M.S. Defense Announcement
Justin Hudson
Friday, March 11, at 10:00 a.m.

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March 11, 2022
10:00 a.m.

Defense
ATS West Seminar Room (121 ATS West) or Teams

Post Defense Meeting
ATS Main Conference Room (209 ATS)

Committee:
Eric Maloney (Adviser)
Kristen Rasmussen
Jeremy Rugenstein (Geosciences)

Surface Heat Fluxes and MJO Propagation Through the Maritime Continent

The 'barrier effect' of the Maritime Continent (MC) is a known hurdle in understanding the propagation of the Madden-Julian Oscillation (MJO). To understand the differing dynamics of MJO events that propagate versus stall over the MC, a new MJO tracking algorithm utilizing 30-96 day filtered NOAA Interpolated OLR anomalies is presented. Using this algorithm, MJO events can be identified, tracked, and described in terms of their propagation characteristics. Latent heat flux from CYGNSS and OAFLUX as well as CYGNSS surface winds are used to compare large-scale patterns for MJO events that do and do not propagate through the MC. Local area-averaged surface fluxes and OLR anomalies are 7-14% and 18-22% of the value of precipitation anomalies, respectively. While differences in these contributions do not change substantially for propagating versus terminating events, precipitation events that successfully propagate through the MC demonstrate surface flux anomalies that are stronger and more spatially-coherent. The spatial scale of precipitation events that propagate through the MC region is also larger than terminating events. It is also shown that large-scale enhancement of latent heat fluxes near and to the east of the Dateline accompanies MJO events that successfully propagate through the MC. This large-scale enhancement of latent heat fluxes to the east of the Dateline is equally driven by dynamic and thermodynamic effects. These findings are placed in the context of recent theoretical models of the MJO in which latent heat fluxes are important for propagation and destabilization. The tracking algorithm is also used to show for historical and greenhouse gas warming scenarios in CESM2 that MJO propagation speed increases and precipitation anomalies propagate further east with warming. However, the CESM2 inadequately represents the 'barrier effect' of the MC region on propagating MJO events.

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