

ATS/CIRA Colloquium

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from NCAR

Hosted by Dave Randall

**3 p.m. Tuesday, October 10
ATS 101 (In-Person Only)**

**The Elusive Connection Between
the Quasi-Biennial Oscillation and the Madden-Julian
Oscillation**

The Madden-Julian Oscillation (MJO) is the dominant intraseasonal variability in the tropical troposphere with a robust eastward propagation. In the observations, MJO's amplitude and propagation are significantly modulated by the Quasi-Biennial Oscillation (QBO), an interannual variability in the tropical stratosphere. The MJO becomes stronger and is more likely to propagate across the Maritime Continent (MC) in the QBO easterly (QBOE) than in the QBO westerly (QBOW) December-January-February (DJF) season. However, none of the current climate models is capable of capturing the observed QBO-MJO connection as the physical mechanism behind it remains unclear.

In this presentation, I will start with some event-by-event diagnostics of the MJO propagation in the observations, which demonstrate the important role of the QBO in modulating MJO propagation. Then, I will present my recent work on how to capture the QBO-MJO connection in a MJO case hindcast experiment with the QBO signals added to the stratosphere through a nudging method and how the results indicate that the tropopause instability theory, one of the most popular hypotheses, is not sufficient to explain the captured QBO-MJO connection. The last part of this presentation will go through some preliminary results of my current research including why the simulated DJF MJO activity biases in CESM2 may hinder the capturing of the QBO-MJO connection in the uninitialized simulations as well as the QBO's influences on the atmospheric river activities around the globe which is partly related to the QBO-MJO connection.