EMS Annual Meeting Abstracts
Vol. 15, EMS2018-671, 2018

The sensitivity of Mediterranean winter to Siberian snow cover variability

Paolo Ruggieri (1), Stefano Materia (3), Marianna Benassi (3), Silvio Gualdi (2,3)

(1) CMCC Foundation, Bologna, Italy (paolo.ruggieri@cmcc.it), (2) INGV, Bologna, Italy, (3) CMCC Foundation, Bologna, Italy

Snow cover extent over Siberia in Autumn was found to be a potential driver of winter midlatitude circulation, thus providing a potential source of predictability for the state of the atmosphere on a seasonal and multi-annual range. The large scale adjustment of the atmosphere to snow-related surface forcing implies modifications of the flow that in principle can be relevant to the Mediterranean region. Hence, a better understanding of the aforementioned processes can help us exploit this predictability and quantify climate responses and impacts on human activities. However, the complex chain of mechanisms that leads to such impacts has not been robustly established yet and it is affected by uncertainty linked also to disagreement between state-of-the-art models.
A crucial step to advance our knowledge on this field is to pin down relevant regional and global processes that can remotely propagate the signal through tropospheric and stratospheric pathways.
In this work, we present a set of ensemble experiments with a state of the art atmospheric general circulation model, targeted at recognising and describing the constructive interference between snow and Arctic sea ice forcing, that has been hypothesised in previous studies. Results from four simulations are discussed, each with different combinations of snow cover in Siberia and sea ice cover in the Barents and Kara seas. The winter circulation response to these forcing patterns is analysed looking firstly at the local atmospheric adjustment, then at the hemispheric scale, with emphasis on the associated interaction between troposphere and stratosphere, and finally at impacts on the Mediterranean region.