



## The ENSO teleconnection to Europe: tropospheric, stratospheric pathways and Atlantic air-sea interactions

Ivana Herceg Bulic (1), Bianca Mezzina (2), Fred Kucharski (3), Paolo Ruggieri (4), and Martin P. King (5)

(1) Andrija Mohorovicic Geophysical Institute, Department of Geophysics, Faculty of Science, University of Zagreb, Zagreb, Croatia (ihercegb@gfz.hr), (2) University of Trieste, Department of Physics, Trieste, Italy, (3) Abdus Salam International Centre for Theoretical Physics, Earth System Physics Section, Trieste, Italy (kucharsk@ictp.it), (4) University of L'Aquila, Department of Physics, L'Aquila, Italy, (5) University of Bergen, Geophysical Institute, Bergen, Norway

The delayed impact of El Niño-Southern Oscillation (ENSO) on European late spring climate is examined using ensembles of AGCM and partially coupled simulation. The focus of the analysis is response of the upper troposphere/stratosphere, downward propagation of the signal and its interaction with the North Atlantic sea surface temperatures (SST). The stratosphere responds to El Niño (La Niña) events with substantial warming (cooling) occurring in the polar area accompanied by a corresponding modification of upper-level geopotential heights and zonal winds resembling the pattern of the Northern Annular Mode. The atmospheric response is found in the upper troposphere as well as at the surface where it interacts with the North Atlantic SST. In this way, the wintertime ENSO signal is memorized in the upper ocean and persists until the following spring when through the interaction with the overlying atmosphere it is transmitted again into the atmosphere. Furthermore, it is demonstrated here that the late springtime ENSO signal over Europe may be considered as a result of two contributing processes: one is a direct (spring-to-spring) ENSO influence and the other is a delayed (winter-to-spring) ENSO influence. The delayed ENSO impact results partially from the persistence of the wintertime ENSO signal in the stratosphere, but it is also maintained by atmosphere-ocean interaction in the North Atlantic. The presented results also emphasize the role of the extratropical Atlantic as a contributing factor for climate variability linking wintertime atmospheric circulation and European climate during the following spring.