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Retrieval of radiatively consistent Sea Surface Temperature under clear and aerosol-loaded conditions using an optimal estimation scheme across the visible and infrared.

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Aerosol types and quantity can vary significantly over the ocean. Depending on the type and amount of aerosol, if undetected, the retrievals of sea surface temperature (SST) can be significantly biased. In this study we present retrievals of SST from the Advanced Along Track Scanning Radiometer (AATSR) using the Optimal Retrieval of Aerosol and Cloud (ORAC) algorithm under clear and aerosol loaded conditions. Importantly, ORAC retrieves surface and atmospheric parameters simultaneously using the visible, short-wave infrared and thermal infrared information. The SST retrieved has been validated using a global set of measurements of bulk SSTs from drifting buoys under cloud-free skies, with typical background aerosol loadings that have a mean optical depth of 0.08. The median SST bias is less than 0.1 K, the level required for climate studies. We also demonstrate that ORAC is able to retrieve the SST under dust by performing retrievals of drifting buoy matchups and AATSR images affected by dust off the Western Sahara.