



## Theory behind the MJO

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The Madden-Julian oscillation is the largest planetary scale disturbance on our planet; its wavelength is on the order of the circumference of the Earth. It brings lots of rain for an extended period of time as its period is 30-60 days. It also influences the weather outside of the tropics, creates atmospheric rivers and intensifies some of the storms and hurricanes.

While searching for the fundamental analytical theory that can explain basic features of the MJO, i.e. the fact that the MJO is a global/planetary mode that couples with convection and propagates eastward, Fuchs and Raymond, 2017 developed a simple model based on two main hypotheses. First, the mean zonal wind on average is easterly and second, precipitation rate increases as the amount of moisture in a vertical column increases. The model produces an unstable mode that moves eastward with a phase speed of about 15 m/s for planetary wavenumber  $l=1$ , however when it interacts with the Indo-Pacific warm pool, it slows down to 5 m/s. It is unstable only at long wavelengths because of the wind induced surface heat exchange, while cloud-radiation interactions increase the instability. We believe that this WISHE-moisture mode explains the fundamental features of the MJO.

Other effects such as nonlinearities are further required to fully grasp the observed structures in finer detail.