EGU21-6594
https://doi.org/10.5194/egusphere-egu21-6594
EGU General Assembly 2021

Impact of latent and dry-static atmospheric energy transport on the Arctic sea ice variability

Marte G. Hofsteenge[1,2], Rune G. Graversen[2], and Johanne H. Rydsaa[2]
[1]Meteorology and Air Quality, Wageningen University & Research, Wageningen, Netherlands
[2]Institute for Physics and Technology, UIT, The Arctic University of Norway, Tromsø, Norway

Superimposed on a strong observed decline in Arctic sea ice extent there is large inter-annual variability. Recent research indicates that atmospheric temperature fluctuations are the main drivers for this variability. They can result both from local ocean heat release and from poleward atmospheric energy transport. Previous studies have emphasised a significant warming effect associated with latent energy transport into the Arctic region. In particular this is due to enhanced greenhouse effect associated with the convergence of the humidity transport over the Arctic. While previously some sea ice minima events have been linked to anomalous moist air convergence, a systematic study of this linkage between energy transport and sea ice variability was missing. Through a regression analysis we here investigate the coupling between transport anomalies of both latent and dry-static energy and sea ice anomalies. From the state-of-the-art ERA5 reanalysis product the latent and dry-static transport over the Arctic boundary (70°N) is calculated. The transport is then split into transport by planetary and synoptic-scale waves using a Fourier decomposition. Lagged regression analysis of sea ice concentration anomalies on the transport anomalies reveal the statistical linkage between the occurrence of sea ice anomalies after transport events. The results show that latent energy transport as compared to that of dry-static energy induces a much stronger decrease in sea ice concentration. One day after maximum of the latent transport event by planetary waves, sea-ice concentration shows a significant decrease lasting up to at least 45 days. In addition, the energy transport by planetary waves shows a greater effect on the sea ice concentration than transport by synoptic-scale waves. Hence, this study emphasizes the important impact of latent energy transport by planetary waves on the sea ice variability.