

## **SESSION: (B1) Mechanisms of S2D predictability**

**(B1-07)**

### **Variability and Teleconnections in the Indian Ocean: Mechanisms, Predictability and Climatic Influence**

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The Indian Ocean basin is host to variability on a variety of spatio-temporal scales that exert a strong influence on the climate system as a whole, through influences on the Asian and Australian Monsoons, the Indian Ocean Dipole (IOD) and the Hadley Cell. However, how variance enters and propagates throughout the Indian Ocean, how it ultimately imprints on the greater climate system and the potential predictability on time-scales exceeding 12 months are not currently well understood and impede current forecasting systems.

Using a combination of ocean observation, a long, fully coupled control simulation, and a shorter data-assimilating ensemble of simulations, we investigate the physical mechanisms driving variability on annual to decadal time-scales in the Indian Ocean. We demonstrate using band-selective periodograms that, in contrast to variability on sub-annual timescales, variance at time scales exceeding 12 months lies not in the tropics, but in the Southern Hemisphere sub-tropical regions associated with mode-water formation. Teleconnection pathways between these sub-tropical high-variance regions and the tropics will be elucidated, showing several distinct pathways linking mid and low latitudes over longer time scales. By studying disturbances propagating along these teleconnection pathways, we are able to determine characteristic time-scales of propagation and persistence, as well as their dominant length-scales. The disturbances are shown to be large, multi-scale and to propagate significantly slower than linear Rossby waves, suggestive of a dominant role being played by non-linearity in the underlying dynamics. The potential predictability of disturbances propagating along these pathways is then briefly discussed using the results of the large, data-assimilating ensemble of simulations.

Finally, the influence of oceanic signals emanating from the subtropical Southern Indian Ocean on the climate system will be discussed, primarily through their influence on the anomalous sea-surface heights and sea-surface temperatures.