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Receiver and Algorithms for Near Real-Time Sea Surface Slopes Statistics from High Altitude GNSS Reflections

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The Global Navigation Satellite Systems (GNSS), about to be enhanced with the European Galileo constellation, represents a rich source of signals of opportunity for the Earth surface monitoring. A receiver over flying the Ocean, for instance, may currently pick the signals of up to 12 Global Positioning System (GPS) satellites simultaneously, covering a wide area in a single track. This budget will be easily doubled when the coming Galileo system is operational.

During the last decade several studies and experiments have been conducted in order to assess the performance of the GNSS-Reflected (GNSS-R) signals acting as passive bi-static ocean altimeters and scatterometers. The geophysical content of such signals lays in a range of possible parameters, allowing multiple retrieval algorithms. Because of this multiple dependence, the complexity of the GNSS bi-static geometry, together with the non-linearity and the numerical nature of the bi-static radar models, the inversion of the GNSS-R signals usually becomes a costful process in terms of computing effort, hindering so far real time applications at high altitude.

The Institute for Space Studies of Catalonia (IEEC) has developed a hardware open loop GPS receiver especially dedicated to gather reflected signals at high delay sampling rate in real-time. Moreover, we have developed a simple algorithm to retrieve the sea surface slopes statistics in near real time. This oceanographic product provides the sea surface roughness sensitive at L-band, which besides scientific and operational applications, it is nowadays interesting to complement the Ocean Salinity experiment on board the SMOS mission (L-band interferometric radiometry). The instrument, the near real-time algorithm, and the results of a testing campaign are here presented, and the oceanographic products validated.