Here, we analyse the skill of the original high-rate altimetry data, relative to conventional 1-Hz data, to recover coastal sea level variations in the test case of the Northwestern Mediterranean Sea. Performance will be quantified through a comparison with different tide gauge sea level time series (more details in Birol et al. 2012). The Northwestern Mediterranean Sea is an interesting case study because of the complex nature of its flow (short spatial and temporal wavelengths). Appropriate data (re)processing and analysis allow the optimisation of the number of informations which can be derived from altimeter measurements. This is particularly true in the coastal zone where data are largely discarded due to problems with the altimeter radar echoes or to inaccurate corrections, but also because the standard processing is not tuned for ocean marginal regions. This results in a relatively large (10-40 km data gap) next to the coast in standard altimetric products. Even if this remains a very challenging exercise, several scientific groups work on extending satellite altimetric products into the shelf and coastal seas (COASTALT, PISTACH, CTOH, …), by means of appropriate corrections and data (re)processing. This enhances data availability and accuracy close to land and then allows a better observation of the coastal oceans. Here, the potential of full rate measurements will be analysed in the context of coastal studies in the Northwestern Mediterranean Sea.

**Context and data processing**

**Figure 1.** Distribution of selected T/P and Jason-1,2 tracks. The 200-m and 1000-m isolines are shown from ETOP02v2 Digital Elevation Models indicate the locations of tide gauge stations (from SONEl data base). Blue dashed arrows give a schematic view of the Ligurian Provençal Current (LPC).

**Figure 2.** Time-space diagrams of 1-Hz track, 20-Hz SLA (bottom), along track 146 for Jason-1 (first three years of data). The nearshore front of the 1-Hz data at 13 km is marked by the dotted black line on all plots.

**Figure 3:** Average correlation deduced from the comparison between all 10/20Hz data wrt 1Hz data. (1) Roblou et al., 2011. Coastal Altimetry, Springer Berlin Heidelberg

**Table 1:** Time period, closest satellite track and approximate distance from the closest along-track T/P-Jason1,2 altimeter location for each tide gauge station.

<table>
<thead>
<tr>
<th>Time period</th>
<th>Satellite mission</th>
<th>d = 30 km</th>
<th>d = 50 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/01/1992</td>
<td>Jason-1</td>
<td>57.99%</td>
<td>60.59%</td>
</tr>
<tr>
<td>10/20Hz</td>
<td></td>
<td>81.83%</td>
<td>86.38%</td>
</tr>
</tbody>
</table>

**Table 2:** Availability of the high rate SLA wrt 1Hz SLA (table 2): • for distance >30km from land: significant improvement for Jason-1,2 (>10%); slightly less for T/P; • for distance between 35 and 50 km: small increase for all missions; • for distance >50km from land: no significant difference between 1Hz and HF datasets (except for Jason-2, 5%, still under study)

**Figure 4:** Correlation coefficients between Jason-1 and tide gauge SLA as a function of distance to the French coast, using both the 20-Hz (red) and the 1-Hz (black) SLA, and for tracks 146 (a), 187 (b), 222 (c) and 9 (d). The thin dashed curves correspond to raw SLA and the thick curves correspond to low-pass filtered SLA, using a 30-km cut-off frequency.

**Figure 5:** Climatology of cross-track geostrophic current anomalies derived from 1-Hz (black arrows) and from 20-Hz (grey arrows) Jason-1 SLA for the winter season December-January. The currents are superimposed on a map of the corresponding winter SST climatology (derived from AVHRR observations). The 200-m and 2000-m isolines are also shown (black lines).

**Application to the regional coastal circulation**

In order to verify the good representation of the LPC in the altimeter data, we have compared the out-of-season winter time PCF fields with geostrophic velocity anomaly derived from altimetry.

**Figure 6:** SST climatology based on weekly SST composites (obtained from the DLR Earth Observation Information Service, http://www.dlr.de/DB, covering the period 2002-2007)

**Figure 7:** Very encouraging results but more investigations needed using in situ observations in order to optimize the processing

**Figure 8:** Expertise support for CNES PISTACH project

**References**

(1) Roblou et al., 2011. Coastal Altimetry, Springer Berlin Heidelberg

(2) Birol et al., 2012. Evaluation of high rate (10/20Hz) altimeter data: a case study of the northwestern Mediterranean Sea (submitted)

**Distributed products**

- raw 10Hz (T/P) and 20Hz (Jason-1, 2) available in 3 regions
- raw 1Hz (T/P) and 20Hz (Jason-1, 2) available in 3 regions
- Details on corrections applied, data processing ...
- Access to some regional diagnostics: maps of rms, percentage of data available, minimum and maximum values.

**Data request mailto: ctoh_products@legos.obs-mip.fr**