



Abrupt ending of MJO by CCKW precipitation leaves swath of flooding across Indonesia

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Convectively coupled equatorial Kelvin waves (CCKWs) are eastward propagating weather systems that locally organise convection and have been linked to precipitation extremes across the Maritime Continent (MC). They are often embedded in convectively active phases of the Madden-Julian Oscillation (MJO) which too propagates eastwards but influences convection in the MC over longer timescales and larger areas. Previous high impact weather case studies have linked CCKWs to local precipitation extremes. In this study, we examine a case study during July 2021 of multiple CCKWs embedded within an active MJO. The final CCKW traversed the western MC causing precipitation extremes across equatorial Indonesia that lead to numerous reports of flooding and landslides, with the West Kalimantan region the worst affected. The MJO event itself was abruptly terminated following the passage of this CCKW. Through analysis of the moisture budget we find that the rainfall exceeded the convergence of moisture to produce the pronounced drying. Prior to the local MJO termination, we find there was enhanced westward propagating diurnal activity across the equatorial MC coinciding with a steady increase of total column water. We also examine observations of the extreme rainfall event in the West Kalimantan province. Comparing different deterministic model configurations, we find that the convection permitting models generally perform better when there are not multiple CCKWs present within the initial conditions. This research highlights how CCKWs should not simply be viewed as convective systems that locally affect weather but have the potential to have devastating impacts over the entire equatorial MC especially when involved in multiscale interactions both with the diurnal cycle and with the MJO.