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Seasonal prediction performance in South America

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The Climandes project, a pilot project of the Global Framework for Climate Services (GFCS) lasting from 2012 to 2018, aimed at implementing seasonal predictions in the agricultural sector in Peru. It is widely known that seasonal predictions have a great socio-economic potential if they are reliable and skillful. Thereby, one specific goal of the project was to determine the value of seasonal forecasts for applications in the agricultural sector and to determine the potential improvement of the seasonal forecasts by using a dynamical model instead of the currently applied statistically based Climate Predictability Tool (CPT). Therefore, we verified the seasonal forecast system 5 (SEAS5) of the European Centre for Medium-Range Weather Forecasts (ECMWF) over South America.

In 2005, Ziervogel et al. suggested that forecasts are only useful for smallholder farmers if they are correct in at least 60 to 70% of the time. In the present work, these thresholds are related to correlations of the hindcasts of ECMWF SEAS5 and homogenized station observations, resulting in beneficial predictions if correlations are at least above 0.3, and preferably above 0.6. Based on this relationship, we show that air temperature predictions have high potential for applications in the tropics during austral summer. Further to the south, maximum air temperature predictions are still useful with correlations being just above the lower threshold value of 0.3 while predictions of minimum temperature are below that value in all regions lying south of 20°S. For precipitation, the prediction performance is generally lower than for temperature and spatially and temporally more variable. The highest prediction performance with correlations above the lower correlation threshold is observed at the coast and the highlands of Colombia and Ecuador, the north-eastern part of Brazil, and an isolated region to the north of Uruguay during DJF.

In addition, we contrast the prediction performance of the dynamical model with simple empirical predictions based on the El Niño-Southern Oscillation (ENSO) index of region 3.4. In the regions where predictions of ECMWF SEAS5 are skillful, ENSO 3.4 has a strong influence on both air temperatures and precipitation. SEAS5 outperforms the simple empirical predictions based on ENSO 3.4 in most regions where the prediction performance of SEAS5 is high, thereby supporting the potential benefit of using a dynamical model instead of statistical relationships for predictions at the seasonal scale.