Anmeldung eines Themas für ein/e

Forschungsseminar ☐
Methodenseminar ☐
Masterarbeit ☐ (bitte eines oder mehrere ankreuzen)

Thema Datum	**Representation of polar vortex characteristics in climate models and their climate change**
Betreuer (mit Kontaktdaten)	Prof. Christoph Jacobi
ggf. weitere Kontaktperson	Dr. Ales Kuchar (ales.kuchar@uni-leipzig.de) Prof. Christoph Jacobi (jacobi@rz.uni-leipzig.de)
Zweitgutachter	Dr. Ales Kuchar
Kurzbeschreibung:	The intense westerly winds form so-called polar vortex (PV) in the wintertime stratosphere. A considerable amount of both observational and modeling studies have shown that a weakening of PV is connected with an equatorward shift of the tropospheric jet and the tracks of surface cyclones (Kidston et al, 2015). While recent observations reveal weakening and equatorward shift trends of the polar vortex, the climate models do not agree on the sign of change of the PV strength (Manzini et al, 2014; Seviour et al, 2017). Therefore, this uncertainty influences the uncertainties regarding future tropospheric circulation. e.g. windiness in Europe and Mediterranean precipitation (Zappa and Shephard, 2017). The thesis aims to analyze changes in stratospheric PV location and strength in ensembles of recent climate simulation frameworks such as the Coupled Model Intercomparison Project phase 5 and 6 or the International Global Atmospheric Chemisty/Stratosphere-troposphere Processes And their Role in Climate Chemistry-Climate Model Initiative. In contrast to Ayarzagüena et al (2019) who found no robust evidence of future changes over the 21st century using zonally averaged PV characteristics, the thesis methodology will use two-dimensional PV characteristics. It will follow Seviour et al (2013) so that the moment diagnostics such as the centroid latitude (center of vortex) and aspect ratio (a measure for vortex stretching) will be analyzed.

Literatur:	Ayarzagüena, B., Polvani, L. M., Langematz, U., Akiyoshi, H., Bekki, S., Butchart, N., … Zeng, G. (2018). No robust evidence of future changes in major stratospheric sudden warmings: a multi-model assessment from CCMI. Atmospheric Chemistry and Physics, 18(15), 11277–11287. https://doi.org/10.5194/acp-18-11277-2018 Kidston, J., Scaife, A. A., Hardiman, S. C., Mitchell, D. M., Butchart, N., Baldwin, M. P., & Gray, L. J. (2015). Stratospheric influence on tropospheric jet streams, storm tracks and surface weather. Nature Geoscience, 8(6), 433–440. https://doi.org/10.1038/ngeo2424 Matsuno, T. (1970). Vertical Propagation of Stationary Planetary Waves in the Winter Northern Hemisphere. Journal of the Atmospheric Sciences, 27(6), 871–883. https://doi.org/10.1175/1520-0469(1970)027<0871:VPOSPW>2.0.CO;2 Seviour, W. J. M., Mitchell, D. M., & Gray, L. J. (2013). A practical method to identify displaced and split stratospheric polar vortex events. Geophysical Research Letters, 40(19), 5268–5273. https://doi.org/10.1002/grl.50927 Seviour, W. J. M. (2017). Weakening and shift of the Arctic stratospheric polar vortex: Internal variability or forced response? Geophysical Research Letters, 44(7), 3365–3373. https://doi.org/10.1002/2017GL073071 Zappa, G., & Shepherd, T. G. (2017). Storylines of Atmospheric Circulation Change for European Regional Climate Impact Assessment. Journal of Climate, 30(16), 6561–6577. https://doi.org/10.1175/JCLI-D-16-0807.1

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