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0.1 Wavelet analysis of a centennial (1895-1994) rainfall series in Pelotas (southern Brazil)

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In this work we apply the wavelet transform to a hundred years (1895-1994) total annual rainfall series from Pelotas, southern Brazil ($31^0$45' S 52^0 21'W). The wavelet transform enable us to identify non-steady variations in a time series. The cross-wavelet spectrum gives us the cross-correlation between two series as a function of time for each period/frequency of interest. This analysis was applied to ENSO, QBO and sunspot number, in addition to Pelotas rainfall, time series, in order to search for similarities among these time series and to evaluate the effect of each forcing parameter on the local precipitation. We found that the Pelotas rainfall wavelet spectrum shows the most significant periodicities between 2-8 years, but they have an intermittent character. Cross-wavelet spectrum showed that: rainfal versus QBO series are correlated at QBO scales, 2-3 years, and this cross-power is persistent along the time series interval; rainfall versus SOI have higher cross-power between 4-8 years, but it is sporadical; rainfall versus sunspot number showed higher cross-power around the 11 year period, but this cross-power is sporadically high and low; finally, rainfall cross-spectrum with the double sunspot number revealed a high cross-power around 20-22 years and is more persistent in duration, compared to the 11 year period. These wavelet results are compared with classical signal analysis and with previous works results.