A central course in the Atmospheric Sciences and Meteorology and a required course for seeking professional development at NOAA, bridging the gaps between dynamic-thermodynamic theories and observations, and providing understandable knowledge and analysis skills that can be applied to weather, ocean, sea ice, ecosystem, environment, and natural hazard studies. The main questions to answer in this course include but are not limited to:

- How do cyclones/storms, fronts, anticyclones/high pressures, jet stream, and polar vortex form, develop, and move, as well as cause extreme weather events?
- How do the weather systems mentioned above impact underlying ocean, sea ice, and interactions between atmosphere, sea ice, and ocean, contributing to climate change?
- How do frequency of occurrence, intensity, and locations of the weather systems and associated extreme events change with time in a warming climate?

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\[
\left( \nabla^2 p + \frac{f_0^2}{\sigma} \frac{\partial^2}{\partial p^2} \right) \omega = \frac{2}{\tau} \nabla \cdot \bar{Q} - \frac{R}{\sigma P} \beta \frac{\partial T}{\partial x}
\]