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Impact of a new albedo scheme on Arctic sea ice within the general circulation model ECHO-G

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Recent observations document a thinning of Arctic sea ice and a reduction in its extend during the last two decades. Additionally latest results of climate change scenario simulations with AOGCMs indicate a pronounced decreasing summer sea ice extend in the Artic during the 21^{st} century. An appropriate description of sea ice thickness and coverage in AOGCMs plays a key role in modelling latent and sensible heat fluxes over the Arctic Ocean.

To study the impact of a more sophisticated description of Arctic sea ice albedo and snow albedo over land a new albedo scheme was implemented into the coupled atmosphere ocean general circulation model ECHO-G. Control runs covering more than 100 years were performed.

The changed snow scheme results in a higher albedo over snow covered areas which yields to an increase in late spring snow coverage on the northern hemisphere and to a significant annual mean near surface temperature decrease over northern North America and northern Siberia.

The new sea ice albedo scheme takes into account the effect of melt ponds. However, the new scheme absorbs less solar radiation in May and June than the original scheme. This leads to an increased Artic sea ice extend in summer and autumn compared to the old version going along with an increased albedo over the Arctic Ocean from May to October and a decreased 2m air temperature, especially in autumn. Despite the decrease of the annual 2m air temperature accompanying by an increase in Arctic sea ice mass no changes in maximum wintertime Arctic sea ice extend take place.

As a main result, compared to observations the model using the new scheme performs

better in simulating the annual cycle of Arctic sea ice extend including minimum and maximum extend.