Project: **961**
Project title: **BINGO**
Project lead: **Uwe Ulbrich**
Report period: **2016-01-01 to 2016-12-31**

Simulations Complete (up to 31.10.2016):

1. EURO-CORDEX 0.11° domain simulations, with ERA-Interim lateral boundary conditions.

These were performed for the years 1979-1989 and 2009-2015, i.e. the periods not covered by the CORDEX experiment. These simulations were rejected in our first application for 2016, so were carried out during the second half of the year after the committee reversed their decision.

2. Downscaling of MiKlip predictions (2015-2024) to 0.11°.

All 10 realistions of the MiKlip baseline1 predictions (2015-2024) have been downscaled to 0.11°. This was done using the already-downscaled 0.44° regionalized MiKlip simulations as lateral boundary conditions. 0.11° resolution is somewhat of a "breakthrough" resolution, which has been shown to add significant value to coarser model output for the simulation of (non-convective) precipitation extremes, particularly in mountainous regions, and can modulate the climate change signal of coarser resolution models [Heikkilä et al., 2011; Torma et al., 2015]. To reduce computational expense, two sub-domains were created covering 5 of the six BINGO research sites (Figure 1). The downscaling for the remaining site (Cyprus) is being carried out by project partners with WRF. Our initial plan was to downscale only 4 realizations, but we increased this to 10 due to the slower progress of the high-resolution downscaling (see point 3 below). These simulations will be made available to the MiKlip community.

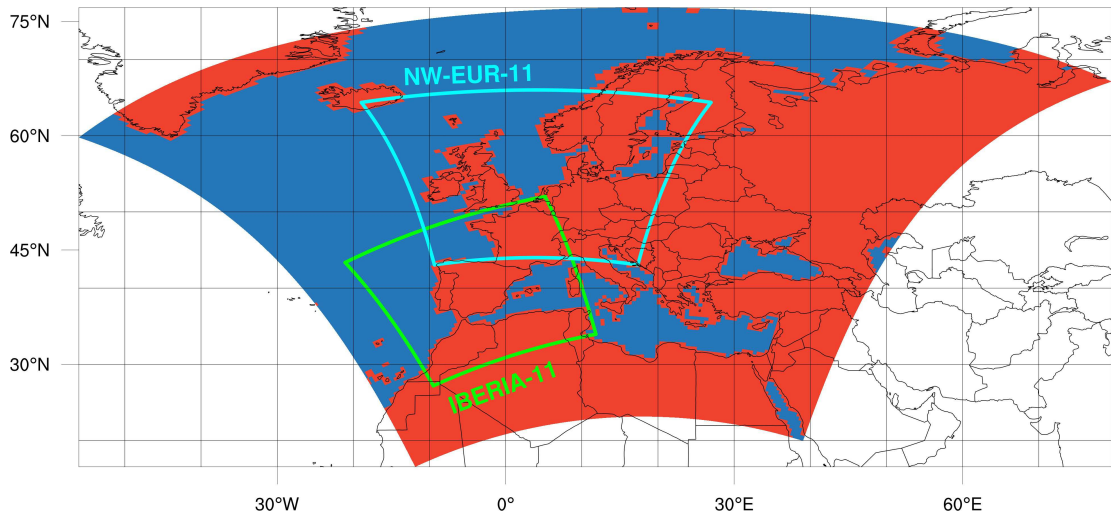

Figure 1. 0.11° MiKlip domains (Iberia and NW-Europe), with 0.44° simulations as boundary conditions (shaded region)

3. High-resolution dowscaling of extremal episodes

The 0.02° high-resolution downscaling began by simulating a test-event for each research site, in order to gauge feedback from our project partners. Following some slight adjustments in response to partner feedback, the main downscaling of extremal episodes from the ERA-Interim-forced 0.11° simulations is now underway. We hope to complete this by the end of the year.

The beginning of the high-resolution downscaling has been subject to quite a delay. Our dowscaling approach (discussed in the project application) is based on the identification of extremal weather patterns for each research site and then only downscaling those days on which such patterns occur, in order to reduce compuational expense. The identification of extremal patterns and the extraction of 'extreme days' from the daily model data proved to be more challenging than expected. We had hoped to be able to narrow the number of simulation days down to about a hundred per site, but this has not yet proven possible and instead we need to simulate a lot more days. To partly mitigate the greater computational expense, we now simulate just one realization of each “event”, rather than multiple realizations of fewer “events” as previously intended.

References

Heikkilä, U., et al., Dynamical downscaling of ERA-40 in complex terrain using the WRF regional climate model, Climate Dynamics, 37, 1551-1564 (2011).

Torma, C., et al., Added value of regional climate modeling over areas characterized by complex terrain – Precipitation over the Alps, Journal of Geophysical Research: Atmospheres, 120, 3957-3972 (2015).