Geophysical Research Abstracts
Vol. 20, EGU2018-9566, 2018
EGU General Assembly 2018

Atmospheric circulation during the Late Maunder Minimum based on ships' logbooks

Javier Mellado-Cano (1), David Barriopedro (2), Ricardo García-Herrera (2,3), Ricardo M. Trigo (1), and Mari Carmen Álvarez-Castro (4)

(1) Instituto Dom Luiz, DEGGE, Lisbon, Portugal , (2) Instituto de Geociencias (IGEO), CSIC-UCM, Madrid, Spain, (3) Departamento de Física de la Tierra II, Facultad de Ciencias Físicas, Universidad Complutense de Madrid, Spain, (4) Laboratoire des Sciences du climat et de l'Environnement LSCE/IPSL, CEA-CNRS-UVSQ, Université Paris-Saclay, France

In recent decades, observations found in ships' logbooks have shown to be a valuable source to explore past climate and its variability. Here, we present four wind directional indices and 8-point wind roses at monthly scales based on daily wind direction observations from ships over the English Channel. They are used to characterize the atmospheric circulation during the Late Maunder Minimun (LMM, 1685-1715), one of the few cold periods in recent centuries that persisted over decades.

The comparison with the present-day (1981-2010) period reveals a pronounced increase of the meridional component of the atmospheric circulation during the LMM and a marked reduction in the frequency of westerly days all year-round. Nevertheless, our findings indicate that the LMM was more heterogeneous than previously thought, displaying contrasting spatial patterns in circulation, as well as, large decadal variability. In particular, we report an increase of northerly winds favoring colder winters in Europe during the first half of the LMM, but enhanced southerlies contributing to milder conditions in the second half of the LMM.

The temperature inferred from the atmospheric circulation confirms the majority of extremely cold winters well documented in the literature, while uncovering other poorly documented cold winters and a substantial number of mild winters that had been unnoticed so far. Our results also suggest a non-stationarity of the climate impacts of the North Atlantic Oscillation (NAO) pattern within the LMM, with extremely cold winters being driven by negative phases of a "high zonal" NAO pattern and "low zonal" NAO patterns dominating during moderately cold winters.

This work was supported by FCT through project UID/GEO/ 50019/2013.