Geophysical Research Abstracts
Vol. 21, EGU2019-4467-1, 2019
EGU General Assembly 2019

The Polar Radiant Energy in the Far InfraRed Experiment (PREFIRE): A Far Infrared Mission to Improve Estimates of the Polar Energy Budgets

Tristan L'Ecuyer

University of Wisconsin, Madison, Atmospheric and Oceanic Sciences, Madison, United States (tristan@aos.wisc.edu)

Considerable uncertainty remains in predicted rates of Arctic warming, sea ice decline, and ice sheet melt associated with global warming. This may be attributed, at least in part, to a lack of observational constraints on energy exchanges between the atmosphere, surface, and space stemming from the challenges of making sustained, high quality atmospheric measurements in the inhospitable polar regions. This observing gap is also evident in large uncertainties in Arctic and Antarctic energy budget reconstructions derived from reanalyses as well as their sensitivity to rapidly changing ice extent. These uncertainties, in turn, have substantial implications for predicting changes in surface cover, precipitation, ice sheet dynamics, and surface mass balance. With nearly 60% of thermal emission in polar regions residing at wavelengths longer than 15 microns, spectrally-resolved measurements in the far infrared have the potential to isolate the signatures of the factors that influence polar surface emission and the atmospheric greenhouse effect more clearly than ever before. The Polar Radiant Energy in the Far Infrared Experiment (PREFIRE) aims to document spectrally-resolved fluxes between 5 and 50 microns, opening up the far infrared for studying the spatial and temporal variations of thermal energy exchanges and the factors that drive them throughout the polar regions. When integrated into predictive models, estimates of spectral surface emissivity and the atmospheric greenhouse effect derived from these measurements offer the potential to dramatically reduce uncertainty in polar climate prediction.