



Exploring the new long-term (150 years) precipitation dataset in Azores archipelago

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Within the scope of the two major international projects of long-term reanalysis for the 20th century coordinated by NOAA (Compo et al. 2011) and ECMWF (Hersbach et al. 2013) the IDL Institute from the University of Lisbon has digitized a large number of long-term stations records from Portugal and former Portuguese Colonies (Stickler et al. 2014). Recently we have finished the digitization of all precipitation values from Ponta Delgada (capital of the Azores archipelago) obtaining an uninterrupted precipitation monthly time series since 1864 and additionally an almost complete corresponding daily precipitation series, with the exception of some years (1864/1872; 1878/1879; 1888/1905; 1931; 1936 and 1938) for which only monthly values are available. Here, we present an annually, seasonally and daily resolution study of the rainfall regime in Ponta Delgada for the last 150 years and the North Atlantic Oscillation (NAO) influence over this precipitation regime.

The distribution of precipitation presents an evident seasonal pattern, with a strong difference between the “rainy season” (November/March) and the “dry season” (June/August) with very little rainfall. April/May and September/October correspond to the transitional seasons. The mean annual rainfall in Ponta Delgada is approximately 910 mm and is accumulated (on average) in about 120 rainy days. The precipitation regime in Azores archipelago reveals large inter-annual and intra-annual variability and both have increased considerably in the last decades. The entire studied period (1865-2012) shows an increase in the rainfall conditions between a drier earlier period (1865-1938) and a wetter recent period (1939-2012). At daily resolution, we have used an approach based on different characteristics of rain spells (consecutive days with rainfall accumulation) that has been proved to be satisfactory for the analysis of the different parameters related to the rainfall regime (Kutiel and Trigo, 2014). This approach shows that the increase in precipitation is mainly due to more intense events which are reflected by higher rain spell yields (amount of precipitation) and rain spell intensity (amount of precipitation by day) values in the last decades.

On the other hand, despite the fact that one of the most widely used NAO definitions includes sea level pressure from the Ponta Delgada station, its long-term impact on the Azores archipelago climate is not well established yet. Here, we assessed the NAO influence over the precipitation regime according to Spearman's rank correlation coefficients. Results show that the inter-annual variability of precipitation is largely modulated by the NAO mode. Correlation values of $r=-0.90$, $r=-0.79$ and $r=-0.63$ were obtained for years with positive (>1) or negative (<-1) NAO values considering annual, winter (DJFM) and summer (JJAS) periods, respectively. Moreover, the winter precipitation composite corresponding to high NAO index is 30% lower than the mean value (403 mm), whereas the corresponding low NAO index is 35% higher.

References

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