sigma0 can be used)
- All the dataset has been reprocessed. Products will be available soon in 2019.
- Using the Poseidon-1 GMSL record to correct TOPEX-A drift can be envisaged due to the very good stability of Poseidon-1 and the good sampling of the series.

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