

# Workshop: "Reconstructing Late Holocene Climate"

Charlottesville, 17 - 19 April 2001

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## Summary:

We prepare a workshop to investigate current applications of statistical empirical and model-based methods to the general problem of paleoclimate reconstruction over the past 1000 to 10,000 years. The workshop seeks to build on recent successes in the areas of paleoclimate reconstructions and modeling, and the considerable current international scientific interest that is evident in this crucial area of climate research. The workshop addresses issues of key importance to the international PAGES/CLIVAR effort, and would be featured at the PAGES/CLIVAR event. Ideally, this workshop will bring together between 60-70 scientists from Europe and North America working in the relevant areas. The emphasis will be on science most relevant to the issue of the problem of assimilation of disparate paleoclimate proxy data (both model and empirical approaches) and we will seek to bring together scientists specifically interested in this problem.

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## Background:

At least two distinct approaches to the assimilation of proxy data in estimating the past history of climate fields have been described in the recent literature. The first of these approaches involves the use of statistical calibration methods to estimating past climate changes from proxy climate data, using the available instrumental record as a template for reconstructing the past. This can take the form of multivariate large-scale (e.g. Mann et al, 1998;1999) or univariate site-by-site (e.g., Jones et al, 1998; Briffa et al, 1998) calibration of proxy data, and can involve "multiproxy" (e.g., Jones et al, 1998; Mann et al, 1998;1999) or single proxy (e.g. tree ring density--Briffa et al, 1998) datasets. The latter approach, highlighted in the recent literature (Vostorich, 1999) involves the assimilation of paleoclimate proxy data into climate model integrations forced to estimate forcing histories in a manner conceptually similar to that by which meteorological information is assimilated into numerical weather forecasting models. These methods are almost certainly complementary. For example, purely empirical approaches involve, at some stage, an assumption of stationarity of relationships between proxy indicators and inferred climate variables, but have the strength that they estimate the unforced trajectory taken by the observed realization of the climate system, and are not limited by the assumption that the complete physics and dynamics of the system are known. In contrast, model-based approaches estimate the dynamical evolution of the system from basic climate physics, and do not assume dynamical stationarity, but may not reproduce the actual observed past evolution of the climate, especially if the true history of relevant forcings is not known. The tradeoffs in these two approaches are analogous to those made in purely empirical statistical downscaling techniques vs. model-based dynamical downscaling in estimating regional scenarios from coarse-scale climate change projections. We expect that bringing together the two previously separate communities involved in paleoclimate reconstruction and climate change modeling can lead to significant advances in the problem of estimating the history of the climate system during previous millennia.

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## Subjects to be addressed in Workshop:

- 1) The range of data available for paleoclimate reconstruction and model assimilation, limitations and strengths in the data both spatially, seasonally, and in terms of frequency-domain fidelity, temporal resolution and temporal extent.
- 2) Synthetic timescale modeling
- 3) Model-based paleoclimate data assimilation and downscaling approaches.
- 4) Use of long coupled ocean-atmosphere model simulations for testing empirical methods of paleoclimate reconstruction.

- 5) Explicit physical/biological modeling of paleoclimate phenomena.
  - 6) Availability of early historical documentary climate information that can supplement proxy climate archives during the past few centuries.
  - 7) Dynamics of forced and free climate variability on timescales of centuries to millennia
  - 8) Applications of paleoclimate reconstruction: the North Atlantic Oscillation; ENSO.
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#### Workshop Specifics:

The workshop will be held in Charlottesville Virginia on 17-19 April 2001. This venue is convenient for both U.S. and European participants. Spring is a particularly nice time of year in Charlottesville Virginia, with pleasant generally warm and sunny days. Ample opportunities for sightseeing and recreational activities are available for those participants who are interested.

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#### Responsible for the workshop are:

- [M.E. Mann](#), U of Virginia, USA
  - [Hans von Storch](#), GKSS Research Centre, Germany
  - [Nanne Weber](#) KNMI, The Netherlands
  - [Heinz Wanner](#), U of Bern, Switzerland
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#### Suggested participants from participating partners:

US: M. Mann, R. Bradley, Hughes, J. Overpeck, T. Crowley, E. Cook, R. Webb, M. Cane, M. Evans, D. Battisti, K. Hugen, J. Lean, J. Cole, H. Diaz, B. Reichert (15)

D: H. von Storch, F. Gonzalez, J. Jones, M. Widmann, J. Negendank, A. Schwalb, Brathauer, H. Miller, M. Schwager, U. Cubasch, A. Lücke, D. Handorf (12)

NL: S.L. Weber, G. van der Schrier, H. Renssen, F. Wagner and B. van Geel (5)

CH: H. Wanner, C. Pfister, T. Stocker, J. Luterbacher (4)

N: Øvind Nordli, Eiliv Larsen and Hans Petter Sejrup (3)

#### Invitees

M. Claussen (D), Barriendos (Barcelona, ES), Brazdil (Brno, CZ), P. Jones, K. Briffa, (UK), J. Guiot (F), K.R. Laird, F. Gasse (N.African lakes), J.Pätzold (Bremen). (9)

#### Other participants

Mark Eakin (NOAA), Steve Coleman (NSF)