Polar2MidLat: Polar-to-mid-latitude climate linkage effects on cold air outbreaks

Description

Cold air outbreaks are typical of the mid-latitude climate during the cold season. Their relevance relies on the threat to life caused by the long-lasting periods with abnormally low temperatures, the potential of damage to crops, and the occurrence of high-impact weather events such as heavy snow and low visibility during blizzards.

Previous studies have documented the linkages between climate variability at high latitudes and that at mid-latitudes, mainly through modulation of the storm tracks, jet streams and stationary waves, which promote blocking events. The role of other climate system components, like sea ice, is much less understood and remains an open question. This becomes even more challenging under the current conditions of fast sea ice reduction in the Arctic and the significant trends observed in sea ice around Antarctica, which leads to an increase in uncertainty in the sub-seasonal to interannual climate predictions as well as for climate projections for the coming decades. Furthermore, significant biases currently exist in the representation of sea ice in state-of-the-art climate model simulations.

The main objective of this proposal is to analyze the physical mechanisms linking variability at high latitudes (including that of sea ice) with climate variability at mid-latitudes. The special focus will be on the mechanisms promoting cold snaps at mid-latitudes and their variability. To this aim, this project will use a data set of very-high-resolution coupled global climate model simulations (at around 10 km), which is expected to bring significant improvements to the representation of sea ice and its linkages with other components of the climate system. The outcomes of this project are expected to become useful for decision-makers, stakeholders, and researchers working in the field of climate predictions and projections.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación