Climate of the 20th Century project on the summer NAO

Hans W. Linderholm[1] and Chris Folland[2]

[1]Regional Climate Group, Department of Earth Sciences, University of Gothenburg, Gothenburg, Sweden
[2]Met Office Hadley Centre for Climate Change, Exeter, UK

1. Background

Summer climate in the North Atlantic-European sector possesses a principal pattern of year-to-year variability similar to the North Atlantic Oscillation in winter. This 'Summer North Atlantic Oscillation' (SNAO) is defined as the first EOF of July-August extratropical North Atlantic pressure at mean sea level. The SNAO exerts a strong influence on European climate, e.g. rainfall, temperature and cloudiness, but is also associated to climate variability elsewhere, e.g. eastern North America, the Sahel region in Africa and eastern Asia (Folland et al. 2009; Linderholm et al. 2009; Linderholm et al. in review). Moreover, modelling and observational results indicate that SNAO variations are partly related to the Atlantic Multidecadal Oscillation (AMO) on interdecadal time scales.

2. Proposed analyses

This project aims at focusing on *the pattern and impacts of SNAO simulated from multi-models* within the C20C community. From some initial tests with coupled models, we have seen that different models tend to produce different SNAO patterns, or not show reasonable SNAO pattern at all. Thus, we need to separate those models which provide a SNAO pattern from those that don't. Moreover, by calculating the coherency between composite results from different models, we can examine the SNAO impacts simulated by models, and, more importantly, highlight the regions of high SNAO impacts. These results will be compared to those based on reanalysis data.

2.1. The C20C SNAO project will include:

- Evaluation of the SNAO pattern (e.g. Barnston & Livezey 1987; Folland et al. 2009) simulated by individual ensemble members of all participating models
- Examination of basic composite maps for SAT, precipitation, and storm tracks from the different model, to evaluate the impacts of SNAO on different regions (including East Asia) varies between models. This will be compared with observations.
- Examination of lead-lag correlations between simulated SNAO and SST anomalies. Probably SST over the North Atlantic (i.e. the AMO) will account for some part of the SNAO variability on decadal time scales. On interannual time scales more research is needed and the project will include an investigation of links in the models and with HadISST. It is already known that La Nina has some influence (Folland et al, 2009)
- Evaluate the coherence of SNAO impact patterns from different models, e.g. highlight regions with high SNAO impacts. This will provide information on the cause and impact of SNAO associated with prescribed boundary conditions (e.g. SSTA).

2.2. Within the project we will try to focus on some specific topics in addition to the major one of SNAO impacts on Europe. The list may be changed or expanded depending on the specific interest of participating research groups. Topics of interest are:

- SNAO and East Asian summer climate (including temperatures at the Tibetan Plateau)
- Linking SNAO to ENSO and East Asian climate change and variability
- The association of the SNAO with spring NAO
- SNAO and Sahel rainfall
- SNAO and Arctic sea-ice variability
- The association between the SNAO and the Asian (including East Asian) summer monsoon on decadal timescales
- The influence of the AMO on the SNAO, especially on decadal and longer timescales.

3. Timetable

We expect to have the multimodel analyses (2.1.) finished by the end of 2011 using mainly existing integrations with HadISST1, but this is depending on the number of C20C models which are to be used. Our aim is to use at least 10 models and a total ensemble size exceeding 50 especially from 1950. This will be presented in a manuscript to be submitted in mid 2012. Also, we will be focusing on exploring the SNAO summer monsoon (West African and Asian) topics (2.2.) during the first stage of the project, and will aim at having a publication on this submitted by mid-2012. This partly depends on the interest of the participating research groups. Post mid-2012 we will turn the focus to the link between the SNAO and sea-ice variability as well as the influence of the AMO.

4. References

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