Arctic Amplification Feedback Analysis in CMIP5 Models: Land Surfaces, Arctic Ocean and Seasonality

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The Arctic region is the region where surface warming associated with atmospheric green-house gas concentration increase is expected to be the greatest. This particularity is already being observed currently and is also simulated by climate models. Feedback mechanisms associated with this particularly strong warming, or Artic Amplification, are multiple. The relative role of the different feedbacks are not easy to evaluate precisely using direct model outputs. In this study, we use the "radiative kernels" method (Soden et al, 2008) to perform a multi-model intercomparison analysis. The radiative decomposition is performed at the surface instead of the top of atmosphere in order to consider surface temperature changes specifically. The kernels are derived from the MIROC3.2 model. The intercomparison includes 32 CMIP5 coupled models, whose outputs are analyzed for changes from the late 20th to the late 21st centuries following the rcp4.5 scenario. We consider results separately for land and oceanic surfaces, as the mechanisms and orders of magnitude differ substantially for these two types of surface. We also consider seasons separately as we show that seasonality in the feedback processes is determinant.

References

Soden, B. J., I. M. Held, R. Colman, K. M. Shell, J. T. Kiel, and C. A. Shields Quantifying climate feedbacks using radiative kernels *Journal of Climate*, **21**, 3504–3520, 2008