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Use of remotely-sensed observations and a data assimilating marine biogeochemical model to determine water quality on the Great Barrier Reef.

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The health of the Great Barrier Reef is presently assessed using the water column concentration of chlorophyll and suspended solids, and measured light penetration. Quantifying these water column properties over 2,000 km of often cloud-covered, sparsely sampled, and highly variable coastal waters is problematic. To provide the best estimate of water quality, we assimilating satellite remote-sensing reflectance (the ratio of water-leaving radiance versus water-entering irradiance) using an in-water optical model to produce an equivalent simulated remote-sensing reflectance, and calculate the mis-match between the observed and simulated quantities to constrain a complex biogeochemical model (eReefs) with a Deterministic Ensemble Kalman Filter (DEnKF). We compare the water quality properties of the data assimilating model with in-situ observations, as well as with withheld remote-sensed observations. As a final step, we consider whether withheld observations can be combined with the data-assimilation generated chlorophyll fields to provide the best estimate of the chlorophyll concentration given all the available information.