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ENSEMBLES Newsletter

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Editorial

Welcome to the seventh ENSEMBLES Newsletter. The European Commission's sixth Framework Programme supports the ENSEMBLES project as a 5-year Integrated Project, under the Thematic Sub-Priority 'Global Change and Ecosystems'. ENSEMBLES has now been running its fourth year and this newsletter outlines the progress of the several project Research Themes.

Many thanks to all the ENSEMBLES partners who have contributed to this issue.

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Project progress overview

RT0: Project integration, management and promotion.

Work is now well underway for the planning of the fifth General Assembly (to be held in Santander, 20-23 October) and for the Final Symposium (which will be held at the Met Office, Exeter in 2009) following further discussion at the Management Board in May. Details of the General Assembly will be published on the project website over the summer. Progress has also been made on the nature and timeline for the publication of the final project report. The six-monthly reporting cycle in February was successfully completed and a delay identified in data provision from one partner for "stream 1" which is now being managed so as to impact as little as possible on downstream users. A joint meeting between AMMA and ENSEMBLES was successfully organised and run in Niger in May (Figure 1). The meeting was about climate change and its impacts, RCM modelling and seasonal to decadal forecasting, all in West Africa. The meeting was attended by seven ENSEMBLES experts.

Figure 1: Attendees at the AMMA-ENSEMBLES meeting in Niger (May 26-29).

RT1: Development of the Ensemble Prediction System

The "stream 2" simulations are now well underway and some partners have completed them already. Further progress has been achieved towards the implementation of a Bayesian technique for probabilistic climate predictions from perturbed physics ensembles based on HadCM3, including generation of a new ensemble sampling uncertainties in terrestrial carbon cycle processes and development of methods to estimate the impacts of structural modelling errors through inclusion of results from other climate models (Figure 2).

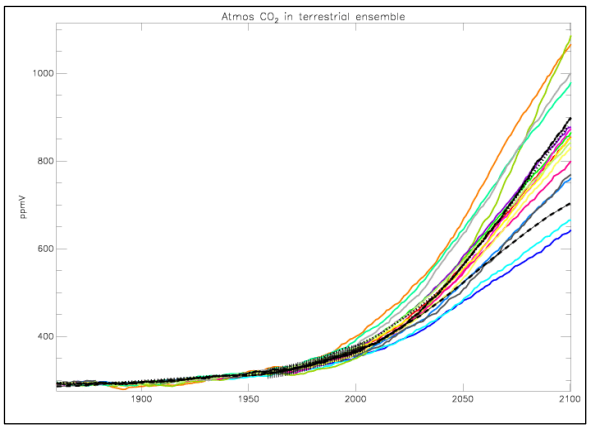

Figure 2: Carbon dioxide concentrations produce using the HadCM3C coupled carbon cycle model with perturbations to parameters which control terrestrial carbon cycle processes. The experiments are forced by historically observed changes in CO_2 emissions and future emissions under the SRES A1B scenario.

Analysis of the large ensemble of HadCM3L climate projections from climateprediction.net has continued, including methods to obtain probabilistic estimates of future climate designed to maximise the influence of observational constraints. Comparison of simulated cloud feedbacks has also progressed by comparing ensembles based on the IPCC AR4 multi-model runs, and perturbed physics ensembles using both the HadCM3 and EGMAM models, in order to assess how the spread of results depends on the method chosen to sample modelling uncertainties. A workshop was held on "Assessing and developing ENSEMBLES approaches to climate prediction from a season to a few decades ahead", including discussions on assessment of the "stream 1" seasonal to decadal (s2d) hindcasts, comparing results from separate multi-model, stochastic parameterisation and perturbed parameter approaches to the sampling of modelling uncertainties. Moreover, the RT1 group has managed to get a direct link to the ENSEMBLES pages on the ECMWF front page: *http://www.ecmwf.int*.

RT2A: Production of seasonal to decadal hindcasts and climate change scenarios

Production of decadal hindcasts for "stream 2" has been completed, while the production of the "stream 2" seasonal-to-decadal hindcasts is under way. Met Office "stream 2" seasonal forecast simulations (using a system based on HadGEM2) have been completed for the 1960-1982 period. The version of the CNRM-CM3.3 coupled model in preparation for the "stream 2" simulation has been further improved to ensure a more accurate conservation of the exchanged fields, particularly between sea-ice and ocean, and tested in control simulations for the pre-industrial conditions. Test simulations with the new model configuration (aerosols, variable land use, and new ozone climatology) show global mean near surface warming for pre-industrial climate in the control run. Thus, some small tuning of cloud parameters was necessary for the "stream 2" model version. Setting up of HadGEM2-AO and HadCM3C models and forcings consistent with the agreed common experimental design for "stream 2" is almost complete. Simulations for the 20th century are in progress. Daily and 6-hourly diagnostics will be included in the archived data compared to those disseminated from HadGEM1 simulations in "stream 1", and HadCM3C will include diagnostics to analyse the carbon cycle system dynamics, e.g. implied carbon emissions.

RT2B: Production of Regional Climate Scenarios for Impact Assessments

Most partners have completed their obligatory transient simulations, which are now available at the ENSEMBLES RCM database at DMI. Some partners have extended their transient simulations from 2050 to 2100. All partners who had started their transient RCM simulations before the GA in Prague sent preliminary results of their runs to MPI-M for inclusion into the so-called Quick-Look analysis (Figure 3). Results of the Quick-Look analysis were presented at the GA in Prague and can be accessed from the RT3 website.

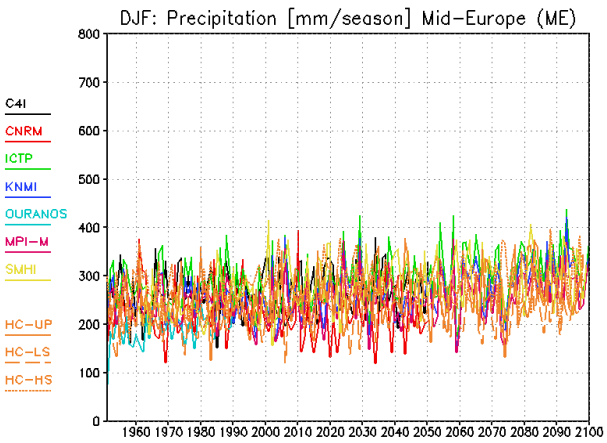

Figure 3: Seasonal sum (DJF) precipitation [mm/season] for PRUDENCE region 4 (Mid-Europe).

The web-based statistical downscaling and data access portal has been updated and now incorporates four streams of data: observations, reanalysis, seasonal to decadal, and climate change scenarios (Figure 4). Progress has continued to be made on statistical downscaling work by many groups, who are now well placed to start applying these methodologies to GCM outputs from the CERA database and RT2B data access tool over the coming months. A number of papers have been submitted and published by RT2B partners. The RT2B leaders have co-ordinated production of ENSEMBLES Technical Report No. 4. 'Information on observations, global and regional modelling data availability and statistical downscaling'.

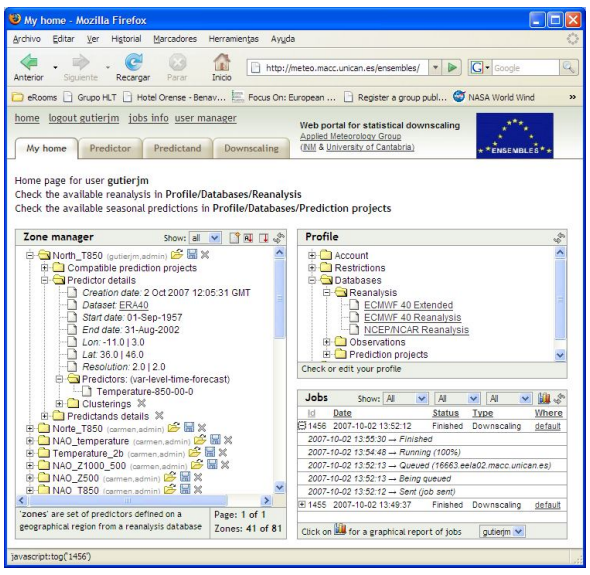

Figure 4: Main window of the Statistical Downscaling portal.

RT3: Formulation of very high resolution Regional Climate Model Ensembles for Europe

Efforts on the performance based regional climate model weights have resulted in the following set of metrics, defined with the help of the ERA40 driven simulations at 25 km resolution:

f1: large scale circulation based on a weather regime classification

f2: meso-scale signal based on seasonal temperature and precipitation analysis

f3: probability density distribution match of daily and monthly temperature and precipitation analysis

f4: extremes in terms of re-occurrence periods for temperature and precipitation

f5: trend analysis for temperature

f6: representation of the annual cycle in temperature and precipitation

Although not comprehensive, these metrics cover a wide range of the so-called added value measures for dynamical down scaling along with some of the minimal requirements for a model to be assessed as credible. When appropriate, the metrics are defined for different seasons and both for sub-regions and for the whole European continent. A single weight for each RCM is achieved by an appropriate multiplication of f_1, f_2,…,f_6.

Another main thrust has been on getting underway with the regional climate model runs for Western Africa runs. The model domain (Figure 5) and simulation periods have been agreed. There are two simulation streams. In the hindcast/evaluation stream, ERA-interim data would be preferred as boundary conditions. The availability of these data is being investigated. The scenario stream focuses on the 1990-2050 period, and follows the A1B SRES scenario as run by RT2A global climate models.

RT4: Understanding the processes governing climate variability and change, climate predictability and the probability of extreme events

A large number of tasks have been accomplished by RT4 partners over the past months. A few of them include the following: CNRS-IPSL has assessed the different contributions of the radiative feedbacks (cloud, water vapour and surface albedo) that contribute to the multi-model mean and inter-model spread

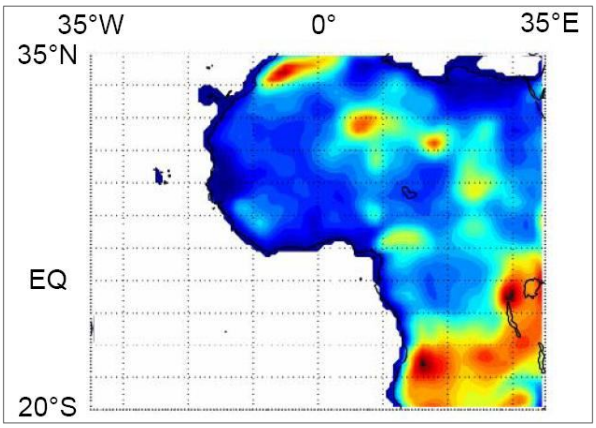

Figure 5: The RT3 Western Africa regional model domain covers the area of 35°W-35°E, 20°S-35°N. The colour scale represents orography.

of global warming estimates for an ensemble of 12 climate models that participate to CMIP3-AR4 simulations. CNRS-IPSL and METO-HC have continued their collaboration on the reduction of climate-carbon cycle feedback using observational constraints. Observed seasonal cycle of atmospheric CO_2 data from the NOAA CMDL database has been compared with models. Extensive analysis of the dynamics of the North Atlantic Sub-Polar Gyre has been carried out by NERSC based on available hydrography and with a dedicated OGCM run in hind-cast mode for the period 1948 to present. Hydrography, circulation, SSH and surface forcing fields have been extracted from the IPCC-suite of models (CTRL and Scenario A2) in order to compare the dynamics of the coupled models with that of observations and the hind-cast simulation. CERFACS has completed a preliminary study of the uncertainties associated to the European summer precipitation late 21st century changes with a specific focus on the role of large-scale circulation. IFM-GEOMAR analysed impact of climate change on tropical storm variability, and how sensitive the results are to model resolution. INGV has completed the analysis of the interaction between NAO and ocean circulation in the North Atlantic sector. The dynamics and variability of the North Atlantic Sub-Polar Gyre have been investigated in the IPCC-suite of models for two set of integrations: CTRL and Scenario A2. UREADMM has been focusing on understanding the transient adjustment processes of land sea warming in response to the direct CO_2 change and indirect SST change induced by double CO_2 forcing using HadAM3 simulations. CNRM has explored the influence of the land surface hydrology on seasonal climate variability and predictability using ensembles of sensitivity experiments with the Arpege-Climat AGCM.

RT5: Independent comprehensive evaluation of the ENSEMBLES simulation-prediction system against observations/analyses

The gridded observational datasets of daily precipitation and temperature covering the period 1950-2006 are made available on a 0.25 and 0.5 degree regular lat-lon grid, as well as on a 0.22 and 0.44 degree rotated pole grid (the same grid as used in many RCMs). This long-term daily station dataset will be valuable for monitoring impact relevant extremes. For example, Figure 6 presents trends in the number of frost days in winter over the period 1976 - 2006 and Figure 7 shows trends in the warm spell duration in summer for the same period. Note that the colour bar is different in the two figures, so as in both cases red colour to indicate warmer and blue to reveal colder conditions.

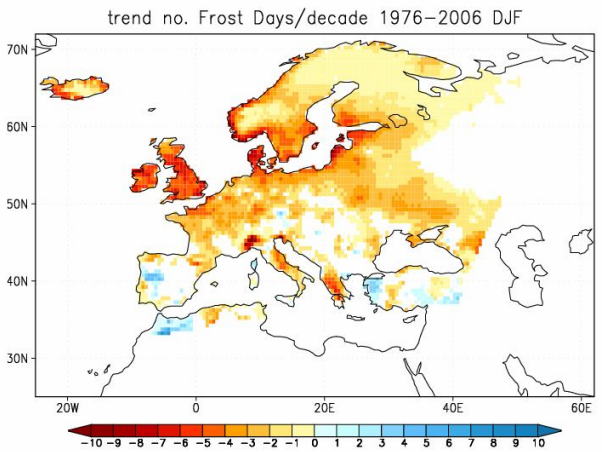

Figure 6: Illustration of trends in number of frost days in winter over the period 1976- 2006, based on the daily gridded observational dataset.

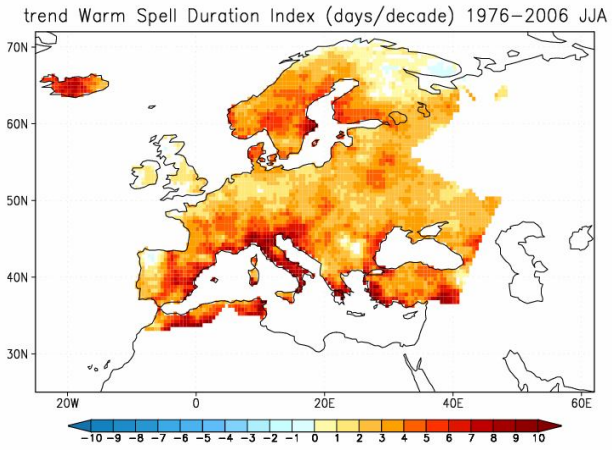

Figure 7: Illustration of trends of warm spell duration for summer over the period 1976- 2006, based on the daily gridded observational dataset.

The daily datasets are available from: *http://eca.knmi.nl/ensembles*. The role of convection in the simulation of the climatic conditions in the Indian Ocean has been investigated. Preliminary results indicate that the convection scheme has a large impact on the intraseasonal variability, and on the coupling between ocean-and atmosphere at this time scale. The evaluation of coupled models capability to reproduce the mechanisms governing the climate of the Indo-Pacific region has been extended. The analysis of current and future climates in HadCM3 has been completed with regard to decadal variations in the strength of monsoon-ENSO teleconnections. The results have shown that even under constant forcing the model is capable of producing variations in the strength of the teleconnection, similar to that observed over the last century. IFM-GEOMAR estimated the perfect predictability for the North-Atlantic Sector on seasonal-to-decadal timescales from an ensemble of high resolution simulations. Figure 8 illustrates that predictability estimated with this model is much higher for the tropical regions, reaching a minimum over central western North America, Greenland and northern Europe.

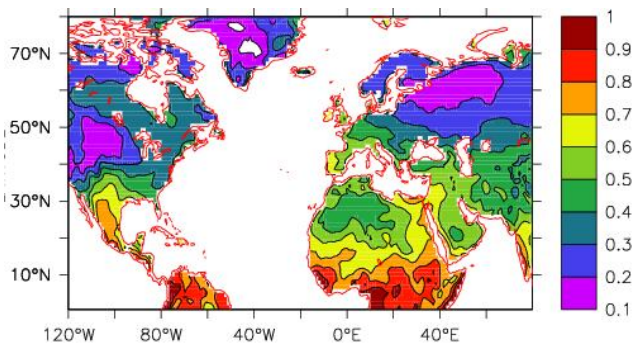

Figure 8: Perfect-model skill of 5-year mean 2-metre temperature variations shows quite some predictability over Europe and North African.

RT6: Assessments of impacts of climate change

The impact response surfaces for the impact model Daisy has continued. The Daisy model is used to simulate winter wheat yields and nitrogen leaching for a selected climate grid in Europe. The effect of CO_2 concentration on crop growth is built into the Daisy model, so the combined impact of changes in precipitation, temperature, and CO_2 can be simulated. Generation of preliminary Durum wheat risk probability maps over the Mediterranean area and an application of the methodology were developed for individual olive trees growth area in order to assess probabilistic variation of the cultivation area in the future. The model constructed for storm loss calculation was applied to nine ENSEMBLES GCM scenario runs of recent and future climate. MeteoSwiss is working together with SwissRe to determine the predictability of European winter storminess and its associated losses using the SwissRe loss model and the ENSEMBLES s2d datasets. Figure 9a represents the Tier-2 correlation skill score of the ensemble mean extreme wind index using the November forecast of the DEMETER s2d data. A more rigorous, probabilistic assessment of the forecast skill (Tier-2) is the Ranked Probability Skill Score (Figure 9b) assessed for tercile forecasts of the extreme wind index. There is little evidence of skill beyond month one of the forecast. Results for the ENSEMBLES "stream 2" ECMWF System 3 model (Figure 10) are very similar to those of the DEMETER model. Little predictability is found beyond month 1 of the forecast. ARPA developed a combined water balance and crop growth model (Criteria/Wofost) that was calibrated and validated at the local scale for the wheat crop.

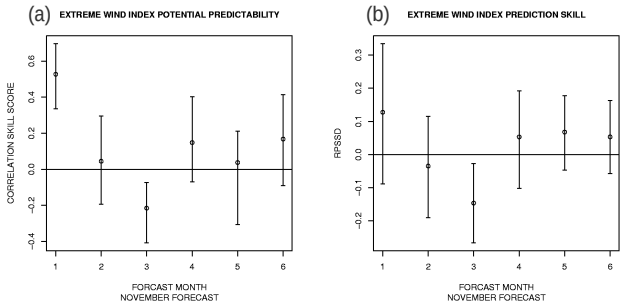

Figure 9: The monthly deterministic and probabilistic skill of the extreme wind index Q95 over western Europe using November DEMETER s2d forecasts. The deterministic skill a) is measured by the correlation between the monthly mean ensemble mean of DEMETER hindcasts and ERA40 (1958-2001). The probabilistic skill b) of the index terciles is assessed using the RPSSd skill score. The number of ensembles members for each of the hindcast years is 9. The error bars on both plots represent the 95% confidence interval based on a bootstrapping technique.

The UniLIV evaluated the sensitivity of tier-3 malaria forecast skill to individual model weight, explored the suitability of kernel dressing methodologies using LSE's EMTOOL for use with malaria forecasts and compared the malaria forecast skill for dressed and undressed ensembles.

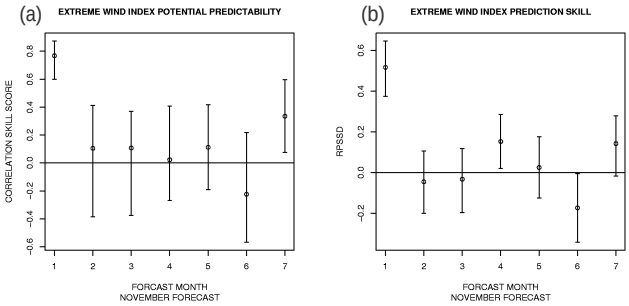

Figure 10: As Figure 9 but using ECMWF system 3 s2d data and the period 1981-2001. The number of ensembles members for each of the hindcast years is 11.

RT7: Scenarios and Policy Implications

The emissions and land use scenarios with and without climate change policy have been completed. RT7 has started a useful collaboration with other Research Themes (RT2A and RT6) aimed to improve knowledge and simulation efforts about feedbacks between climate and economic variables. This is expected to make interfaces between climate and economic sub-models effectively working in the next future.

RT8: Dissemination, Education, and Training

The 6th ENSEMBLES newsletter was produced and this was slightly different than previous newsletters. It was divided into two sections, one dedicated to the Prague General Assembly and the overall project progress and the other section dedicated to the ENSEMBLES side event in Bali. To increase the project's visibility to much wider target audiences than just purely scientific, NOA has made contact with press officers from WHO, IPCC, WWF, FAO, WTO and UNEP, asking them to include ENSEMBLES related material and information in their newsletters. So far positive replies have been received for the Mediterranean Office of WWF and from WHO and WTO. The 16th session of the European Research Course on Atmospheres (ERCA) was held from 7 January to 8 February 2008. It was attended by 55 participants from about 25 countries in Europe, Asia, North and South America, Africa and Australia. The programme included 120 hours of lectures, seminars, panels, poster sessions, visits of research institutes, and a 6-day stay at Observatoire de Haute Provence. A joint ACCENT/ENSEMBLES mentoring programme was launched during the ENSEMBLES GA in Prague. During the GA, training for both Mentors and Mentees was conducted, and a first meeting for Mentor/Mentee pairs was organised for them to agree on a contract.

In addition, a course for PhD students on climate change and health will be conducted as a joint ACCENT/ENSEMBLES activity in July 2008 (Interlaken, Switzerland), and will be financed by the ACCENT NoE (*http://www.accent-network.org*) UNIGENEVA is currently discussing the possibility of organising a meeting dedicated to "Socio-Economic Drivers of Climatic Change" in the Paris region later on this year.

Gender Action Plan

The third annual Gender Action Report was presented to the ENSEMBLES management board meeting in April and is available from the ENSEMBLES web site. It outlines the ACCENT/ENSEMBLES mentoring programme and other activities including plans for receptions at the next General Assembly and this years EMS/ECAC meeting.

Forthcoming meetings

- **RT8 Stakeholder meeting on "Impacts of climate change and extreme events in the Mediterranean"** (*Athens, Greece, 17 September 2008*)
- **Climate change impacts and adaptation: Dangerous rates of change** (*Exeter, UK, 22-24 September 2008*)
- **EMS Annual Meeting European Conference on Applied Climatology (ECAC)** (*Amsterdam, The Netherlands, 29 September–03 October 2008*)
- **ENSEMBLES 5th General Assembly**, *(Santander, Spain, 20-24 October 2008)*
- **RT8/RT7 Workshop on "Socio-Economic Drivers of Climatic Change"** (*Paris, France, dates to be confirmed*)