Session: B9 Oral presentation

Decadal changes in surface radiative fluxes - overview and update

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Surface radiative fluxes are major determinants of the climates of our environments and govern a wide variety of climate-relevant surface processes. Variations in these fluxes have therefore the potential to play a key role in discussions of climate and environmental change. There is increasing observational evidence that surface radiative fluxes indeed undergo significant changes on decadal timescales, not only in their thermal components as expected from the increasing greenhouse effect, but also in the amount of solar radiation that reaches the Earth surface. This presentation provides an overview and update on our current knowledge in terms of changes in both solar and thermal components. It includes updated information from the high accuracy records provided by the Baseline Surface Radiation Network (BSRN), the surface radiation (SURFRAD) network and the Atmospheric Radiation Measurement (ARM) Program, from the long term radiation records contained in the Global Energy Balance Archive (GEBA) and the World Radiation Data Center (WRDC) archives, as well as from related measurements, such as sunshine duration and diurnal temperature range. These indirect indicators allow an extension of the information on solar radiation changes both spatially and temporally. With respect to the surface solar radiation, a focus will be on the developments since 2000 at globally distributed sites, and on information from indirect sources on decadal changes in remote regions with sparse direct observations. The thermal records will be used to investigate to what extent updated BSRN records allow the detection of the enhanced greenhouse effect from the surface. Climate models are often not capable of adequately reproducing the decadal changes in these quantities (e.g., Wild 2009 JGR, Wild and Schmucki 2011 Clim. Dyn. online). We use a comprehensive global climate modeling system with sophisticated aerosol and cloud microphysics treatment (ECHAM-HAM) to investigate its capability to reproduce and explain some of these observed changes (Folini and Wild, submitted).