Improving models simulating key climate patterns in the Northern Hemisphere

March 22 2023, by Li Yuan

The warm Arctic-cold Eurasia (WACE) climate pattern is the main feature of winter temperatures in the Northern Hemisphere in the last 20 years. Extreme cold events related to this pattern have occurred frequently there.

The ability of [climate](#) models to simulate WACE directly affects the skill in simulating winter temperature. Past studies have shown that previous generations of climate models were poor at simulating midlatitude atmospheric response to sea ice, making them simulate a weaker than observed WACE.

Now, scientists from the Institute of Atmospheric Physics of the Chinese Academy of Sciences, China Meteorological Administration and Nanjing University of Information Science and Technology have evaluated the ability of CMIP6 models (i.e., models participating in phase 6 of the Coupled Model Intercomparison Project) to simulate WACE and revealed the key factors influencing the differences in [simulation](#) capability.

The findings were published in *Advances in Atmospheric Sciences*.

Results showed that the CMIP6 multi-model ensemble mean was better able to simulate WACE, but there were still large gaps among individual models. Models with good ability in simulating climatic states and extremes of Eurasian winter temperatures also showed more skill in simulating WACE.

"The difference in the simulation of extremes was mainly reflected in the ability to simulate the warming anomalies in the Barents Sea-Kara

Sea (BKS) region," said Zhao Liang, co-author of the study.

Further analysis showed that the models' simulations of BKS warming anomalies were related to their reflection of the location and persistence of the Ural blocking (a large-scale anticyclone that occurs in the Ural Mountains region), which transmits heat northward to the BKS, thereby warming the Arctic, strengthening the downstream westerly trough, and cooling central Eurasia. Therefore, the simulation of the Ural blocking is the key to improving the capability of climate models in simulating WACE.

Provided by Chinese Academy of Sciences