

Climatic change projections and Aerosol indirect effects in complex orography area

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Background: Mountains are dependent on climatic conditions that vary in function of altitude: gaining a deeper understanding of the possible changes in climate for regions with complex orography continues to be one of the main challenges of this century.

In my PhD research we aim to:

- Highlight the possible elevation dependent changes of climatic indices;
- Study climatological indirect effects of aerosols on complex orography environment;

Data: 30-year historical simulations (1979-2008) and climate-change projections (2038-2068, RCP8.5) have been run at a spatial resolution of 4 Km to resolve convection, with initial and boundary conditions provided by EC-Earth 25Km over the Great Alpine Region (GAR). In addition, 5-years long simulations have been run with different concentration of aerosols.

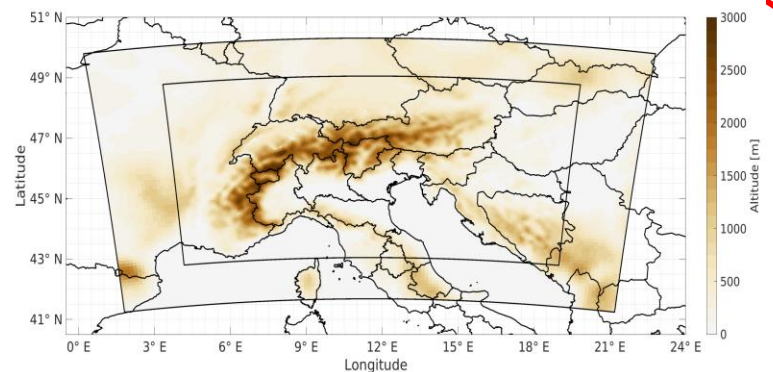


Figure 1: Domains of the simulations

Climate study: for the objective measurement and characterization of climate variability and change, a suite of climate indices ETCCDI has been used to evaluate a possible future-past change as a function of altitude.

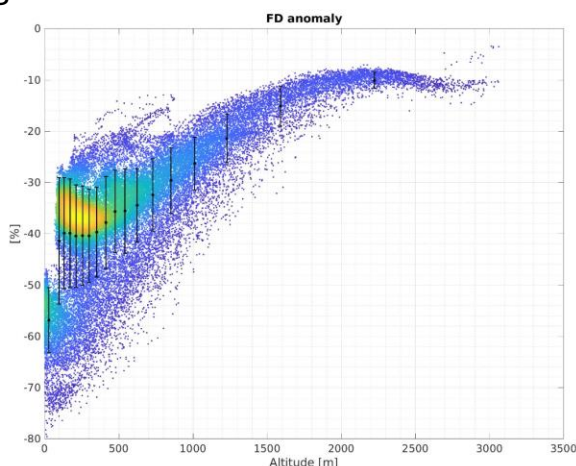


Figure 2: relative variation of the mean annual number of days with minimum temperature below 0°C (frost days) in function of the altitude

Aerosol study: variables as surface temperature, cloud fraction and precipitation in two different seasons (DJF, JJA) has been analyzed to evaluate possible different indirect effects at different altitudes.

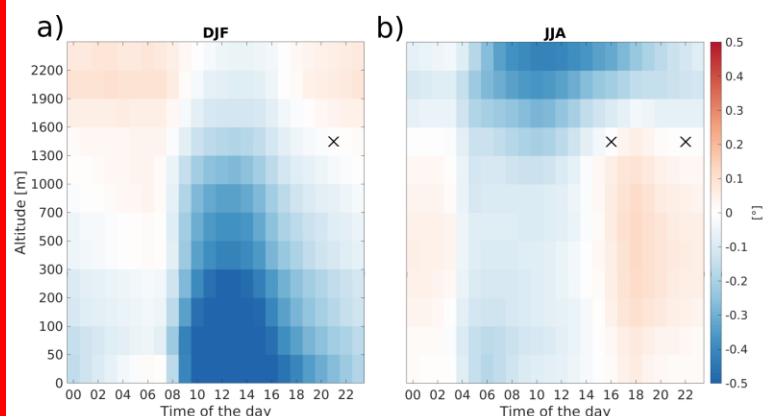


Figure 3: Difference of the mean temperature at 2 metres in function of the time and the altitude in different seasons.

Conclusions:

- Climate change could have potential different effects depending on the altitude: knowing the physical phenomena is important for adapting the population and mitigating climate change in complex orographic areas.
- Pollution increases the possibility to have clouds and, consequently, the indirect effects of aerosols can lead both to surface warming and surface cooling depending on season and altitude