Extratropical Persistent Anomalies: Current Trends and Future Projections

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Extratropical persistent flow anomalies (PAs), a subset of which are known as “blocking” events, are often associated with high-impact weather. Flooding, wildfires, heat waves, droughts, and cold-air outbreaks can be associated with PAs. These events can take place throughout the annual cycle, therefore, methods for their objective identification must be effective in all seasons. Despite their importance to society, the question of how the frequency, intensity, and duration of PAs will respond to climate change remains an open question. This is due in part to the complexity of this multifaceted phenomenon. Previous work has proposed increases in blocking and PA activity due to Arctic amplification. We can also hypothesize that the subset of blocking events resulting from latent heat release would to increase in frequency and intensity with warming owing to larger vapor content. Other GCM-based studies have found decreases in the frequency of blocking in warmer climates, while several studies have identified serious deficiencies in GCM representation of blocking. How will PAs change in a warmer climate?

Here, we present a new PA index, extending the method of Dole and Gordon (1983) to increase versatility. We apply this index to a reanalysis dataset, seeking trends in PA activity. We next examine changes in PA characteristics between the present climate and projected end-of-century conditions using high-resolution time-slice simulations from the Model for Prediction Across Scales (MPAS). In the future MPAS simulations, the Arctic Ocean is nearly devoid of autumn sea ice, making these runs ideal for studying the influence of Arctic amplification on midlatitude PA activity. Finally, we use an idealized oceanic channel model to study bivariate sensitivity of PAs to domain-average temperature and to baroclinicity (jet strength).

Using the ERA Interim reanalysis, we identify only weak trends in both positive and negative PA activity, including both annual and seasonal values. Results from the MPAS and channel model experiments will be shared at the seminar, because we would not want the abstract to give away all of the punchlines!

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virtual seminar
https://www.ucar.edu/live?room=fl21022
Viewers may submit their questions throughout the presentation to:
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