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Forecasting the weather
- ensemble techniques
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Synoptic-scale transient activity and quasi-stationary waves interactions in association with summer precipitation variability in Central West Argentina

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The interannual variability of Central West Argentina (CWA) summer (Oct-Mar) precipitation in the period 1900-2010 and its association with Southern Hemisphere tropospheric circulation at seasonal and synoptic scales is studied using NCEP/NCAR reanalysis data after 1958. Significant precipitation quasi-cycles are present in bandwidths about 2, 4-5, 6-8 and 16-22 years. The quasi-bidecadal oscillation is significant from the early 1910s until the mid-1970s. Accordingly to the lower-frequency spectral variation a prolonged wet spell is observed from 1973 to the early 2000s. The precipitation variability shows a reversal trend since then. In that wet epoch the regionally averaged precipitation has been increased in about 24%. The lower-frequency spectral variation is attributed to the climate shift of 1976/77.

In the period before the mid-1970s precipitation variability is associated with barotropic quasi-stationary waves (QSWs) propagation from the tropical southern Indian Ocean and the South Pacific generating vertical motion and moisture anomalies at middle-to-subtropical latitudes east of the Andes over southern South America. In this region the stationary wave anomalies seems to be maintained by the convergence/divergence configuration of synoptic-wave activity. The QSWs propagation could be related with anomalous convection partly induced by tropical anomalous SSTs in the western Indian Ocean (WIO). It could be also linked to another mid-latitude source along the stormtracks, to the southeast of New Zealand where there is statistically significant enhanced synoptic-scale wave activity.

After 1976/77 the precipitation variability is associated with equatorial symmetric circulation anomalies linked to El Niño-Southern Oscillation (ENSO)-like warmer conditions. Positive moisture anomalies are consistently observed at lower latitudes in association with inflation of the western flank of the South Atlantic anticyclone. Reduced high-frequency transience is observed at further south latitudes. Out of this the precipitation variability is unrelated with ENSO.