



## **Local effects of climate change over the Alpine region: A study with a high resolution regional climate model with a surrogate climate change scenario**

Erika Coppola, Eun-Soon Im, and Filippo Giorgi

The Abdus Salam International Centre for Theoretical Physics, Earth System Physics Section, Trieste, Italy (coppolae@ictp.it)

We discuss a surrogate climate change (SCC) simulation over the Alpine region with a high resolution regional climate model (RegCM3) using a fine scale sub-grid land surface representation. Multi-year simulations are completed with an imposed illustrative 3K warming on the forcing large scale meteorological conditions and on the sea surface temperatures in the interior domain. The corresponding relative humidity is kept constant, which results in an increase of atmospheric moisture. We find that in the winter season precipitation increases consistently with the SCC approach, with a significant dependence on topographical elevation. Other components of the surface energy and water budgets also show a marked elevation dependency, mostly tied to changes in snow cover. In summer, contrary to what might be expected from the SCC forcing, precipitation decreases over the Alpine mountain chain. This is due to a local surface-atmosphere feedback mechanism involving reduced snow cover and soil moisture at the beginning of summer. Our results suggest that over the Alps during summer local feedbacks related to the surface energy and water budgets are important factors in determining the precipitation response to global warming. This result might extend to other mid-latitude mountainous areas.