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Weather regimes in South East Asia: connections with synoptic phenomena and high impact weather

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A tiered set of weather regimes describing variability in 850 hPa winds in South East Asia (SEA) is presented and compared to a corresponding non-tiered set of weather regimes. The tiered regimes are calculated in two parts: the first tier computed by applying EOF/K-means clustering on a planetary scale domain which partitioning seasonal variation and ENSO, and the second tier obtained by EOF/K-means clustering on a smaller SE Asia regional domain, partitioning the synoptic variability within each of the first tier regimes. This identifies synoptic weather phenomena with multi-day persistence. In contrast, the un-tiered (“flat”) clustering approach uses a standard EOF/K-means classification in the regional domain without conditional dependence on large-scale, with the number of regimes set to match the tiered regimes.

These regimes are used to study the likelihood of extreme precipitation depending on synoptic circulation. We consider the conditional probability depending on regime type of synoptic weather events including cold surges, phases of the MJO and BSISO, tropical cyclones, Borneo Vortices and equatorial waves. We then study the regime-conditioned probability of high percentile TRMM precipitation. We find that a perfect regime forecast would have greater skill than the GloSEA5 precipitation forecast for lead times longer than approximately one week. The tiered regimes distinguish a greater fraction of considered modes of variability, while the flat regimes better distinguish the precipitation variability.

The predictability of these regimes will be discussed in a separate presentation, titled “Weather regimes in South East Asia: Sub-seasonal predictability of the regimes and the associated high impact weather” and presented by Paula Gonzalez.

