Project title: PAMIP: Polar Amplification Model Intercomparison Project
Project lead: Tido Semmler (AWI)
Collaborator: Dr. Daniela Matei (MPI)
Allocation period: 01.01.2019 – 31.12.2019

Motivation and description of the planned simulations

In recent years a multitude of studies regarding the influence of reduced Arctic sea ice on mid-latitude climate and weather has been sparked by the strong Arctic sea ice decline in the past 30 years. Different methods and different model set-ups have been used to tackle the question if the observed rapid sea ice decline may have an important impact on the climate of the mid-latitudes.

The need for coordinated model experiments has been acknowledged by Cohen et al. (2018). As a result the Polar Amplification Model Intercomparison Project (Smith et al., 2018) has been initiated, designed, and endorsed by CMIP6. The scope has been widened and is now not only restricted on Arctic sea ice but has been extended to both poles and also to other components than the sea ice such as the sea surface temperature. At MPI and AWI we are making strong contributions to CMIP6 consisting of the mandatory DECK simulations but also encompassing ScenarioMIP, HighResMIP, OMIP, PMIP, SIMIP, CORDEX, DCPP, and others. The DECK simulations which already have been completed show a very promising performance compared to CMIP5 models and measured by an objective performance metrics. Since we have a track record of research regarding Arctic – mid-latitude linkages (Semmler et al., 2012; Jung et al., 2014; Semmler et al., 2016a; Semmler et al., 2016b; Semmler et al., 2017; Ye et al., 2018; Manzini et al., 2018) and since we have actively shaped the design of the PAMIP protocol, it is imperative that we deliver a good and timely contribution to PAMIP.

In PAMIP there are uncoupled atmosphere-only simulations and coupled atmosphere-ocean-sea ice simulations. In the first stage we plan to carry out the uncoupled atmosphere-only simulations, most of them both in ECHAM LR configuration (T63) and ECHAM HR configuration (T127) to be able to study the resolution dependency of our results.

References

Cohen, J., X. Zhang, J. Francis, T. Jung, R. Kwok, J. Overland, P. C. Taylor, S. Lee, F. Laliberte, S. Feldstein, W. Maslowski, G. Henderson, J. Stroeve, D. Coumou, D. Handorf, T. Semmler, T. Ballinger, M. Hell, M. Kretschmer, S. Vavrus, M. Wang, S. Wang, Y. Wu, T. Vihma, U. Bhatt, M. Ionita, H. Linderholm, I. Rigor, C. Rouston, D. Singh, M. Wendisch, D. Smith, J. Screen, J. Yoon, Y. Peings, H. Chen, and R. Blackport (2018): Arctic change and possible influence on mid-latitude climate and weather. US CLIVAR Report 2018-1, 41pp, doi: 10.5065/D6TH8KGW

Jung, T., M. A. Kasper, T. Semmler, and S. Serrar (2014): Arctic influence on subseasonal midlatitude prediction. Geophysical Research Letters, doi: 10.1002/2014GL059961

Manzini, E., Karpechko, A. Y., & Kornblueh, L. (2018). Nonlinear response of the stratosphere and the North Atlantic-European climate to global warming. Geophysical Research Letters, 45. Doi: doi.org/10.1029/ 2018GL077826.

Semmler, T., R. McGrath, and S. Wang (2012): The impact of Arctic sea ice on the Arctic energy budget

and on the climate of the Northern mid-latitudes. Climate Dynamics, doi: 10.1007/s00382-012-1353-9

Semmler, T., T. Jung, and S. Serrar (2016a): Fast atmospheric response to a sudden thinning of Arctic sea ice. Climate Dynamics, doi: 10.1007/s00382-015-2629-7

Semmler, T., L. Stulic, T. Jung, N. Tilinina, C. Campos, S. Gulev, and D. Koracin (2016b): Seasonal atmospheric responses to reduced Arctic sea ice in an ensemble of coupled model simulations. Journal of Climate, 10.1175/JCLI-D-15-0586.1

Smith, D. M., J. A. Screen, C. Deser, J. Cohen, J. C. Fyfe, J. Garcia-Serrano, T. Jung, V. Kattsov, D. Matei, R. Msadek, Y. Peings, M. Sigmond, J. Ukita, J.-H. Yoon, and X. Zhang (2018): The Polar Amplification Model Intercomparison Project (PAMIP) contribution to CMIP6: investigating the causes and consequences of polar amplification. Geoscientific Model Development Discussions, doi: 10.5194/gmd-2018-82

Ye, K., T. Jung, and T. Semmler (2018): The influences of the Arctic troposphere on the midlatitude climate variability and the recent Eurasian cooling. Journal of Geophysical Research, doi: 10.1029/2018JD028980