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Atmospheric crculation patterns and teleconnections over southern South America in reanalyses

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Atmospheric reanalyses have been widely used to study large-scale atmospheric circulation, its links to local weather, and to validate climate models. Much less effort has so far been made to compare reanalyses with each other. In particular, studies utilizing automated classifications of circulation patterns—one of the most popular methods in synoptic climatology—have paid little or no attention to the issue of reanalysis evaluation. Studies employing circulation type (CT) classifications are particularly scarce in the Southern Hemisphere. The same holds for teleconnections (modes of low-frequency variability).

This contribution compares five reanalyses (ERA-40, NCEP-1, JRA-55, 20CRv2, and ERA-20C) in terms of the frequency of occurrence and persistence of CTs and teleconnection patterns. The CTs are defined over two South American domains, focusing on subtropical (20 - 40 S) and mid (40 – 60 S) latitudes. Eight different classifications are used in parallel with the intention to eliminate possible artifacts of individual classification methods. This also helps document how substantial effect a choice of method can have if one quantifies differences between reanalyses. Teleconnections are defined by rotated principal component analysis over the entire Southern Hemisphere (south of 20 S inclusive), and only those affecting South America are considered (most notably the Southern Annular Mode and two Pacific- South American Modes). 20CRv2 is significantly different from other reanalyses over both domains, having a clearly suppressed frequency of zonal CTs, as well as in the display of teleconnections. Differences between reanalyses are considerably larger than in a similar study conducted over Europe and North Atlantic.