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Recursos hídricos

SOUTH AMERICA INTRASEASONAL OSCILLATION INDICES

ABSTRACT

The Madden-Julian Oscillation (MJO) is the dominant mode of intraseasonal variability over the tropics. Many global indices were developed for monitoring MJO phases and their impacts on the circulation and precipitation around the globe, like the Real-Time Multivariate MJO Index (Wheeler and Hendon, 2004) and the OLR-based MJO index (Kiladis et al., 2014). Sometimes, these global MJO indices do not well represent the impacts of the intraseasonal variability over regions where the convective signal of the MJO is not strong, such as in the South America continent. The MJO induces a dipole of rainfall anomalies over South America. The tropical-extratropical MJO teleconnections also modulate the precipitation in the continent at intraseasonal timescale. These patterns affect the Brazilian watersheds, which are crucial from the point of view of electricity generation and water resources management. For South America, Barreto et al. (2019) developed a regional index to monitor the intraseasonal oscillation, but this index is not operational yet. Thus, this study aims to develop regional indices to monitor the impact of intraseasonal variability in South America, with a focus on Brazilian watersheds. Outgoing Longwave Radiation (OLR) data from NOAA (Liebmann and Smith, 1996) and precipitation data from IMERG (Huffman et al., 2019) are used. Daily anomalies of IMERG precipitation and OLR were obtained by subtracting the first three harmonics (the annual cycle and the first two subsequent harmonics) at each grid point to remove the seasonal cycle. These anomalies were then band-pass filtered in the 30-90 days frequency to isolate the low-frequency intraseasonal signal. To obtain the intraseasonal regional indices, the Empirical Orthogonal Functions (EOFs) and Self Organizing Maps (SOM) techniques were applied to the filtered data for the region of maximum intraseasonal signal over South America. Then the performances of the regional indices compared to global MJO indices (RMM and OMI) were assessed for some Brazilian watersheds. Preliminary results show that these regional indices already outperform the global indices over South America, especially over Brazilian watersheds. We also found that the indices

obtained from the SOM technique better represent the non-linearities and irregularities associated with the MJO when compared to the EOF indices. This can give us some insights into the non-linearities of the tropical-extratopical teleconnections patterns that modulate the precipitation in South America at intraseasonal time-scale. The next steps consist of making these indices operational to provide the prediction of their phases using, for example, the Subseasonal to Seasonal (S2S) forecasts.