

EGU2020-6018

<https://doi.org/10.5194/egusphere-egu2020-6018>

EGU General Assembly 2020

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Developing Best Practices for Observing Global Surface Shortwave and Longwave Radiation across the Land and Ocean

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In-situ shortwave or solar radiation and longwave or thermal radiation are observed at the earth's surface on both the land and the ocean. In addition, satellites are used to develop fields of surface radiation balance. Planning for the Global Ocean Observing System (GOOS) and the Global Climate Observing System (GCOS) has identified surface heat flux, including the radiative fluxes, as an Essential Ocean Variable (EOV) and Essential Climate Variable (ECV), respectively. The GOOS and GCOS requirements for surface radiative fluxes (spatial and temporal sampling, accuracies) are summarized here. Surface radiation sites will continue to be sparse in the future, especially in the ocean; and satellite-derived products developed in concert with in-situ observing system will be important. To make better progress towards meeting those requirements, we propose the goal of establishing dialog across the different methods of in-situ observing surface radiation and with the remote sensing community. Objectives of the effort would include sharing knowledge and experience of how to make the observations, documentation of calibration methods, and assessment of the uncertainties to be associated with the different observing methods. The resulting metadata and quantitative understanding of the different approaches would support improved combination of surface radiation observations across land and sea into homogeneous products at global scale. At the same time, improved in-situ sampling would help assess and validate climate models and contribute to our understanding of the earth's energy balance. We review here the different observing methods now in use on land and at sea and discuss the challenges faced in making the observations. We also propose future field inter-comparison and standardization of calibration methods to better establish the accuracy and comparability of surface radiation observations on land and at sea.