Geophysical Research Abstracts
Vol. 20, EGU2018-16728-1, 2018
EGU General Assembly 2018

Comparative study on uncertainty analyses for process-based models and infused remote sensing data products*

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With the advancement in capabilities and commonality of remote sensing and increasing demand from modeling applications for data, there is a growing desire to increase the synergies between these two realms. Models and mapping exercises can make great use of the large quantities of data being generated by programs such as COPERNICUS, which provides publicly available data sets of remote sensing images. Each individual product contains a unique valuation of error resulting from the method of measurement and application of pre-processing techniques. However, these valuations are not always comprehensive or detailed enough to fully capture the variability or limitations of the data. Uncertainty and errors are further compounded when the data provided is further altered through scaling or aggregation in order to conform to the needs of models. Additionally, the variability in temporal and spatial resolution in this data, further complicated through the introduction of gaps due to sensor limitations, makes the utilization and uptake of this information quite complex. Additionally in order to utilize data products the model uncertainties must also be ascribed in order to quantify the relational weighting ascribed to each in order to best blend the two elements together. Therefore, through this study an array of uncertainty quantification and subsequent methods of data product blending are executed and compared against the original information, in-situ measurements, and the various blended product outputs in order to determine the influence and optimal assessment strategy for ecologically relevant variables in Dutch coastal waters. Both qualitative and quantitative measures are taken including Bayesian statistical modelling, Monte Carlo simulations, assessments of spurious error propagation, and the introduction or correlated and background noise within raw data acquisition. The resulting analysis focuses both on the coastal shores of The Netherlands, with emphasis placed on the highly dynamic water of the Wadden Sea.

*This work has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641762