



## **Instrumental evidence of an unusually strong West African Monsoon in the 19th century**

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The precipitation in the Sahel –which is mainly controlled by the dynamics of the West African Monsoon-, has been in the spot of the climate community for the last three decades due to the persistence of the drought period that started in the 1970s. Unfortunately, reliable meteorological series in this area are only available since the beginning of the 20th Century, thus limiting our understanding of the significance of this period from a long term perspective. Currently, our knowledge of what happened in times previous to the 20th Century essentially relies in documentary or proxy sources. In this work, we present the first instrumental evidence of a 50 year-long period characterised by an unusually strong West African monsoon in the 19th Century.

Following the recent advances in the generation of climatic indices based on data from ship's logbooks, we used historical wind observations to compute a new index (the so-called ASWI) for characterising the strength of the West African Monsoon. The ASWI is based in the persistence of the southwesterly winds in the [29°W-17°W;7°N-13°N] area and it has been possible to compute it since 1790 for July and since 1839 for August and September.

We show that the ASWI is a reliable measure of the monsoon's strength and the Sahelian rainfall. Our new series clearly shows the well-known drought period starting in the 1970s. During this dry period, the West African Monsoon was particularly weak and interestingly, we found that since then, the correlations with different climatic patterns such as the Pacific and Atlantic "El Niño" changed significantly in relation to those of the previous century.

Remarkably, our results also show that the period 1839-1890 was characterised by an unusually strong and persistent monsoon. Notwithstanding, two of the few dry years within this period were concurrent with large volcanic eruptions in the Northern Hemisphere. This latter result supports the recently suggested relationship between major volcanic eruptions with large aerosol loads in the northern hemisphere stratosphere and the occurrence of isolated drought episodes in the Sahel.

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