ON THE FEASIBILITY OF TRACKING THE MONSOON HISTORY BY USING ANCIENT WIND RECORDS

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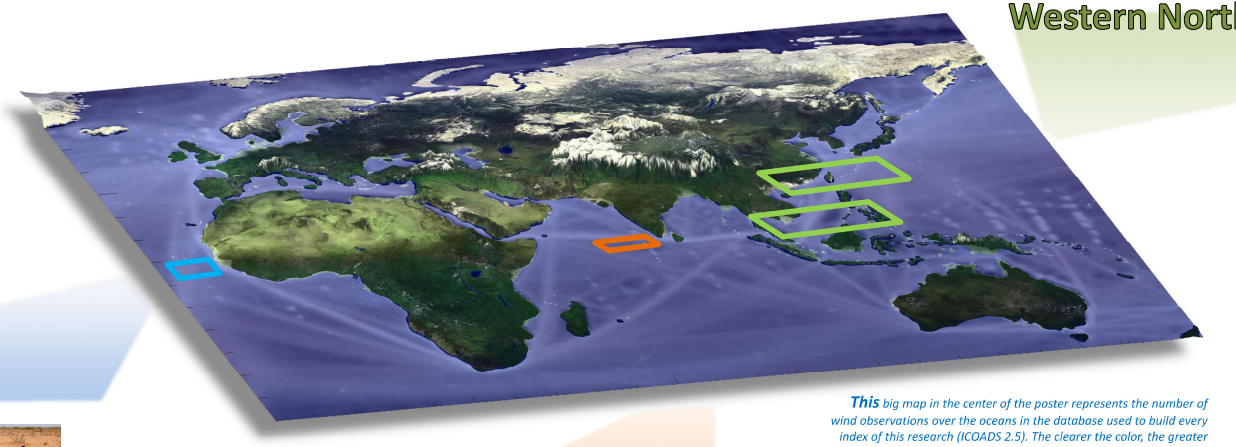
Western North Pacific Summer Monsoon



This big map in the center of the poster represents the number of wind observations over the oceans in the database used to build every index of this research (ICOADS 2.5). The clearer the color, the greater the number of observations. The main historical routes circumnavigating Africa and the Indian Ocean are clearly seen. Color rectangles indicates the area searched for the African (blue), the Indian (orange) and Western North Pacific (green) monsoons.

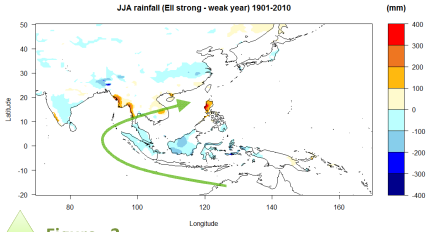


Figure 3 The Western North Pacific Summer Monsoon (WNPSM) is an oceanic monsoon system driven primarily by the meridional SST gradient. This system has attracted attention as a separate monsoon system only from the late 1980's, probably because to quantify its strength it is mandatory the use of meteorological variables in open sea. Figure 3 (above) shows the changes in precipitation between well-developed and weak monsoons. This change in precipitation can reach up to 400 mm in densely populated areas such as the Philippines or the west coast of Myanmar.

Quantifying the strength of this monsoonal system for periods previous to the mid 20th Century constitutes a challenge, mainly because to properly characterize the WNPSM is essential the use of wind measures in oceanic areas. Fortunately, this area has been very busy from a nautical point of view since at least the 19th century, and lots of ship routes crossed the region. Most of these ships took very precise wind direction measures that has been used to produce a new since the 1880's. This new index doubles the length of the former longest WNPSM series.

The analysis of this series is still underway!

West African Monsoon

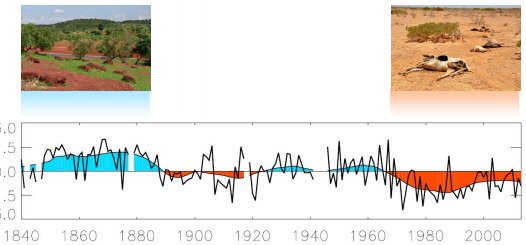


Figure 1 The monsoonal winds in West Africa modulates the precipitation of the Sahel, a region in between the African Savannah grasslands to the south and the Sahara desert. The monsoonal rains in the Sahel are critical for the living of people and since the 1970's an unusually strong drought is affecting the area. Unfortunately there is no instrumental precipitation records in the Sahel prior to 1900, so it is difficult to judge the severity of the recent drought from a climatic perspective.

By computing the percentage of days in a month with prevailing SW winds in the [29W-17W;7N-13N] area (see big map in the center of the poster, blue square), it has been possible to build a new index measuring the strength of the West African Monsoon since 1839. Figure 1 shows the standardized index (black line) and the 30-year low-pass filtered series (red-blue colors). We found instrumental evidence of the severity and unusual character of the recent drought in the Sahel (prevailing negative index since 1970) and the first instrumental evidence of an unusually strong monsoon period between 1840 and 1890 (prevailing negative index).

Gallego, D., Ordóñez, P., Ribera, P., Peña-Ortiz, C. and García-Herrera, R. (2015), An instrumental index of the West African Monsoon back to the nineteenth century. Q.J.R. Meteorol. Soc.. doi:10.1002/qj.2601

Indian Monsoon Onset

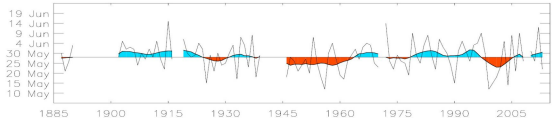


Figure 2 The date of the Indian Summer Monsoon onset is one of the most important meteorological events of the world and affects the life of hundreds of millions of people. Consequently, the India Meteorological Department has dated this onset over the southern tip of the Indian Peninsula (Kerala) since 1901, but its methodology was considered subjective and in consequence it was updated in 2006. Unfortunately, the new method relies on OLR measurements, which impedes the construction of an objective onset series before the 1970's and therefore, the generation of a long-term homogeneous monsoon onset series. By using historical wind records we have developed a new monsoon onset series dated back to the the last decade of the 19th Century. As this series relies only in the wind direction, it is susceptible of being extended by the inclusion of any new historical wind data not yet known.

The new series captures the rapid precipitation increase associated to the onset, correlates well with previous approaches and it is robust against bogus onsets. The onset date is quite variable in the interannual scale, ranging between May 11th (1956) and June 15th (1915). Although no significant trends in the onset date were detected (see Figure 2, at the top of this paragraphs), a tendency to later than average onsets during the 1900-1925 and 1970-1990 periods and earlier than average onsets between 1940 and 1965 have been found. Our results show a relatively stable relationship between the ENSO and the onset date, however this link tends to be weaker during decades characterized by prevalent La Niña conditions.

Currently, we are working in the study of the connection of this monsoon with the Mediterranean climate at decadal timescales.

Ordóñez, P., Gallego, D., Ribera, P., Peña-Ortiz, C. and García-Herrera, R. (2015). Tracking the Indian Summer Monsoon onset back to the pre-instrumental period. *Submitted to J. Climate.*

***Contrary** to what conventional meteorological wisdom suggests, wind direction alone is a powerful tool to build climate indices. In this poster we show that it is possible to build consistent monsoon indices based solely on observations of wind direction.*

Since at least the 17th Century, thousand of ships have circumnavigated the globe, taking precise wind direction observations that were preserved in old logbooks. Lots of these logbooks have been preserved and in some cases their content have been digitized and made freely available by International initiatives such as the Comprehensive Ocean-Atmosphere Data Set (ICOADS). The examples shown in this poster are based on ICOADS (v2.5) data.

Beyond these particular examples, it is worth mentioning that a large amount of wind observations for periods previous to the 20th century still remain unexplored in thousands of logbooks preserved in several historical archives. These meteorological data could be used to extend these indices further back in time. In this sense it is difficult to exaggerate the interest to unveil these yet unexplored data to track the monsoons by means of an instrumental, homogenous and objective methodology for more than –perhaps- 250 years. No doubt, it would largely justify the time and economic costs of its digitation.

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