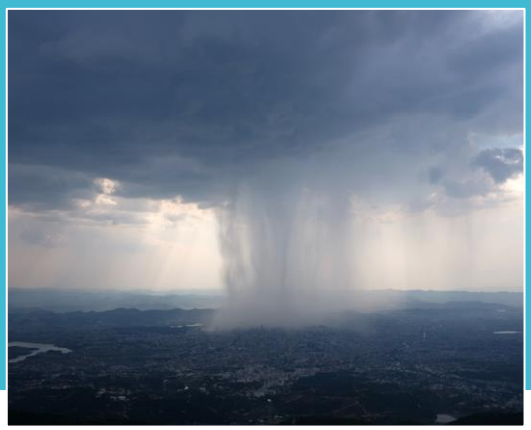
Factsheet: Madden-Julian Oscillation



What is the Madden-Julian Oscillation (MJO)?

The Madden-Julian Oscillation (MJO) is a large-scale moving pattern of clouds, rain, wind, and pressure that travels eastward around the Earth in the tropics. It takes about 30 to 60 days to complete one cycle. Unlike El Niño/La Niña conditions, which can last for many months in the Pacific Ocean, the MJO can happen multiple times in one season. This means the MJO changes from week to week, affecting the weather across the whole tropics. Source: NOAA, Gottschalck, 2014.

Forecast models now do a good job of predicting the MJO on timescales of two weeks to two months (sub-seasonal) in the tropics. By monitoring tropical winds and clouds, the location of the MJO can be identified; these are defined as phases (see Figure 2). Understanding the link between the phase of the MJO and weather systems, such as tropical cyclones in the Indian Ocean, helps to provide information that is crucial to support anticipatory action ahead of storms.

A video on the MJO can be viewed here (source: Met Office YouTube).

The MJO, Madagascar, and tropical cyclones

There is growing evidence that the MJO affects cyclones in the southern Indian Ocean and over Madagascar. Tropical cyclones can form more easily, develop and become more intense during certain phases of the MJO (see Figure 1).

Rainfall in Madagascar has also been linked to certain phases of the MJO (Macron et al., 2016). MJO phases 6-7 can cause wetter conditions over Madagascar. However, it is important to remember other parts of the climate system also influence Madagascar's weather and climate .

The MJO phases

Phase 1: greater rainfall over the western Indian Ocean.

Phases 2, 3: rainfall moves eastwards over Africa, the Indian Ocean and parts of India, Pakistan, and Bangladesh.

Phases 4, 5: rainfall reaches Indonesia and the western Pacific.

Phase 6, 7, 8: rainfall moves eastward over the western Pacific, and eventually dies out in the central Pacific area.

Either next MJO cycle begins or MJO weakens and discontinues.

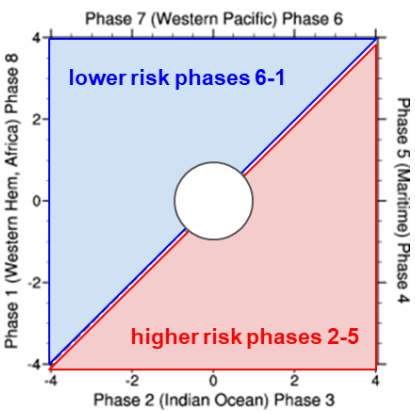


Figure 1 (left): when the MJO is in phases **2, 3, 4 or 5** (shaded red) there is **higher risk** of tropical cyclones impacting Madagascar. When the MJO is in phases **6, 7, 8 or 1**, (shaded blue) **risk is lower.**

If forecasts fall within the central white circle, there is weak MJO activity and, therefore, no added skill from MJO.

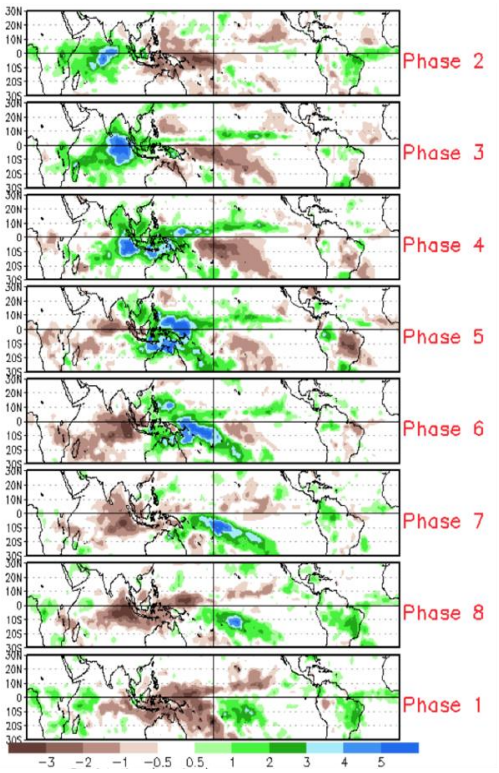


Figure 2 (above): phases of the MJO. Green shading indicates more rainfall than normal; brown indicates less rainfall (source: NOAA, 2014).

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