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Subseasonal prediction of active and break phases of the South American monsoon and the influence of the MJO

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Over most of South America (SA) the rainy season is connected with the summer monsoon, including subtropical areas. The monsoon region includes the most populated areas and those that have the largest contribution to agricultural production and hydroeletric power generation. Therefore, the skillful prediction of active and break periods of the monsoon with lead time beyond one week has great economic and social importance. To diagnose these periods a monsoon index is defined as the daily rainfall anomaly area averaged over the core monsoon region, in 10º-20º S; 45º-55º W, and active (break) monsoon days are defined as those with the index values greater than or equal to (less than -) one daily standard deviation, during the austral summer (DJF). Composite anomalies for active (break) monsoon rainfall episodes in the monsoon core region show that they are associated with large-scale cyclonic westerly (anticyclonic easterly) low-level wind anomalies, for which the Madden-Julian Oscillation (MJO) makes a dominant contribution and is therefore a source of predictability. Therefore, it is important that the models selected for a subseasonal forecast scheme of the SA monsoon variability are able to simulate and forecast the MJO and its impacts over South America. Among the models participating in the Subseasonal to Seasonal (S2S) Prediction Project one shows skill in predicting the right phase of the MJO (among the 8 usual phases that characterize its evolution) for lead times beyond 3 weeks, while most of them have predictive skill up to 2-3 weeks in advance. Their skill in reproducing the MJO impacts on SA is tested at this lead time. We assess the models' modulation of active (or break) episodes by the MJO by calculating the proportion of monsoon active (or break) days in each MJO phase, and compare it with the observed proportion. The most skillful models represent well the observed modulation by the MJO up to week 3. Another important aspect is the prediction of the MJO related precipitation anomalies in each phase and the associated teleconnections. The models show a good skill for predicting them, but tend to move them by one phase. The correlation coefficient between predicted and observed precipitation in the core monsoon region shows small skill after week 2. The skill can probably be improved for longer lead time if a correction regarding the systematic phase lag between observed and predicted MJO-related precipitation is applied. The results provide motivation for further investigation of the subseasonal predictive capability.