ECLISE final DKRZ report:

ECLISE was a European FP7 project in which researchers, in close cooperation with users, developed and demonstrated local climate services to support climate adaptation policies. The goal was to provide climate services for several climate-vulnerable regions in Europe, organized at a sectorial level: coastal defense, cities, water resources and energy production. Furthermore, ECLISE was designed to define, in conceptual terms, how a pan-European Climate Service could be developed in the future, based on experiences from the before mentioned local services and the involvement of a broader set of European decision makers.

Amongst other tasks, the Climate Service Center Germany (GERICS) was engaged in the working package WP2: MODELS. Within this working package a set of experiments with high-resolution non-hydrostatic regional climate models (NHRM) was conducted for the island of Crete. The models were run at resolutions of ~2km. Here the Climate Service Center participated by providing the boundary data that was used for all model simulations and by contributing six high resolution non-hydrostatic model simulations to the ensemble, created with the regional climate model REMO-NH.

In the first block the experiments were done for observed extreme events using lateral boundaries (LBC's) from a “poor-man's” reanalysis. This data was created with the regional climate model REMO by downscaling ERA-Interim reanalysis data using frequent re-initializations towards its driving fields at a horizontal resolution of approximately 12 km covering the period 1989 to 2008 (Dee et al., 2011).

In the second block of experiments, the simulations were re-run with perturbed lateral boundary conditions which represent a changed warmer climate. The perturbation of +2C was applied uniformly to the lateral and surface boundary conditions of the NHRMs (this included an increase in SSTs as well as surface temperatures). This level of warming was chosen, as this is approximately the amount of warming that one might expect to happen in the future. The relative humidity was assumed to remain constant, which seems at least for the lower troposphere a reasonable assumption (Held and Soden, 2006) though there are indications that this may not be the case in the upper troposphere (Minschwaner, 2006). As such, the specific humidity increases in response. Although this is a simple idealized approach, it already represents a large climate change signal, represented by the increase in absolute humidity, the height of the troposphere, and the tropopause height (Attema et al., 2014).

An expected result is that the NHRMs simulate much higher precipitation with more detailed geographic structure, compared to the lower resolved ERA-Interim dataset, in all three cases. Fig. 1 illustrates these findings by showing the daily precipitation sums and the 2m temperature daily mean fields for REMO-NH and ERA-Interim on the 17^{th} October 2006. It was also found that the different models simulate the precipitation event differently. The intensity of the maximum precipitation is highly sensitive to the choice of NHRM. Also the climate change signal appears to be different between the different models, although it clearly shows, that the warmer situation in the +2C case leads to stronger precipitation.

More information about the project and the results of the study can be found on the project website and in the project report for WP2.4:

http://www.eclise-project.eu/

http://www.eclise-project.eu/content/mm_files/do_825/ECLISE_D2_4_final_140131.pdf

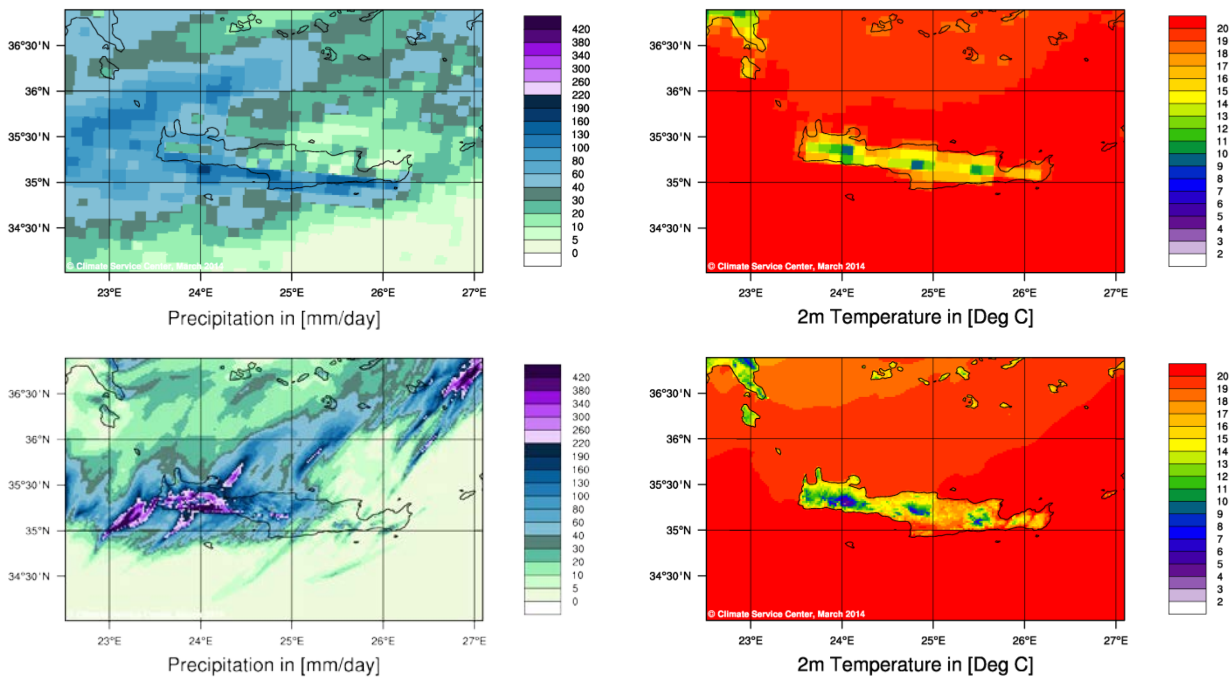

Fig. 1: Precipitation daily sum (left) and 2m temperature daily mean field (right) for the 17th October 2006 as simulated with ERA-Interim (top) and REMO-NH (bottom).