Geophysical Research Abstracts
Vol. 20, EGU2018-7635, 2018
EGU General Assembly 2018


# Oceanic drivers of European summer climate variations during the last millennium

Johann Jungclaus (1), Eduardo Moreno-Chamarro (2), Juerg Luterbacher (3,4)

(1) Max-Planck-Institute for Meteorology, The Ocean in the Earth System, Hamburg, Germany (johann.jungclaus@mpimet.mpg.de), (2) Earth, Atmosphere and Planetary Sciences. Massachusetts Institute of Technology. Cambridge. USA, (3) Department of Geography, Climatology, Climate Dynamics and Climate Change, Justus Liebig University Giessen, Germany , (4) Centre for International Development and Environmental Research, Justus Liebig University Giessen, Germany

European climate is influenced by variations in the surface conditions and ocean-atmosphere interactions in the surrounding oceans. Summer temperatures during the 20th century follow closely the evolution of the Atlantic Multidecadal Variability (AMV) (Ghosh et al., 2016) and reconstructions of both AMV and European temperatures (Wang et al., 2017; Luterbacher et al., 2016) suggest a substantial amount of common variability over the Common Era. However, there is lack of understanding about how these connections operate on decadal to centennial time-scales, which mechanisms modulate the low-frequency oceanic variability, and how the variations are related to changes in external forcings.

Here we use a small ensemble of MPI-ESM-P simulations over the last millennium together with climate reconstructions to investigate pathways from the Atlantic Ocean to the European continent and mechanisms behind past variability. We identify two important patterns in the North Atlantic sea surface temperature (SST) field that act differently on the atmosphere and the surrounding continents and lead to different impacts in terms of temperature and precipitation. The patterns emerge as the leading EOFs of North Atlantic SSTs. The first resembles the AMV and has a substantial component modulated by external forcing. The second reflects mainly regional SST anomalies in the mid-latitude western Atlantic and is related to shifts in the Gulf Stream and variations in the oceanic gyre circulation. The atmospheric response is a wave-train-like pattern that introduces zonally-oriented anomaly patterns in surface temperature and precipitation. This mode of variability appears to be mainly internally generated.