VIII – Climate modelling, observations and scenarios: user needs for adaptation

Parallel session B – Monday 10th March 16:00-17:30

ID Nº: [149]

Title: **LAND USE ALTERATIONS DUE TO CLIMATE CHANGE: APPLICATION OF A SPATIAL INTERACTION MODEL TO TADAHART – TANGER (MOROCCO)**

Authors: Paulo Silveira[1]; Vasco Silva[2]; Eduardo Brito de Azevedo[3]; Eric Masson[4]; Abdel Khattabi[5]; Marco Antonellini[6]; Tomaz Dentinho[7]

Institutions: [1]University of Evora; [2]University of Azores; [3]University of Azores (CMMG - Center of Climate, Meteorology and Global Change); [4]Université des Sciences et Tecnologies, Lille; [5]Ecole Nationale Forestiére d'Ingenieurs, Rabat; [6]IGRG – University of Bologna; [7]University of Azores (CEAAplA - Centre of Applied Economics Studies of the Atlantic)

The impact of Climate Change on the different human activities is well known, namely in activities that are more dependent on environmental factors such as agriculture. It is important to assess these impacts in order to promote correct adaptive policies that minimize Climate Change repercussions on the development of societies.

Spatial Interaction Models have been used in the impact estimation of different scenarios regarding land use management due to their ability of simulating future land use based in environmental and socioeconomic variables. Subsequently, new land use maps can be generated as a feedback to variations of the input and control variables that reflect changes in terms of current conditions and policies.

With the support of suitability maps for different land use categories, which result from the environmental conditions of the case study regions such as soil, precipitation, temperature and orography, coupled with socioeconomic variables, like productivity of the land and of men, consumption patterns, commuting patterns, among others, it is possible to simulate land use patterns with a previously developed Spatial Interaction Model. This tool has been used as a Decision Support System (DSS) for a reasonable number of projects.

In this presentation, we intend to demonstrate the feasibility of this instrument as a tool for possible future land use scenario simulation by considering a specific Climate Change scenario produced by IPCC (Intergovernmental Panel on Climate Change). This case of study reports the region of Tahadart Basin in Tanger (Morocco) and respective surrounding provinces within CIRCLE-MED Project WATERKNOW, which also includes Terceira Island in Azores (Portugal) and Quinto Bacino in Ravena (Italy) as case studies. Future land use scenarios were generated using IPCC A1b and A2 Climate Change scenario. It was assumed that no substitute activities appear to compensate the lack of income from a possible loss of some of the presently favored land use categories.

The land use changes are evident within the three regions due to alterations of the local environmental conditions, which results in a loss of population due to modifications of the employment structures within the areas.

Presenter

Name: Paulo Silveira

Email: paulosilveira@uac.pt

Conference on European Climate Change Adaptation
Research and Practice

ID Nº: [229]

Title: **CONSTRUCTION OF REDUCED-FORM ENSEMBLES OF CLIMATE SCENARIOS FOR IMPACT/ADAPTATION STUDIES**

Authors: Martin Dubrovsky[1]; Ian Holman[2]; Miroslav Trnka[3]

Institutions: [1]Institute of Atmospheric Physics ASCR, Prague, Czech Republic; CzechGlobe - Center for Global Climate Change Impacts Studies, Brno, Czech Republic; [2]Cranfield Water Science Institute, Cranfield University, UK; [3]Institute for Agrosystems and Bioclimatology, Mendel University, Brno, Czech Republic; CzechGlobe - Center for Global Climate Change Impacts Studies, Brno, Czech Republic

Data: 2013-12-09 13:47:39

It is desirable that the climate change (CC) impact/adaptation studies use an ensemble of CC scenarios, which capture uncertainties in future climate projection. This contribution presents two approaches used in the CLIMSAVE project (www.climsave.eu) to create reasonably large ensemble of scenarios for a web-based Integrated Assessment Platform: (A) GCM-based scenarios are created by the pattern scaling method, in which the standardised scenarios derived from multiple GCMs (CMIP3 database) are scaled by multiple values of the global mean temperature change determined with the MAGICC model run for various combinations of emission scenario and climate sensitivity. To reduce the size of the scenario ensemble (and thereby reduce the risk of user confusion), we developed an objective methodology for choosing a representative subset of GCMs which aims to preserve inter-GCM variability. (B) UKCP09 ensemble of scenarios (available only for a territory of UK) is based on eleven variants of the Met Office Regional Climate Model driven by HadCM3 Global Climate Model. The original UKCP09 ensemble of 10000 realisations of climate scenario (for each single gridbox, timeslice and low/middle/high version of the scenario) was screened with the aim to choose 27 scenarios representing 3´3´3 combinations of low/middle/high changes in mean annual temperature, summer precipitation and winter precipitation. The contribution consists of three parts: (i) Description of the methodologies used to derive the two scenario ensembles. (ii) Comparison of probability distribution functions of changes in precipitation and temperature based on the two ensembles (for a territory of UK). (iii) Example Europe-wide study, in which the CMIP3-based scenarios were used to assess climate change impacts on a potential occurrence of important pest (*Ostrinia nubilalis*) and number of days with snow cover.

Acknowledgements: The study was supported by project Building up a multidisciplinary scientific team focused on drought (No. CZ.1.07/2.3.00/20.0248), project CLIMSAVE (EU FP 7. Contract No. 244031), and WG4VALUE (project LD12029 sponsored by the Czech Ministry of Education, Youth and Sports).

Presenter

Name: Martin Dubrovsky

Email: madu1110@gmail.com

ID Nº: [71]

Title: **SPATIAL AND TEMPORAL ANALYSIS OF FUTURE CLIMATE TRENDS IN THE LOIRE VALLEY, FRANCE**

Authors: Etienne Neethling[1]; Hervé Quénol[2]; Gérard Barbeau[3]

Institutions: [1]COSTEL-UMR 6554 LETG du CNRS (Rennes, France) and INRA-UVV (Angers, France); [2]COSTEL-UMR 6554 LETG du CNRS (Rennes, France); [3]INRA-UVV (Angers, France)

According to the latest climate projections published by the IPCC, the average global temperature will increase by 1 to 3.7°C towards the end of the 21st century, depending on the region, climate model and socio-economic scenarios. The impacts of climate change are already visible and prominent on perennial crops, particularly in viticulture. In order to preserve the quality and uniqueness of wines from different designation of origins, a better understanding of future climate changes will allow to better reason the adaptation strategies to implement at different spatial and temporal scales. In this context, this paper aims to analyze the spatial and temporal variability of future climate trends for seven weather stations in the Loire Valley, France.

Daily temperature (min, max) and precipitation data from the outputs of the ARPEGE climate model (scenario A1B), disaggregated by CERFACS (resolution of 8 km in France) were used. First, the simulated data were compared with observed data from seven weather stations of Météo France over a control period (1960-2000), to assess the eventual bias. Secondly, the simulated data were used to study the trends in climate conditions, bioclimatic indices and frequency of climatic extremes, towards the end of the 21st century. The temporal analysis was performed for three future horizons: 2020 to 2030 (short term), from 2050 to 2060 (medium term) and 2080 to 2090 (long term). Also, the simulated data for these three future periods were compared to the observed data of a reference period (1981-2010) for the seven locations.

For all the weather stations, simulated data has shown a warm bias for the minimum observed temperatures and cold bias for maximum observed temperatures. Despite the resulting uncertainties, the results shows that mean annual temperatures will increase by 2.5°C, towards the end of the 21st century. Regional differences appear: minimum temperatures increased more significantly in the west of the Loire Valley whereas the increase in maximum temperatures shows a west to east gradient. According to the Huglin Index, all seven locations in the Loire Valley will change from a temperate climate to a warm temperate climate by 2050. Precipitation trends were more complex, but the future tendency is towards a decrease. Finally, results show that in the far future (2080), climate conditions will be significantly different from those previously observed in the Loire Valley. These disaggregated climate projections at a 8 km resolution have permitted a better analysis of future climate trends. The results allow to better reason the adaptation strategies to implement at different spatial and temporal scales in the vineyards of the Loire Valley, France.

Presenter

Name: Etienne Neethling

Email: eneethling@angers.inra.fr

ID Nº: [261]

Title: **MAPPING OBSERVED ADAPTATION-RELEVANT CHANGES IN LOCAL CLIMATE**

Authors: David Stainforth[1]; Sandra Chapman[2]; Nicholas Watkins[1]
Institutions: [1]London School of Economics; [2]University of Warwick

[Descrição]

Climate change adaptation activities take place at regional and local scales. It is at these spatial scales that observed and predicted changes in climate are directly relevant for adaptation planning. Complex climate models are often the primary source of such information yet such models face significant questions of robustness and reliability as a basis for forecasts at these scales [Stainforth et al., 2007, van Oldenburg et al. 2009]. Here we present results of an approach which is independent of climate models and instead uses observational timeseries to evaluate the sensitivity of different parts of local climatic distributions. The approach tells us about the changing shape of local climate and can be focused on decision-relevant thresholds [e.g. Porter and Semenov, 2005]. By using only observations the results inherently integrate information relating to local influences on climate.

Our approach takes timeseries of local daily temperature or precipitation from specific locations and extracts the changing cumulative distribution function over time. Changes at different quantiles are extracted using a simple mathematical deconstruction of how the difference between two observations from two different time periods can be assigned to the combination of natural variability and/or the consequences of climate change [Chapman et al. 2013]. These changes are, of course, geographically varying across Europe but we find many regionally consistent patterns of response which are of value in adaptation planning.

Given the limited length of the observed time-series, and the existence of multi-decadal natural variations, most conventional statistical approaches to uncertainty assessment are inappropriate for this analysis. It is nevertheless possible to take a conservative approach to the data analysis and identify robust patterns of change.

Recently published results for summer and winter temperatures across Europe [Stainforth et al. 2013] will be presented along with new results of changing precipitation patterns.

While the results cannot, of course, be predictive, they can paint a detailed picture of the geographical patterns of observed changes at decision-relevant thresholds. Such information is potentially valuable for the prioritisation of adaptation activities.

References:

- Chapman, S.C., et al., 2013. On Estimating Local Long Term Climate Trends. Phil. Trans. Roy. Soc. A, 371.

- Porter, J. and Semenov, M. Crop responses to climatic variation. Phil. Trans. R. Soc. B. 2005 vol. 360 no. 1463 2021-2035

- Stainforth, D. A., et al., 2007. Confidence, uncertainty and decision-support relevance in climate predictions. Phil. Trans. R. Soc. A-Math. Phys. Eng. Sci. 365:2145-2161.

- Stainforth, D. A., et al., 2013. Mapping climate change in European temperature distributions, Environmental Research Letters.

- van Oldenborgh G J, et. al., 2009 Western Europe is warming much faster than expected. Clim. Past 5 1–12

Presenter

Name: David Stainforth

Email: d.a.stainforth@lse.ac.uk