



Troposphere-lower-stratosphere connection in an intermediate complexity model.

Paolo Ruggieri (1), Martin King (2), Fred Kucharski (3), Roberto Buizza (4), and Guido Visconti (5)

(1) University of L'aquila and CETEMPS, L'aquila, Italy (paolo.ruggieri@aquila.infn.it), (2) Uni Research Climate and Bjerknes Centre for Climate Research, Bergen, Norway (martin.p.king@gmail.com), (3) Abdus Salam International Centre for Theoretical Physics, Trieste, Italy (kucharsk@ictp.it), (4) European Centre for Medium-Range Weather Forecasts, Reading, United Kingdom (roberto.buizza@ecmwf.int), (5) University of L'aquila, L'aquila, Italy (guido.visconti@aquila.infn.it)

The dynamical coupling between the troposphere and the lower stratosphere has been investigated using a low-top, intermediate complexity model provided by the Abdus Salam International Centre for Theoretical Physics (SPEEDY). The key question that we wanted to address is whether a simple model like SPEEDY can be used to understand troposphere-stratosphere interactions, e.g. forced by changes of sea-ice concentration in polar arctic regions.

Three sets of experiments have been performed. Firstly, a potential vorticity perspective has been applied to understand the wave-like forcing of the troposphere on the stratosphere and to provide quantitative information on the sub seasonal variability of the coupling. Then, the zonally asymmetric, near-surface response to a lower-stratospheric forcing has been analysed in a set of forced experiments with an artificial heating imposed in the extra-tropical lower stratosphere. Finally, the lower-stratosphere response sensitivity to tropospheric initial conditions has been examined.

Results indicate how SPEEDY captures the physics of the troposphere-stratosphere connection but also show the lack of stratospheric variability.

Results also suggest that intermediate-complexity models such as SPEEDY could be used to investigate the effects that surface forcing (e.g. due to sea-ice concentration changes) have on the troposphere and the lower stratosphere.