Improving the emissivity model of rough water with GNSS-reflectometry: correlation of L-band radiometric measurements with GPS-R data.

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Remote sensing of sea surface salinity (SSS) is quite a challenging task. Variations of salinity in oceans are very little, but even minor changes influence the global circulation of water, thus the environment and climate. Those variations are therefore to be monitored with the highest sensitivity as possible, and they are measured by means of radiometry. Unfortunately, the thermal radiation that is emitted by the sea, and from the measurement of which salinity can be estimated, does not dramatically change with SSS gradients, hence the difficulty to map the global salinity distribution with high accuracy. What's more is the roughness of the sea: increasing roughness leads to additional thermal radiation from the sea, but in a way that is not known and not properly accounted for. As a result, the theory used to model the emissivity of water needs empirical corrections, which can be made by investigating in which manner, and to which extent, the emission of the sea changes with geophysical parameters that characterize this roughness. Those parameters are brought by studying how the signals of the Global Navigation Satellite System (GNSS) change when they are reflected at the surface.

We investigate the possible correlation of radiometric measurements with several GPS-R observables. The data considered were obtained from two different airborne campaigns, for which the instrumentation onboard was however the same (same radiometer and same GPS-R reflectometer). When correlation is observed, results show that the emission of the sea that is due to the surface roughness is always a linear function of this roughness. This observation was made for four GPS-R observables. Among those observables, one is computed from the combination of GOLD-RTR measurements with a statistical description of the sea waves: the Mean Squared Slope (MSS), and it turns out that correlation with radiometric measurements is clearest with this parameter.