Cloud regimes and associated MJO variability over the Maritime Continent in the austral summer

Zijie Zhao[1,2], Claire Vincent [1,2], Todd Lane[1,2]

[1]*School of Earth Science, The University of Melbourne, Melbourne, Victoria* [2]ARC Centre of Excellence for Climate Extremes, The University of Melbourne, Melbourne, Victoria

Introduction

- In this study, we present a new technique to generate cloud regimes and to analyse corresponding spatial and temporal patterns over the Maritime Continent
- This technique is subsequently used to analyse the diurnal and seasonal variability of cloud regimes using two satellite products.
- The MJO variability shown in the dynamical propagation of cloud regimes is also analysed and visualised.

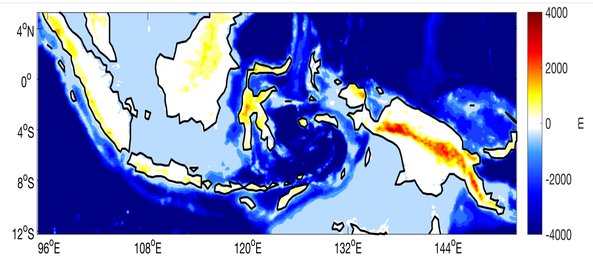
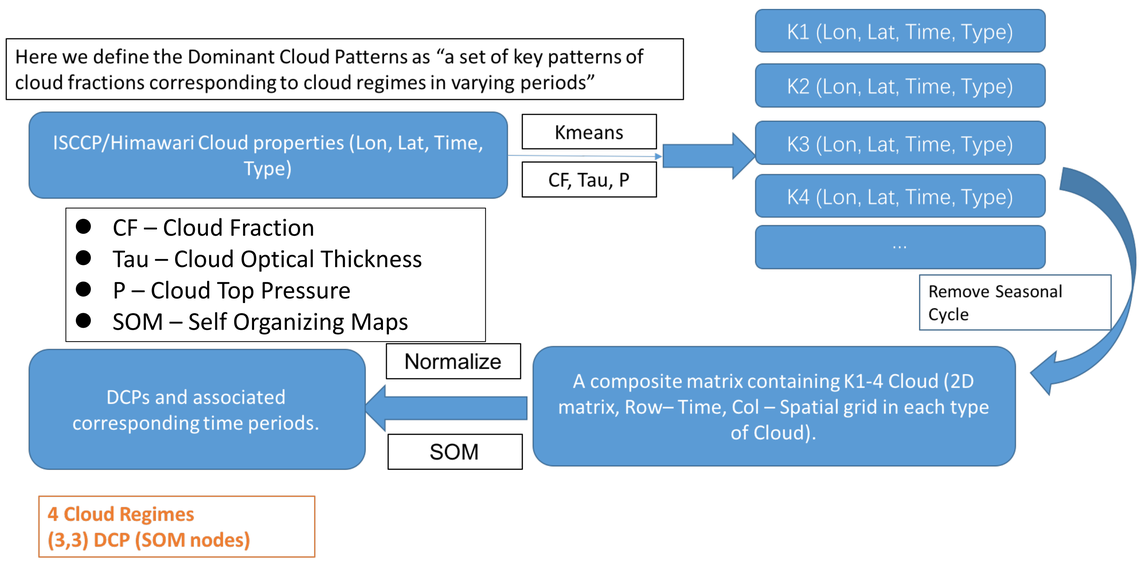


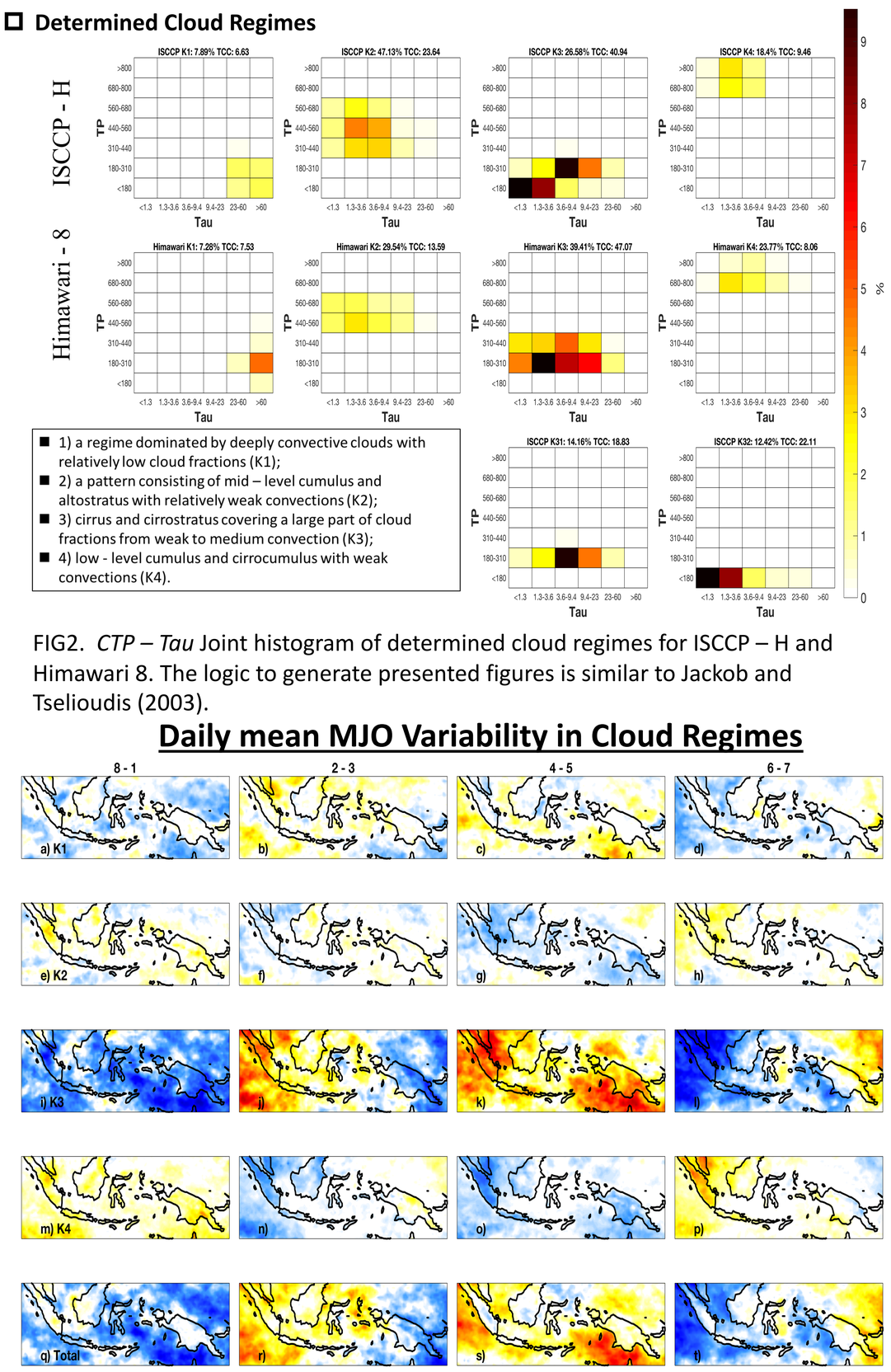
FIG1. Geographical topography over the Maritime Continent (MC)

Determination of Cloud Regimes

Protocol of the workflow



Determined Cloud Regimes



- 1) a regime dominated by deeply convective clouds with relatively low cloud fractions (K1);
- 2) a pattern consisting of mid – level cumulus and altostratus with relatively weak convections (K2);
- 3) cirrus and cirrostratus covering a large part of cloud fractions from weak to medium convection (K3);
- 4) low - level cumulus and cirrocumulus with weak convections (K4).

FIG2. *CTP – Tau* Joint histogram of determined cloud regimes for ISCCP – H and Himawari 8. The logic to generate presented figures is similar to Jackob and Tselioudis (2003).

Daily mean MJO Variability in Cloud Regimes

FIG3. Daily mean MJO variability in Cloud Regimes. Each row represents a particular cloud regime or total clouds. Each column represents a particular MJO segment.

Dominant Cloud Patterns (DCPs; K1 for Deep Convective Clouds)

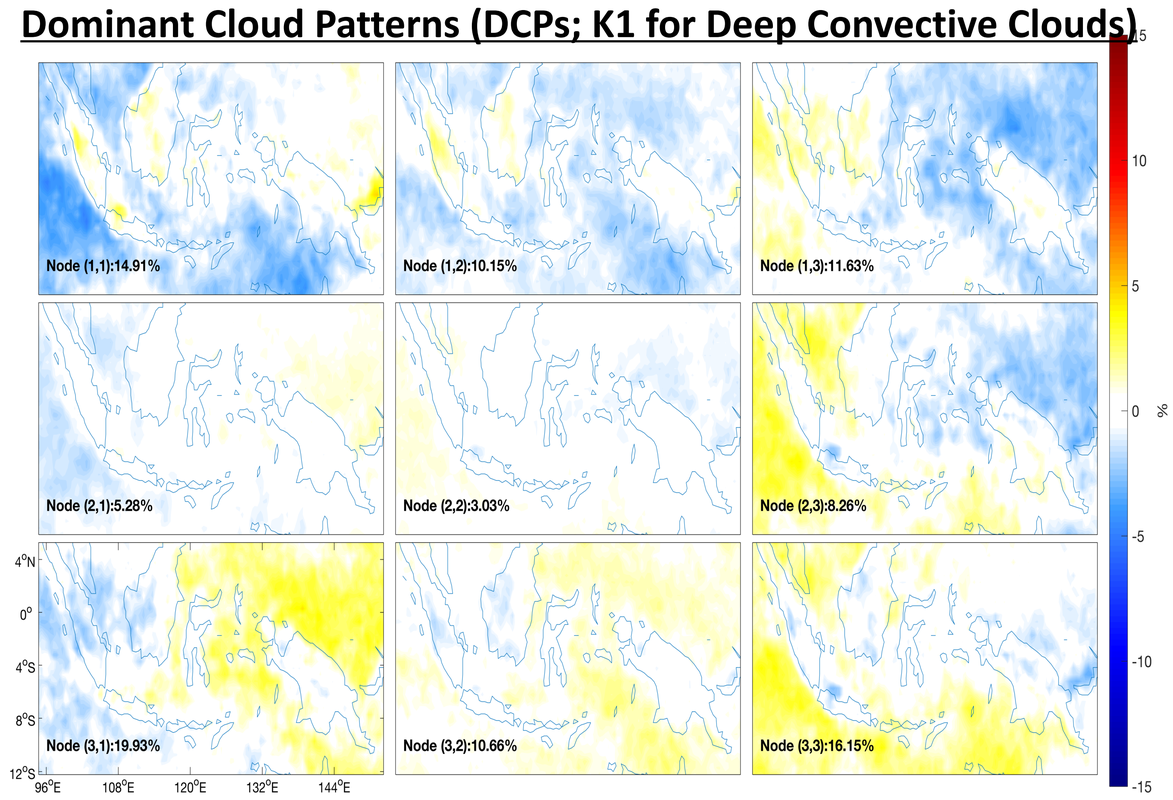


FIG4. DCPs resulting from SOM for K1, Deep Convective Clouds.

Cloud Propagation revealed in DCP

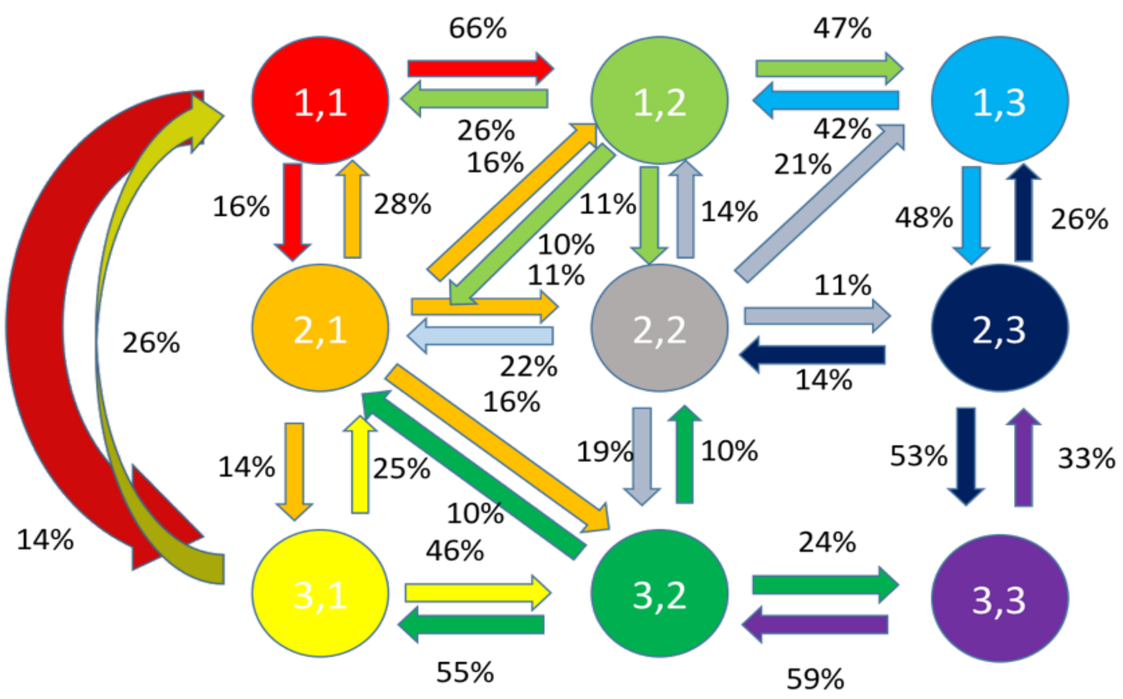


FIG5. Diagram revealing the propagation among the DCP typology. Each circle represents a particular DCP node, and each arrow represents a particular transition from one node to another.

MJO Propagation revealed in DCP

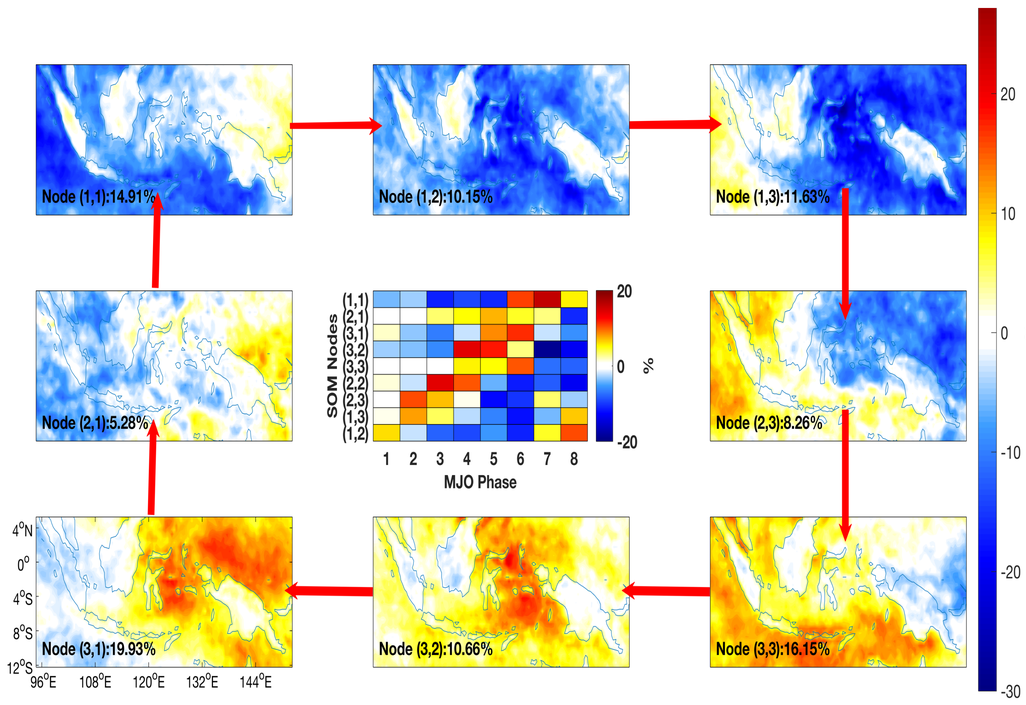


FIG6. MJO propagation revealed in DCP. Except central panel, each panel represents a reconstructed total cloud anomaly pattern based on SOM cluster. The central panel represents the percent of each SOM node in a particular MJO phase, after removing the climatology. The red arrow indicates the propagation among DCP typology revealed in the central panel.

Conclusions

- In daily mean scale, the high clouds conduct most MJO variability , while the the low clouds with inactive convection play a significant role in diurnal scale of MJO propagation.
- The MJO is the dominant mode to induce the intraseasonal variability of clouds over the MC in the austral summer.
- The technique presented here is a useful tool to analyse the propagate of cloud regimes in intraseasonal scale.

Reference

Jakob, C. and Tselioudis, G., 2003. Objective identification of cloud regimes in the tropical western Pacific. *Geophysical Research Letters*, *30*(21).