

**M.S. Defense Announcement**  
**Ann Casey Hughes**  
**Tuesday, September 12, 2023, at 9:00 am**

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September 12, 2023  
9:00 am

Defense  
ATS Large Classroom (101 ATS) or via [Teams](#)

Post Defense Meeting  
Riehl Conference Room (211 ACRC)

Committee:  
David Randall (Adviser)  
James Hurrell  
Iuliana Oprea (Mathematics)

Diagnosing the Angular Momentum Fluxes that Drive the Quasi-Biennial Oscillation

The quasi-biennial oscillation (QBO) is one of the most amazing phenomena in the atmosphere. It is a descending pattern of alternating easterly and westerly equatorial stratospheric winds that is produced by the upward transport of momentum in multiple types of atmospheric waves. The discovery of the QBO and its role in the global circulation are discussed. The angular momentum budget of the QBO is analyzed using ERA-Interim isentropic analyses. We explain the benefits of isentropic coordinates and angular momentum as tools for analyzing atmospheric motion. We diagnose vertical motion utilizing continuity, allowing direct computation of the angular momentum fluxes due to vertical motion. The angular momentum fluxes due to unresolved convectively generated gravity waves are computed as a residual. These results are discussed with the goal of improving the representation of sub-grid scale motions in numerical models.