PROJECT TITLE

Arctic climate extremes: the role of interactions between atmospheric modes

PROJECT DESCRIPTION

During the past few decades the Arctic has experienced the greatest warming on Earth: the resultant sea ice loss, permafrost melting and snow cover changes have affected the regional hydrology, ecosystems and indigenous peoples. One of the primary drivers is changes in atmospheric circulation. A small number of studies have demonstrated that the interplay between some of the many different circulation patterns or modes that influence Arctic climate variability can markedly change both the magnitude and spatial extent of their impact. Thus, there is a clear need to fully understand the interactions between all these different atmospheric modes to better constrain projections of how the Arctic climate will evolve, and in particular climate extremes, which have the greatest impact on human and natural systems. This project will consist of statistical analyses of pre-existing meteorological observations, gridded reanalysis datasets and climate models. Model data will include output from historical and future Climate Model Intercomparison Project (CMIP) model runs used by the Intergovernmental Panel on Climate Change (IPCC). The student will employ a variety of statistical techniques, such as empirical orthogonal function (EOF) analysis and one-point correlation maps, to examine the spatial and temporal covariance within northern high latitude pressure fields. Subsequently they will use non-parametric statistics to analyse the relationship between the interplay among different combinations of atmospheric modes of variability and indices of Arctic temperature and precipitation extremes

JOB DESCRIPTION

You will aim to answer the question, “To what extent are atmospheric mode interactions responsible for recent and projected changes in Arctic climate extremes?” You will employ statistical analyses to evaluate the interplay between the different macroscale modes of atmospheric variability (teleconnections) that impact Arctic climate. Utilising an array of historical meteorological observations and gridded reanalysis data, you will define the ‘key’ mode interactions that have had the greatest impact on Arctic climate extremes. Subsequently, based on an ensemble of global climate models as utilised by the IPCC, you will compare the frequency of these 'key' mode interactions in historical and future model runs. You will determine (i) the extent to which projected changes in their frequency play a role in driving changes in future Arctic climate extremes and (ii) how this will vary under different emissions scenarios. If appropriate, you will be a co-author on and contribute to the writing of a short scientific paper for publication.

SUGGESTED LENGTH – 5 MONTHS

WHAT ARE WE LOOKING FOR?

We are looking for enthusiastic, self-reliant, and self-motivated candidates with a strong numerical background in mathematics, physics or the environmental sciences. Previous programming experience in one of Python, MatLab, IDL or similar computing environment would be advantageous