Error Decomposition and Estimation of Inherent Optical Properties: Application to Sentinel-3

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We describe a methodology to quantify and separate the errors of inherent optical properties (IOPs) derived from MERIS. The total error is decomposed into three different sources,
namely, model approximations and inversion, sensor noise, and atmospheric correction. Prior information on plausible ranges of observation, sensor noise, and inversion goodness-of-fit are employed to derive the posterior probability distribution of the IOPs. The relative contribution of each error component to the total error budget of the IOPs, all being of stochastic nature, is then quantified. The method is validated with model simulations and MERIS match up data. The derived errors are close to the known values with correlation coefficients of 60-90% for simulated data. Model- induced errors inherent to the derived IOPs are between 10% and 57% of the total error, whereas atmospheric-induced errors are in general above 43% and up to 90%. Sensor-specific error tables are constructed for MERIS and Sentinle-3 data. The later table serves as a benchmark to evaluate the performance of the Sentinle-3 processing chain. Our method is generic and can be applied to quantify the error of derived biogeophysical parameter.