

MJO Initiation

Katherine H. Straub

Associate Professor, Department of Earth and Environmental Sciences
Susquehanna University, Selinsgrove, PA

Although the Madden-Julian Oscillation (MJO) has now been studied for 40 years, terms like “MJO initiation” remain mysterious. Does “MJO initiation” mean the onset of deep convection in the Indian Ocean? Or can MJO initiation occur anywhere? Does initiation necessarily imply the onset of convection? Or could it be tied to winds? Or moisture? Can initiation really be pinned down to a particular date? Or is it a more gradual process?

I will make the case that the Wheeler-Hendon Realtime Multivariate MJO (RMM) index provides a new method to study MJO initiation. However, as we delve into a more thorough understanding of this MJO index, we need to address a number of questions fundamental to our understanding of the MJO itself. For example, must the MJO always have a strong, coherent convective signal? Or do coherent wind signals suffice? How do our answers to these questions motivate our choice of an index with which to identify the MJO?

The RMM index can be used to pinpoint MJO initiation to a particular day or short period. Using this method, the resulting initiation dates often precede those identified in previous works by several days to a week. This suggests that predecessor signals exist in the atmosphere that are typically overlooked. However, composites formed from “primary” MJO events (those without a recent history of MJO activity in the RMM index) are in many cases quite similar to those formed from “successive” MJO events (with a recent history of high amplitude MJO activity in the RMM index). These results suggest that the atmosphere is almost always in an MJO-like state, even when MJO indices suggest an absence of MJO activity. In this case, our future efforts might be better focused on determining the conditions that allow the ever-present MJO to intensify or weaken, rather than the conditions that turn the MJO “on” or “off.”