WCRP CORDEX 17TH-20TH MAY 2016 STOCKHOLM, SWEDEN ICRC-CORDEX 2016

PARALLEL SESSION B : FRONTIER DOWNSCALING TOOL
B2: HUMAN-CLIMATE REGIONAL INTERACTIONS, TOWARDS RESMS

Biogeophysical effects from land-cover changes in Europe

Gustav STRANDBERG

SMHI - Sweden

This study aims to estimate the magnitude and size of biogephysical forcing in Europe. Globally the green-house gas forcing is of much greater importance, but on local/regional scale the size of the biogeophysical forcing may be of equal size. Furthermore, the sign of the biogeophysical forcing varies between regions. The biogephysical forcing is a potentially large forcing that is not well constrained. Three scenarios for land-cover changes are simulated: 1) potential vegetation 2) present conditions and 3) potential deforestation. By comparing these three scenarios of land use we can estimate the impact of historical land-cover changes until today and also investigate the possible effects of deforestation and afforestation as possible mitigation strategies for the future.

The sensitivity in climate to changes in land cover is simulated by two RCMs, RCA4 and HCLIM. To minimise model dependencies in the results the RCM simulations are driven by the ERA Interim observation set. Both RCA4 and HCLIM reads the same vegetation files. By using the same climate forcing in all simulations and the same vegetation forcing in both models the results, and differences in results, in the two RCMs are only an effect of how vegetation and climate interacts within the RCMs. This approach minimises model dependencies and at the same time estimates the potential spread in results between models. Most previous studies have been relying on results from a single model.

The response in temperature can be as much as ±1.5 °C (somewhat more in maximum temperature and less in minimum temperature) in summer depending on local/regional surface characteristics. Generally changes in heat fluxes and evaporation have a larger effect than changes in albedo. The results show that land-cover changes can have significant effects on the simulated climate and be a driver of climate change at the regional scale. Furthermore they show that climate-vegetation interactions must be simulated with high resolution since the response depend on small scale features. Changes in vegetation as a mitigation strategy should be used with caution since it may lead to undesired climate change at the local/regional scale.

Gustav Strandberg [1,2]

[1] SMHI, [2] Department of Meteorology and Bolin Centre for Climate Change Stockholm Universitycal