

## **Report on the C20C Detection and Attribution of Climate Change project**

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The C20C Detection and Attribution of Climate Change project has been in planning and testing stages since the 5th Workshop, including trials of the experimental setup. A larger trial is just starting, with results planned for September 2012. The formal start of the project, and in particular of the model simulations, is planned for October 2012.

### **Management and scientific direction**

The project is being managed by D. Stone (LBNL, formerly UCT) with P. Stott and N. Christidis (MOHC). Scientific direction is being provided by the Attribution of Climate-related Events (ACE) group, the International Detection and Attribution Group (IDAG), and researchers at participating modelling groups and UB. This scientific direction consists of planning details of the core experiment, including such specifics as the output variable list. A brochure describing the experimental design and a draft output variable list have been circulated to C20C members.

There are two main opportunities for further discussion of the scientific direction and experimental design before the planned October 2012 start of simulations:

- Frontiers in the Detection and Attribution of Climate Change workshop. Banff International Research Station, Banff, Alberta, Canada, 27 May-1 June 2012.
- Third Attribution of Climate-related Events meeting. U.K., September 2012.

### **Running simulations**

MOHC and UCT have performed small trials of the planned experimental setup for periods covering the past few years. A larger trial is now starting, involving LBNL, MOHC, NOAA, UCT, and UOx, which will examine 2011 in detail. Results and experiences of this larger trial will be discussed at the ACE meeting in September 2012.

A number of groups have already confirmed they are planning on running simulations for the project: LBNL with the CAM5.1 model running at 1 degree resolution, and possibility also 2 degree and/or 0.25 degree; MOHC with the HadGEM3-A model at N96 and possibility also N216; UCT with the HadAM3P model at N96, and possibly also the HadAM3 model at N48; and UOx with the HadAM3P-N96/HadRM3P nested regional model setup under the weather@home system, with the regional model running at 25 or 50km resolution over Europe, the western U.S., Australia-New Zealand, and/or southern Africa. LASG/IAP, NIES, and NOAA are hoping to run simulations too. Because of the use of the weather@home system, the UOx simulations will not be able to fully satisfy many of the requested criteria, but will be able to include much larger ensembles covering a wider set of "world-that-might-have-been" estimates; some of the plans for higher resolution models may not be able to meet the requested ensemble sizes. It is recognised that such heterogeneity will be a reality and in fact may prove useful in differentiating how various aspects of the experimental setup influence results.

### **Generation of attributable sea surface temperature and sea ice concentration estimates**

The small trials by MOHC and UCT have highlighted the challenge of producing attributable SST and SIC estimates for the counterfactual scenarios which have minimal sampling noise. UOx have performed further tests of the sensitivity of the attributable SST estimates to details of the calculation procedure, and are testing a revised approach in the current larger trial for 2011 described above. UOx have also developed and tested an algorithm for generating estimates of changes in SICs which is being adopted in this 2011 trial. LBNL, MOHC, and UOx will work together to generate and provide the attributable SST and SIC estimates by the start of the project simulations in October 2012.

### **Distribution of output from model simulations**

NERSC has agreed to host a data portal for this project, linked into the earthsystemgrid. A test setup using data from the trial projects will be tried out within the next few months.

## **Analyses**

No formal list of planned analyses is being maintained at the moment, recognising that specific interests will be varied and will likely depend strongly on extreme events occurring during the next year. Outside of the “participating groups”, researchers at the University of California at Berkeley, the University of Colorado, and the University of Dar es Salaam have stated that they are hoping to analyse output from this project.

## **Publications**

A poster detailing plans for this project was presented at the WCRP Open Science Conference in October 2012:

- Stone, D., P. Stott, N. Christidis, C. Folland, and J. Kinter. 2012. C20C – Climate of the 20th Century: A multi-model effort to detect and attribute trends in weather risk. World Climate Research Programme's Open Science Conference, Denver, U.S.A., 24-28 October.

The plans were also discussed in a plenary presentation at the same meeting:

- Stott, P. 2012. Attribution of weather and climate-related extreme events. World Climate Research Programme's Open Science Conference, Denver, U.S.A., 24-28 October.

and in a position paper arising associated with that presentation:

- Stott, P. A., M. Allen, N. Christidis, R. Dole, M. Hoerling, C. Huntingford, P. Pall, J. Perlwitz, and D. Stone. 2012. Attribution of weather and climate-related extreme events. Positions Papers from the World Climate Research Programme's Open Science Conference, submitted.

There are also two technical papers in preparation which outline the experimental setup being adopted by this project:

- Stone, D. A., C. Lennard, M. Tadross, M. F. Wehner, J. Imbers Quintana, M. R. Allen, P. A. Stott, and P. Pall. 2012. A weather risk attribution forecast system for Africa and the world. To be submitted to JAMES by April 2012.
- Rye, C. et al. To be submitted within the next few months.

## **Institutions currently participating or planning to do so**

LASG/IAP: Institute of Atmospheric Physics, China

LBNL: Lawrence Berkeley National Laboratory, U.S.A.

MOHC: Met Office Hadley Centre, U.K.

NERSC: National Energy Research Scientific Computing Centre, U.S.A.

NIES: National Institute for Environmental Studies, Japan

NOAA: National Oceanic and Atmospheric Administration, U.S.A.

UB: University of Botswana, Botswana

UCT: University of Cape Town, South Africa

UOx: University of Oxford, U.K.