Geophysical Research Abstracts
Vol. 18, EGU2016-13542, 2016
EGU General Assembly 2016

CLaMS-Ice: Large-scale cirrus cloud simulations in comparison with observations

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Cirrus clouds are an element of uncertainty in the climate system and have received increasing attention since the last IPCC reports. The interactions of different freezing mechanisms, sedimentation rates, updraft velocity fluctuations and other factors that determine the formation and evolution of those clouds is still not fully understood. Thus, a reliable representation of cirrus clouds in models representing real atmospheric conditions is still a challenging task.

At last year's EGU, Rolf et al. (2015) introduced the new large-scale microphysical cirrus cloud model CLaMS-Ice: based on trajectories calculated with CLaMS (McKenna et al., 2002 and Konopka et al. 2007), it simulates the development of cirrus clouds relying on the cirrus bulk model by Spichtinger and Gierens (2009). The qualitative agreement between CLaMS-Ice simulations and observations could be demonstrated at that time. Now we present a detailed quantitative comparison between standard ECMWF products, CLaMS-Ice simulations, and in-situ measurements obtained during the ML-Cirrus campaign 2014. We discuss the agreement of the parameters temperature (observational data: BAHAMAS), relative humidity (SHARC), cloud occurrence, cloud particle concentration, ice water content and cloud particle radii (all NIXE-CAPS).

Due to the precise trajectories based on ECMWF wind and temperature fields, CLaMS-Ice represents the cirrus cloud vertical and horizontal coverage more accurately than the ECMWF ice water content (IWC) fields. We demonstrate how CLaMS-Ice can be used to evaluate different input settings (e.g. amount of ice nuclei, freezing thresholds, sedimentation settings) that lead to cirrus clouds with the microphysical properties observed during ML-Cirrus (2014).