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Recent changes in frost days events characteristics in Uruguay-Southeastern South America.

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There are few studies about extreme temperature events in Southeastern South America as is it mentioned in the SREX report (2009), although these events generate human health impacts and big economical looses. Southeastern South America is one of the major agricultural production regions worldwide. Particularly in Uruguay, agricultural production represents a high percentage of the GDP and, in the last 15 years there has been a significant increase in the area used for that economic activity.
Although frost is not always is considered as an extreme event it causes, in the case of Uruguay, an impact on society, energy consumption and agricultural losses.
Previous studies have shown a negative trend in the occurrence of cold nights (TN10) during winter (June-July-August) and autumn (March-April-May) in Uruguay. This work try to determine if these trends affects the occurrences and characteristics of frost days (Tmin< 0ºC). Based on a high-quality daily minimum temperature for 11 meteorological stations that cover the period 1950-2009, we analyzed different features of frost days. Long term trends do not present a clear spatial behaviour suggesting that there is a not clear relationship between the percentile based index (TN10) and a fixed index (FD). At monthly scale, May and September show a negative trend, although these months present a low number of cases that difficult the statistical treatment. It is noticeable that from a decadal point of view the last decade (2000-2009) was the decade with fewer occurrences comparing with the rest, while the 90′s is the decade that presents more cases. We also analyzed changes in frost period (FP) which commonly extends from May to September. In general all the stations present a decrease in the FP in accordance with the negative trend detected at monthly scale, suggesting a warming in autumn and spring time. Although we detected different behaviour in two stations, one located inner land and the other located on the Atlantic coast of the country. The former presents a linear trend in the FP, while the other shows a decadal variability.
Regarding the frost intensity we analysed the consecutive frost days (CFD) index, which shows that the usual length is around 2-4 days. The decadal analysis shows that during the first decades events lasting 4-5 days were common, while in the last decades isolated events were detected. We also study the intensity considering the occurrence of events in different ranges of temperature: [0,-1], [-1,-2] and below -2ºC. Overall, during the 90's there are more events below -2 ºC, while during the 2000s although there were fewer events in the coastal stations they are more intense. Relationships with large scale anomalies circulations were also studied.