Project no. GOCE-CT-2003-505539

Project acronym: ENSEMBLES

Project title: ENSEMBLE-based Predictions of Climate Changes and their Impacts

Instrument: Integrated Project

Thematic Priority: Global Change and Ecosystems

Milestone M4.4.1: Development of methodologies to explore climate variability and predictability tested initially on existing simulations for use with the ENSEMBLES multi-model

Due date of deliverable: February 2006
Actual submission date: 10 September 2006

Start date of project: 1 September 2004 Duration: 60 Months

Organisation name of lead contractor for this deliverable: CERFACS

Revision [draft 1]

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the Consortium (including the Commission Services)	

Milestone M4.4.2: Development of methodologies to explore climate variability and predictability tested initially on existing simulations for use with the ENSEMBLES multi-model

In month 1-24 of the ENSEMBLES project, few partners of WP4.4 have contributed to the development of methodologies to explore seasonal-to-decadal climate variability and predictability with a clear focus on the North Atlantic European sector. These contributions have mainly focused so far on the weather and climate regime paradigm and the relevant associated statistical tools (clustering methodologies, non linear principal component analysis, etc …). A specific framework where a global AGCM has been forced with observed diabatic heating has been used to quantify the influence of tropical Atlantic ITCZ fluctuations upon summer weather regimes and associated heat waves. The use of the potential predictability concept based on forced AGCM experiments forced with either or both SST and soil moisture boundary conditions has been used to study the relative influence of SST and soil moisture at seasonal scale. This can be viewed as a two-way analysis of variance (ANOVA) and can be used to analyse the interaction term between soil moisture and SST. The use of an AGCM coupled to a complex mixed-layer has also been used to study the winter variability over the North Atlantic region and, in particular, the persistence of the North Atlantic Oscillation due to the re-emergence mechanism. Summer sub-surface 3-D oceanic temperature anomalies associated with the previous winter NAO are estimated using lagged maximum covariance analysis and used as perturbed oceanic initial conditions for the coupled system. Large ensembles are then performed to test if the oceanic sub-surface memory can influence the atmospheric circulation of the next winter. Some of the main findings of these studies have been included in the associated report written for deliverable **D4.4.1.** Most of these studies have been published (see list below) and the relevant papers are available from the authors for the interested reader.

Publications associated with the project (the names of the participants to the RT4-WP4 of the project are in **bold):**

Christiansen, **B.**, 2006: A cautionary note on the use of Nonlinear Principal Component Analysis to identify circulation regimes. *J.Climate***, in press.**

Cassou C., **L. Terray** and A. S. Phillips, 2005: Tropical Atlantic influence on European Heatwaves. *J.Climate*, **18,** 2805-2811.

Cassou, C., C. Deser, and M. A. Alexander, 2006: Investigating the impact of reemerging sea surface temperature anomalies on the winter atmospheric circulation over the North Atlantic *J. Climate*, **in revision**.

Conil S., H. Douville, S. Tyteca (2006) The relative roles of soil moisture and SST in climate variability explored within ensembles of AMIP-type simulations. *Clim.Dyn.* doi:10.1007/s00382-006-0172-2

Straus, D.M., **S. Corti** and F. Molteni, 2006: Circulation Regimes: Chaotic variability versus SST-forced predictability. *J.Climate*, **in press.**