Contribution ID: **39** Type: **Oral**

Seasonal forecast sudden stratospheric warmings and associated winter temperature anomalies based on solar forcing and QBO

Monday 16 September 2024 14:30 (20 minutes)

The ground temperature variability in the Northern Hemisphere winter is greatly influenced by the state of the polar vortex. When the vortex collapses during sudden stratospheric warmings (SSWs), rapid changes in stratospheric circulations propagate downward to the troposphere in the subsequent weeks. The ground effect following SSWs is typically manifested as the negative phase of the North Atlantic Oscillation. Our findings reveal a higher frequency of cold temperature anomalies in the Northern part of Eurasia during winters with SSWs, and conversely, in winters with a strong and stable vortex. This behavior is particularly evident when temperature anomalies are categorized into three equal subgroups, or terciles. Recently, we developed a statistical model that successfully predicts SSW occurrences with an 86% accuracy rate. The model utilizes the stratospheric Quasi-Biennial Oscillation (QBO) phase and two parameters associated with solar activity: the geomagnetic aa-index as a proxy for energetic particle precipitations and solar irradiance. In this study, we explore the model's potential to provide a seasonal forecast for ground temperatures. We assessed the probabilities of regional temperature anomalies falling into the lowest or highest terciles based on the predicted weak or strong vortex state. Additionally, we demonstrate that the QBO phase further enhances the forecast's quality. As the model provides SSW predictions as early as preceding August, our results carry significant societal relevance as well, e.g., for the energy sector, which is highly dependent on prevailing weather conditions.

Solicited or Contributed

Contributed

Author list and affiliations

Presenting author

Timo Asikainen

Primary author: Mr VOKHMYANIN, Mikhail (University of Oulu)

Co-authors: Dr SALMINEN, Antti (University of Oulu); Prof. MURSULA, Kalevi; ASIKAINEN, Timo (University of Oulu)

Presenter: ASIKAINEN, Timo (University of Oulu)

Session Classification: Climate response / Earth Radiation Budget / S2S prediction

Track Classification: Climate response / Earth Radiation Budget / S2S prediction