

EAS 4802/8802: Linking Weather and Climate

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Prerequisites: None, but it would be helpful to have basic knowledge of weather processes and the climate system.

Course Goals: Problems of weather and climate were historically treated separately in the field of atmospheric sciences, despite the fact that the real system is a continuum. In recent decades, the need to understand linkages between short-term weather fluctuations and long-term climate variations has increased drastically since the characteristics (e.g., frequency and intensity) of severe and hazardous weather (e.g., tornadoes and hurricanes) are projected to change as the global warming continues. The goal of this seminar course is to introduce to participants past observations, existing theories, and ongoing modeling efforts related to this topic through extensive paper review and class discussion. The emphasis will be on interactions between synoptic-scale weather variability (periods of about 1 week) and climate variations of a season or longer.

Text Books: None.

Course Outline:

1. **Phenomena that link weather and climate:** blocking, atmospheric teleconnections, Pacific-North American Pattern (PNA), North Pacific Oscillation (NPO), North Atlantic Oscillation (NAO), Arctic Oscillation (AO) and Northern Annular Mode (NAM), Madden-Julian Oscillation (MJO), El Nino-Southern Oscillation (ENSO).
2. **Mechanisms that bridge the timescales of weather and climate:** dynamics of atmospheric low-frequency-variability (Rossby wave energy dispersion, instability of zonally varying mean flows, multiple-equilibria and flow regimes, forcing by synoptic-scale transient eddies), dynamics of stationary waves and storm tracks, extratropical response to tropical convective heating.
3. **Modeling and prediction:** statistical versus dynamical downscaling, regional climate model versus high-resolution global model, a case study (seasonal prediction and climate model projection of the North Atlantic hurricane activity).

Class Format:

1. Key papers will be reviewed by the instructor at the beginning of each chapter. This will be followed by short (15-minute) student presentations of papers selected by the instructor.
2. Each student is required to submit a written-review of one recently published paper on a topic covered by the course and selected by himself/herself. Review should be no less than three pages and not exceeding five pages (figures and tables included).
3. There will no exam and homework assignment.

Grading:

Class participation: 20%
Written paper review: 20%
Class presentation (a total of 3): 60%

A 90-100
B 80-89.99
C 70-79.99
D 60-69.99
E <60.