Wednesday, October 10
Poster Session 3
16:00–18:00

Poster 35

USE OF CRAMER-RAO BOUNDS APPROACH TO PREDICT THE MINIMUM UNCERTAINTIES IN THE INVERSION OF OCEAN COLOR OPTICAL PROPERTIES

An analytical approach based on Cramer-Rao Bounds (CRBs) is proposed to investigate the uncertainties in ocean color optical properties. Based on given bio-optical and noise probabilistic models, CRBs can be computed efficiently for any set of ocean color parameters and any sensor configuration, directly providing the minimum estimation variance that can be possibly attained by any unbiased estimator of any targeted parameter. Here, CRBs are explicitly developed using (1) water reflectance models corresponding to deep and shallow waters, resp., and (2) probabilistic models describing the environmental noises observed within ocean color satellite sensors, namely Sentinel-2 MSI, HICO, Sentinel-3 OLCI and MODIS sensors. For both deep and shallow waters, CRBs are shown to be consistent with the experimental estimation variances obtained using published remote-sensing methods, while not requiring one to perform any inversion. CRBs are also used to investigate to what extent perfect a priori knowledge on one or several geophysical parameters can improve the estimation of remaining unknown parameters. It is shown that pre-existing knowledge of bathymetry (e.g., derived from LiDAR) within the inversion helps to greatly improve the retrieval of bottom cover for shallow waters. Finally, CRBs are shown to provide valuable information on the best estimation performances that may be achieved with the MSI, HICO, OLCI and MODIS configurations for a variety of oceanic, coastal and inland waters. CRBs are thus demonstrated to be an informative and efficient tool to characterize minimum uncertainties in inverted ocean color geophysical parameters.

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