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The Drought Interest Group: Monthly water condition of soil and rainfall in central-northeastern Argentina. Decadal variability

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Several components of the climate system are characterized by the interaction between them. In this context, the yields of the crops depend on the variability and the interaction between two of these components: soil and atmosphere. In particular, the climatic variability is associated to a series of atmospheric processes that determine the behaviour of the rainfall. This variable constitutes a key factor for the determination of the water condition of the soil. Besides, crops need different amount of water depending on their phonological stage. In this contest, the water condition is different depending on the semester: warm (October-March) or cold (April-September). The aim of this work is to analyze the monthly water condition of the soil related to the rainfall variability, in the region of greatest agriculture production in Argentina, South America. Monthly data of temperature and precipitation was used to estimate the water condition, in the period 1970-2006 for 30 stations in the region of study. The monthly relationship between water condition and rainfall was analyzed by the correlation coefficient, for different lags: R(0), R(1), R(2). These coefficients were evaluated for the whole series and each semester. Also, their temporal variability was compared in the whole period and each decade, beginning in 1970. The rainfall preceded the water condition when R(1), R(2) were computed. Even though, it is reasonably expected to have dependence between water condition and rainfall, due to the methodology used, it is interesting to observe how the relationship varies according to the region, time of the year and decades. When the spatial behaviour of the correlation coefficient is analyzed at the same time, R(0) is significant. A meridional gradient (east-west) is observed in the complete series and during the warm semester. In the cold semester, the area of significant relationship is concentrated only on the Northeast of Argentina. In general, this semester shows the smallest correlation for any of the three monthly lags. The water condition gradually loses its memory related to the rainfall, as the lags increase. However, it is interesting to observe the behaviour and significant of R(2). For the complete series, the region with greater R(2) is basically concentrated on the Northeast of Argentina, varying from 0.25 to 0.3. During the warm semester, almost the whole region presents significant coefficient R(2), reaching values in the range 0.4 to 0.45 in the northeast. The decadal variability of R(1) and R(2) for each semester is important. To remark few results, the 90s present the highest and significant correlations in the centre of the region, both for R(1) and for R(2). During the warm semester, it is interested to observed the low values of R(2) in the 80s. Through the analysis of the interaction between the soil and atmosphere, it will be possible to better understand the climate system and it could be used to analyze the vulnerability and the impact of the climatic variability over the crops.