



Relevance of decadal variations in surface radiative fluxes for climate change

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Recent evidence suggests that radiative fluxes incident at the Earth surface are not stable over time but undergo significant changes on decadal timescales. This is not only found in the thermal spectral range, where an increase in the downwelling flux is expected due to the increasing greenhouse effect, but also in the solar spectral range. Observations suggest that surface solar radiation, after decades of decline („global dimming“), reversed into a “brightening“ since the mid- 1980s at widespread locations (Wild et al. 2005).

This presentation reviews potential impacts of the variations in surface radiative fluxes on different aspects of the climate system and climate change. Discussed are specifically the evidence for effects of the radiative changes on different temperature indices, such as mean, maximum, minimum temperature and related diurnal temperature range, as well as asymmetries in the hemispheric warming rates (Wild 2009a, 2012). Climate models do not reproduce the decadal variations in these indices to the full extend, suggesting that the models do not properly include solar dimming and brightening (Wild 2009b, 2012). Further addressed are the potential impacts of dimming and brightening on the intensity of the hydrological cycle as well as glacier melt and the terrestrial carbon uptake, as a result of a modification of the diffuse fraction under dimming and brightening conditions (Mercado et al. 2009, Wild 2009a).

Selected references:

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