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Estimating Relative and Absolute Sea Level Rise at Ny-Ålesundwith satellite altimetry and in-situ observations

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Consistent and long-term satellite-based data-sets to study climate-scale variations of sea level globally and in the coastal zone are available nowadays. Two altimetry data-sets were recently produced: the first one is generated by the European Space Agency's (ESA) Sea Level Climate Change Initiative (SL_CCI) over a grid of 0.25 x 0.25 degrees, merging and homogenizing the various available satellite altimetry missions. The second one is a climate-oriented altimeter sea level product that started in the framework of the European Copernicus Climate Change Service (C3S), and is now released as daily-means over a grid of 0.25 x 0.25 degrees, covering the global ocean since 1993 to present. Both reach in the Arctic the latitude of 81.5 N degrees. Therefore, these new altimetry products cover the coastal area surrounding Ny-Ålesund (Svalbard Islands, Norway), where a tide gauge station is active since 1976. Near the Svalbard coasts also the along track surface elevations of the CryoSat-2 mission are made available through the European Space Agency's Grid Processing on Demand (G-POD) for Earth Observation Applications facility.

In this study, we compare sea level measurements from the Ny-Ålesund tide gauge with the climate-oriented altimeter sea level gridded products (SL_CCI and C3S) and with the along track data from the only CryoSat-2 mission. This study has three objectives: 1) to assess the performances of the gridded data moving from offshore to near coasts; 2) to explore how the synergy with along track high resolution CryoSat-2 data might help to detail the sea ice impact on the observation of relative and absolute sea level rise around Svalbard; 3) to verify if the differences between satellite altimetry and tide gauges can be used as a proxy of vertical ground movement in the study area by adopting the approaches elaborated in Vignudelli et al. [2018] and De Biasio et al. [2020] that can be validated with ground vertical displacements estimated using Global Positioning System (GPS) data from the stations close to Ny-Ålesund.

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