2. The atmospheric response to sea ice loss in simple models.

The atmosphere and Earth's climate are physical systems that undergraduate physics students can investigate while learning about weather and climate, fluid dynamics, numerical modelling, partial differential equations, and analysis of large datasets. For your NSERC USRA, why not use your physics toolkit to study issues related to climate variability and climate change in the EAPP group (https://www.physics.utoronto.ca/research/eapp) at the University of Toronto?

This project in the Kushner group (http://uoft.me/pjk) deals with polar climates and sea ice. Simplified models of the atmospheric circulation provide an idealized testbed of atmospheric dynamical mechanisms operating in the real world. In this project, we will carry out simulations of the three dimensional atmospheric circulation on the sphere to understand how atmospheric circulation anomalies generated by sea ice influence weather and extremes at lower latitudes. A key theoretical question of interest is whether there is a connection between externally forced patterns of climate response and those that appear spontaneously as modes of internal variability. If such a connection exists, as suggested by fluctuation-dissipation theory from statistical mechanics, it provides a potentially powerful constraint on expected responses to changes such as those induced by sea ice. Recent evidence suggests, however, that fluctuation-dissipation theory does not provide a strong constraint on climate responses. Sorting through this theoretical issue will be a key focus of this research project.