



Winter synoptic-scale circulation in the output of atmospheric reanalyses and state-of-the-art global climate models for two South American regions

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Atmospheric circulation is an important aspect of climate and as such has received considerable attention from researchers. A plethora of methods and datasets have been utilized to study large-scale circulation, with the focus shifting to modeling experiments. Consequently, as the amount of available model output increases, a need for comparative studies arises.

Here, we address this need by analyzing austral-winter (JJA) synoptic-scale circulation over two South-American regions (central and southern South America) in a suite of atmospheric reanalyses (ERA-40, NCEP/NCAR, JRA-55, ERA-20C, CERA-20C, 20CRv2, and 20CRv2c) and in the output of historical runs and RCP8.5 projections by an ensemble of 25 CMIP5 CGMs. A total of eight automated circulation classifications of winter 1961–2000 daily MSLP reanalyzed patterns have been calculated for each region, in order to minimize the effect of methodological choices on results. Processing these classifications makes it possible to compare the frequency and persistence of circulation types between reanalyses, quantify the observation uncertainty, and define a reference dataset against which GCMs could be analyzed.

The preliminary results show that there are substantial differences between how daily patterns from two reanalyses referring to the same day are classified. Namely, most pairs of reanalyses differ in classification of more than 50% of days in the pre-satellite era while the accordance has markedly increased since about 1980. Such a lack of temporal stability may considerably hinder any trend analysis. On the other hand, the accordance of both versions of 20CR, which assimilate only surface data, with the remaining reanalyses is in general somewhat lower, yet temporally stable. By utilizing the results for reanalyses, GCMs will be analyzed in the next step, as for biases in historical runs and trends in 21st century projections under RCP8.5 scenario.