THE TEMPORAL STABILITY AND ACTIVITY OF LANDSLIDES IN EUROPE WITH RESPECT TO CLIMATIC CHANGE

CEC Environment Programme - Contract N° EV5V-CT94-0454

1st TESLEC MEETING
Padua, Italy

10th - 12th July 1994

Local organizers:

National Research Council
Research Institute for the Prevention
of Geological and Hydrological Hazard
Padua

SUMMARY OF THE PROGRAMME

SUNDAY 10th July

Opening Session

14.00 - 15.30 Structure and organization of the project and of the meeting (Budget, deliverables, deadlines, responsabilities, addresses, distribution of the handbook etc.)

15.30 - 16.00 Coffee break

Afternoon Session

Objective 1: RECOGNITION OF RELICT LANDSLIDES

16.00 - 19.00 The Manual - essential tasks (Key-note: Denys Brunsden)
- *Methods (remote sensing, mapping, classification, description of the behaviour)*
- *Checklist for non-specialists*

Deadlines and responsabilities

Evening free

MONDAY 11th July

Morning Session I

Objective 2: PAST DISTRIBUTIONS OF LANDSLIDE INCIDENTS AND THEIR RELATIONSHIP TO CLIMATIC CHANGE PARAMETERS. QUALITATIVE EVOLUTION MODELS (LANDSLIDE AND LANDSCAPE EVOLUTION)

09.00 - 10.30 Discussion of national records of landslides and times series
- *Data techniques, central database of the project (data availability and exchange)*

10.30 - 11.00 Coffee break

Morning Session II

11.00 - 12.30 Discussion of test sites
- *Reports on the proposed National Programmes (max. 15-20 min: France/Spain/Italy)*
- *Central database (data availability and exchange)*

Deadlines and responsabilities

Objective 3 HYDROLOGICAL AND SLOPE STABILITY MODELLING

12.30 - 12.45 Introduction (Richard Dikau)

12.45 - 13.15	Hydrological models (Key-note: Theo van Asch, max. 30 min) *- Discussion*
13.15 - 15.00	Lunch at C.N.R. Canteen

Afternoon Session I

15.00 - 15.45	Slope stability models (Key-note: Eddie Bromhead, max. 30 min) *- Discussion*
15.45 - 16.30	Climate change models (Key-note: Hans von Storch, max. 30 min) *- Discussion*
16.30 - 17.00	Coffee Break

Afternoon Session II

17.00 - 19.00	General modelling framework *- Model inventory and link between hydrological, slope stability and climatic change models* *- Model application, development and exchange* Deliverables and responsabilities
20.30	Meeting Dinner

TUESDAY 12th July

Morning Session

09.00 - 11.00	Workshops on modelling framework *- Constitution of working groups on hydrological models, slope stability and climatic change models* *- Discussion of scientific and technical problems*
11.00 - 11.30	Coffee Break

Closing Session

11.30 - 13.00	Final discussion *- Summing up of the results and agreements (manual, data records, modelling framework)* *- Next workshops and meeting*
13.15	Lunch at C.N.R. Canteen
14.00	Departure

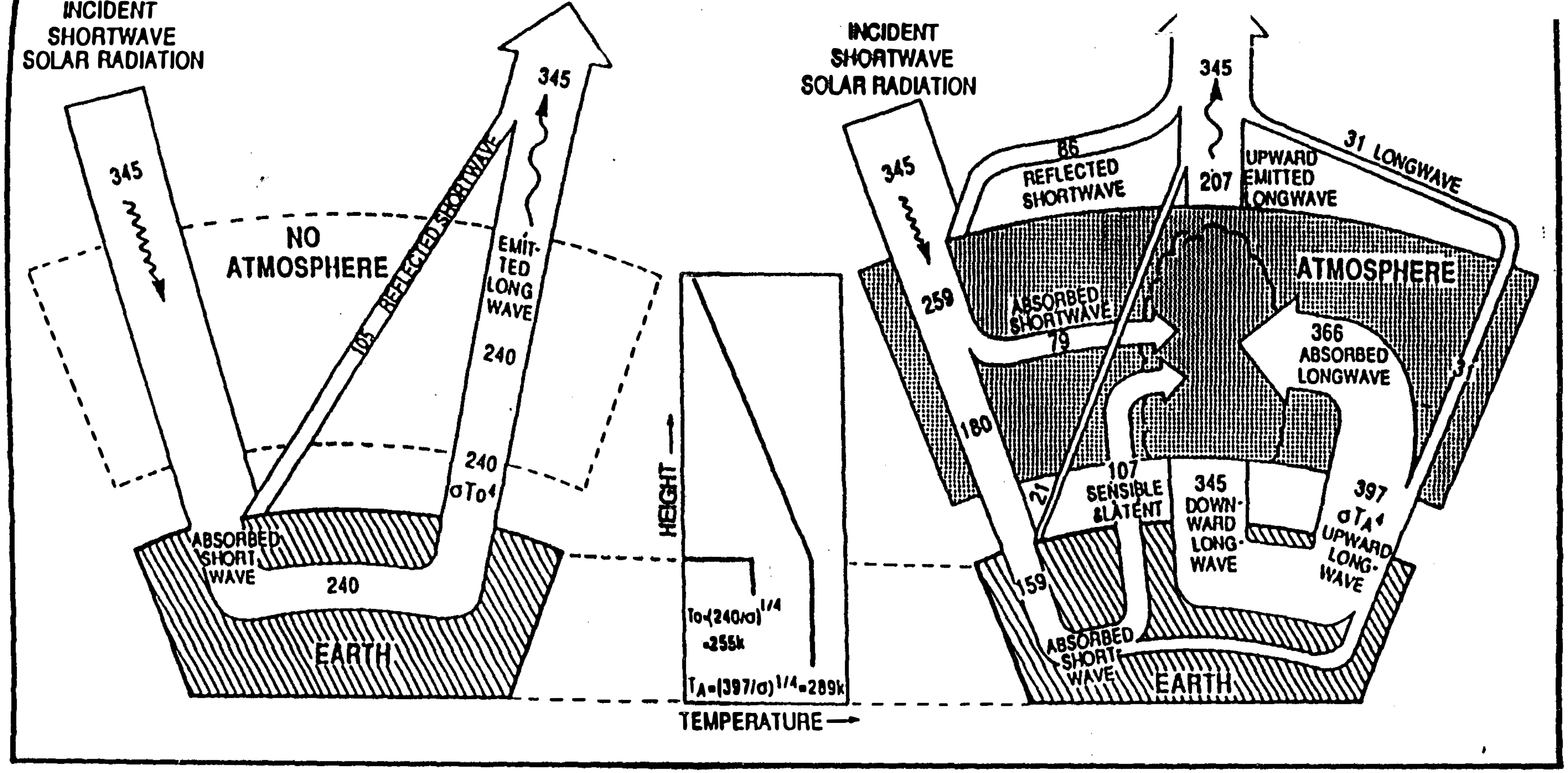
Climate Change Models

Hans von Storch
Max-Planck-Institut für Meteorologie
Hamburg, Germany

Talks presented at the 1st TESLEC Meeting
in Padua, Italy, on July 11 - 12, 1994

Prologue

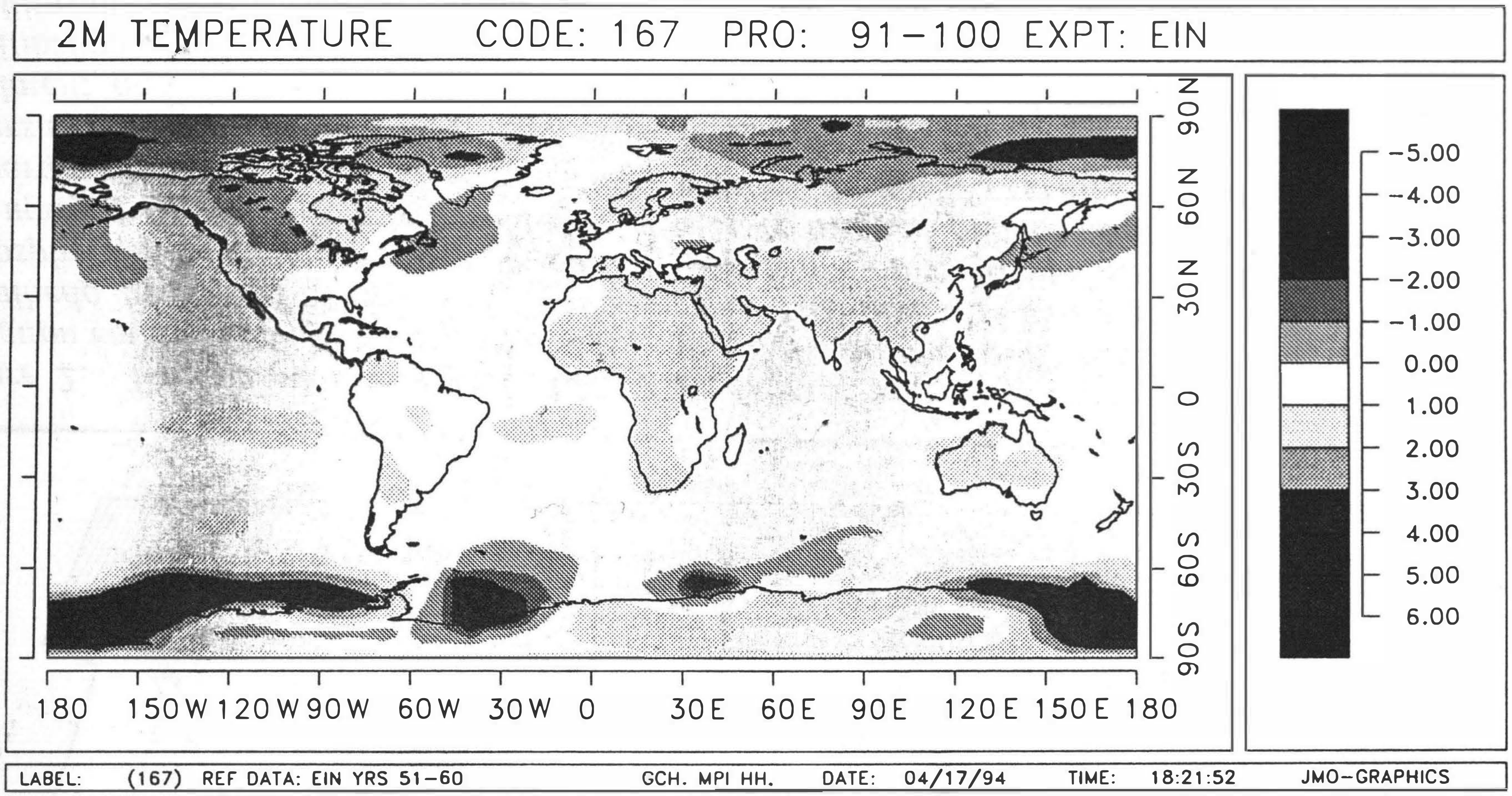
- **The Max-Planck-Institut für Meteorologie** is one of the centers where scenarios of global climate change are derived by means of coupled ocean/atmosphere/sea-ice dynamical models in
  - equilibrium runs (e.g, "$2 \times CO_2$")
  - "transient" runs (e.g., Scenario A)
- **These scenarios are used as input for climate impact studies** - for a responsible use in such studies the communication between scenario producers and scenario users is required.



$R_{\ell} \sim T^4$

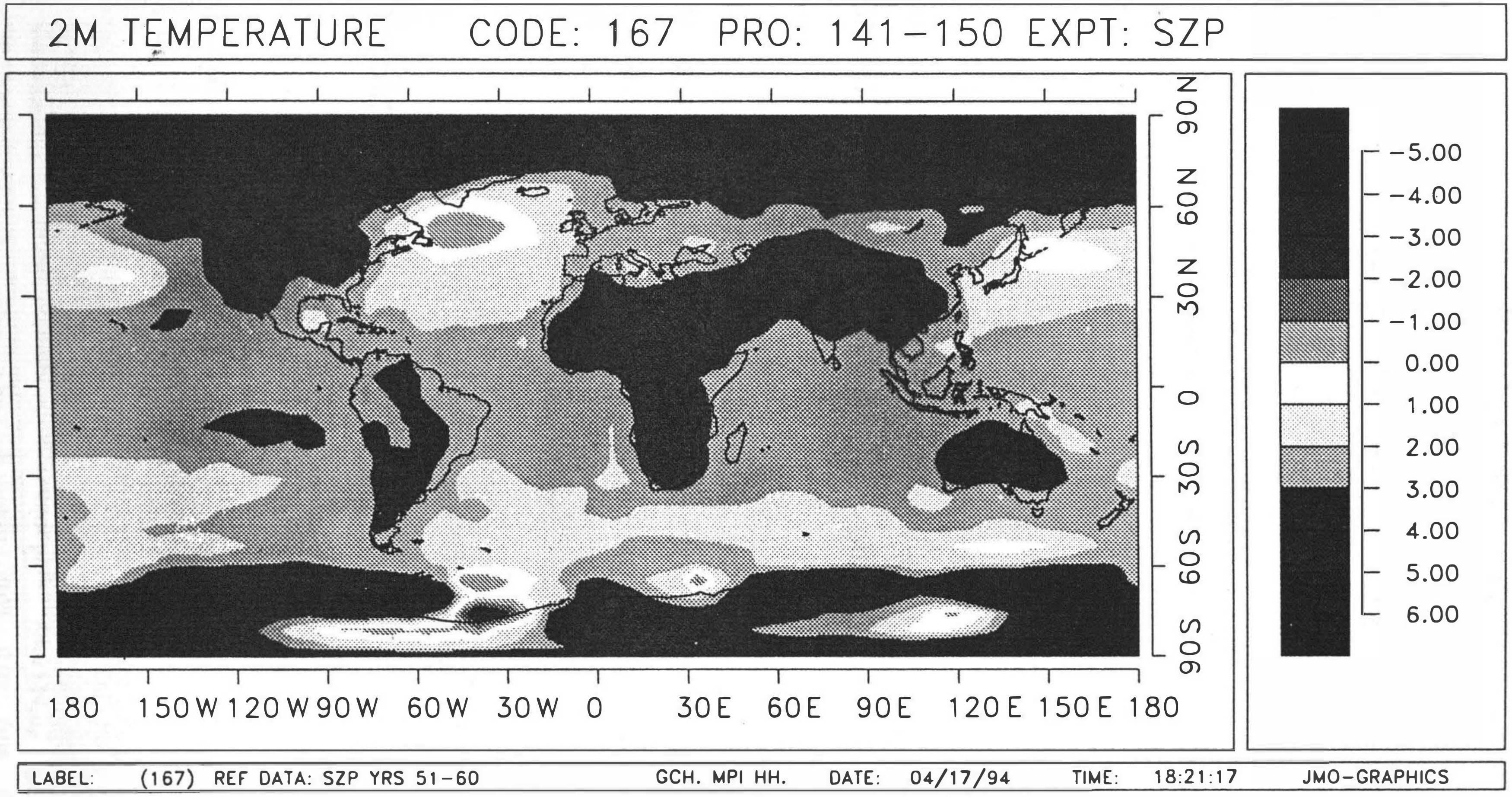
Figure 2. The greenhouse effect. In the absence of an atmosphere (left), the long–wave radiation emitted back to space will exactly equal the absorbed short–wave radiation (assuming an albedo of approximately 0.31) if the surface radiative temperature is 255K. With an atmosphere containing water vapour, carbon dioxide and other greenhouse gases (right) most of the upward radiation emitted from the surface is trapped and re–radiated downward and upward by cloud and greenhouse gases thus warming the earth's surface and cooling the upper layers of the atmosphere. The net long–wave radiative cooling of the atmospheric layer is offset by latent and sensible heat flux upward from the warmed surface. Radiative–convective equilibrium is achieved when the globally averaged surface temperature reaches 289K. In the equilibrium situation, the atmospheric temperature falls off with height to temperatures well below the planetary temperature of 255K as shown schematically above (centre). All heat fluxes are approximate global averages for the present climate and are given in Watts per square metre (Wm^{-2})

(2026 - 2035) - (1986 - 1995)



von Cubasch et al, 1994

(2076 - 85) – (1986 - 95)



von Cubasch et al, 1994

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Climate Change in the Past 100 Years - natural*or external?

- **The homogenized analyses of near-surface temperature** indicate an increase of this temperature in the past 100 years.
- **To asses whether this increase is natural or not** a "detection variable" is formed, which is the projection of the analysed ("observed") temperature fields on the warming pattern simulated by a climate model.
- **The observed warming is declared "inconsistent with natural variability"** (= signal has an external source) if the detection variable is outside the 95% confidence band of natural variability
- **The 95% confidence band of natural variability** is estimated from observed data (problem: contamination by the signal) or from climate model runs (problem: model might be wrong)
- **This procedure leads to the decision**

  <u>the recent warming trend is NOT natural.</u>*

- An a-priori optimization of the "signal-to-noise" ratio reduces the risk of an incorrect assessment.

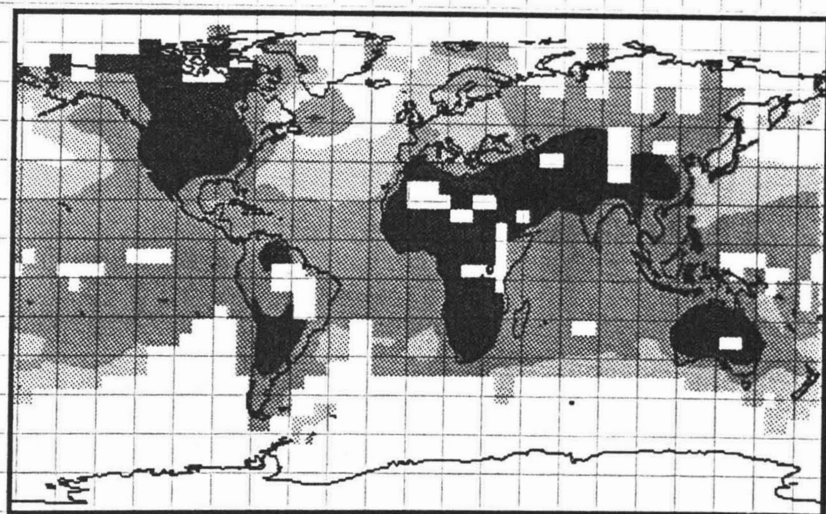
A publication is presently prepared by Hegerl et al. at the MPI in Hamburg

* perhaps, "due to internal dynamics" would be a better phrase.

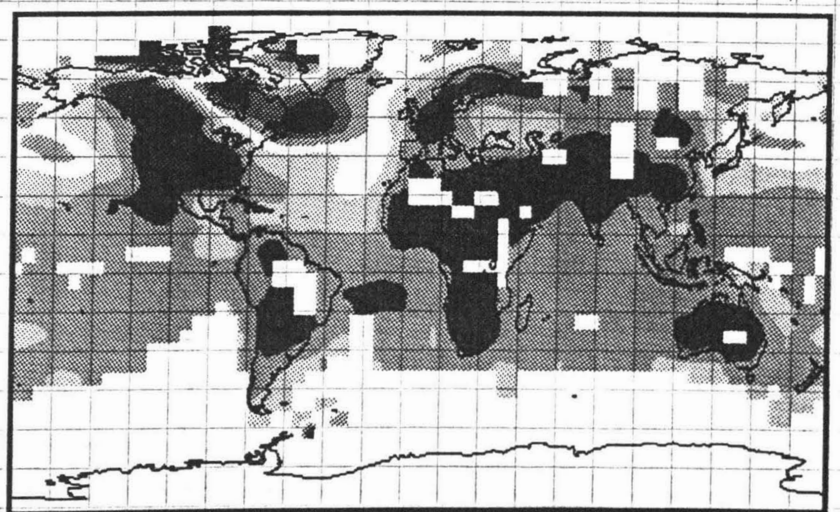
Optimal Rotation for full set of Variability data

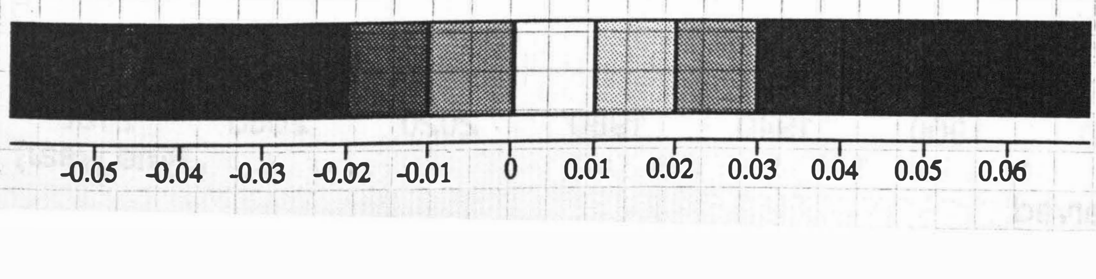
optimized in the space spanned by EOFs 1-4 of the Early Industrial global warming simulation

guess-pattern fingerprint



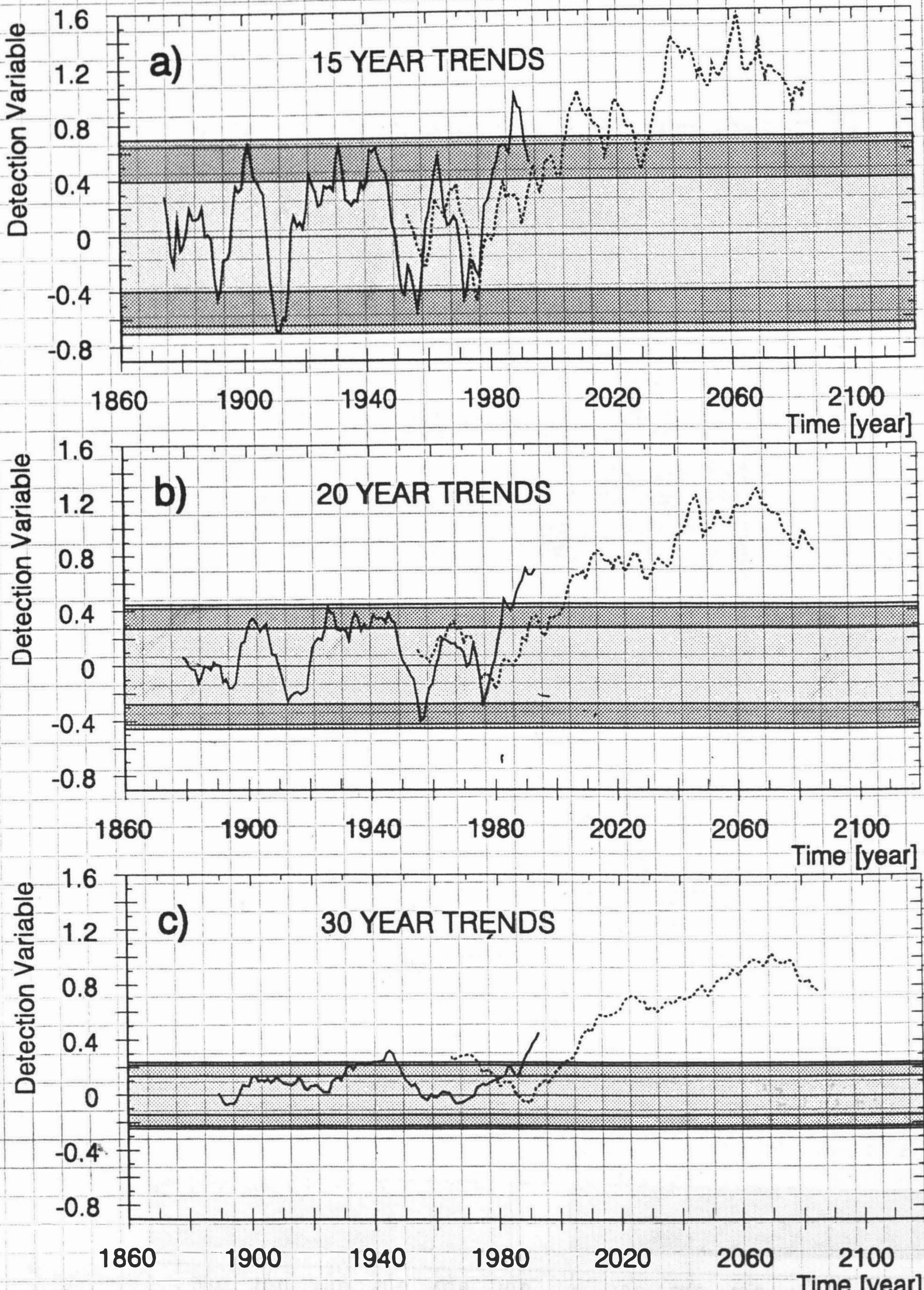
optimally rotated fingerprint





SIGNIFICANCE OF THE OBSERVED PATTERN

for the optimal fingerprint



— observed

□ 95% confidence interval for the ECHAM / LSG control simulation

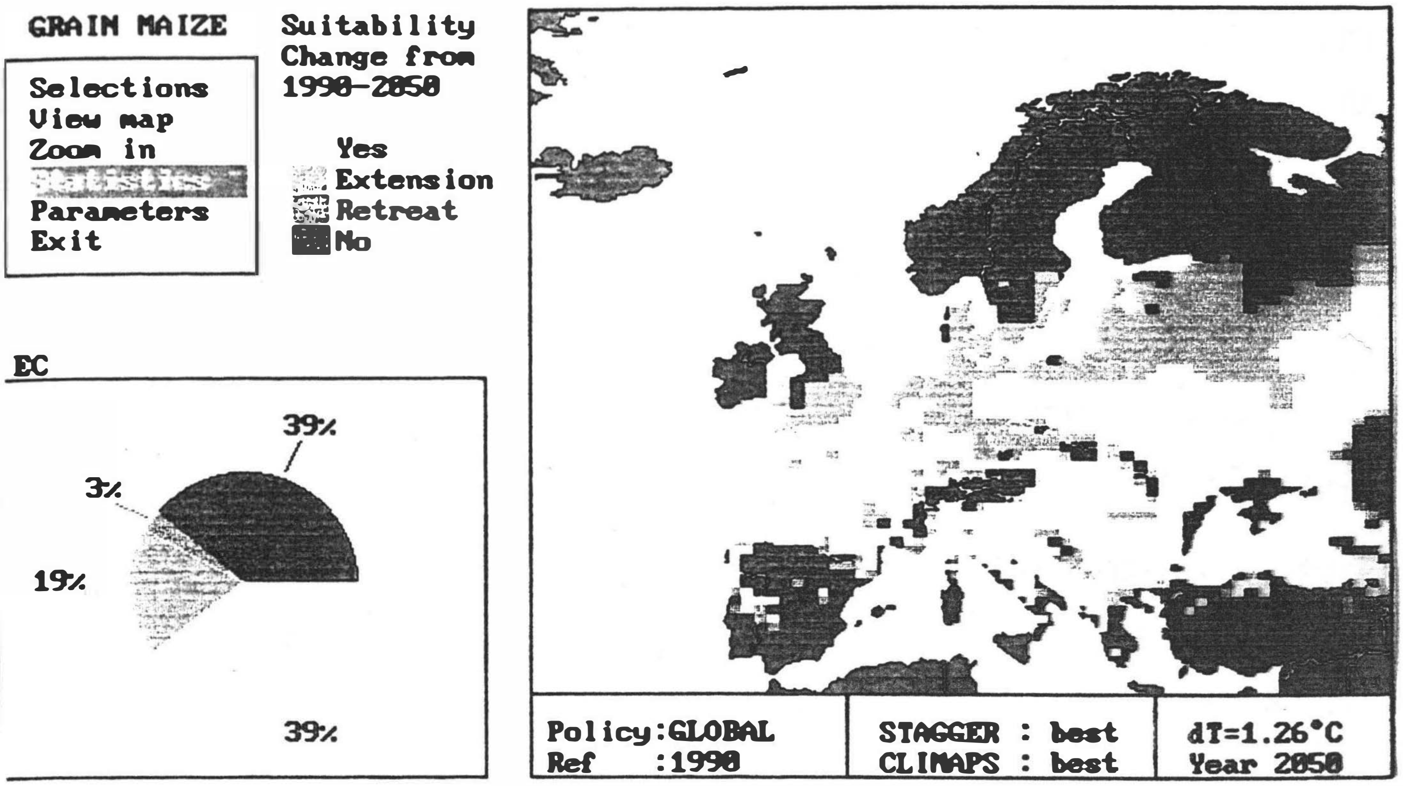
▩ 95% confidence interval for the ECHAM2 / OPYC control simulation

▨ 95% confidence interval of observations (GHG-signal subtracted)

034GCHc.drw Gabi Hegerl

Climate Impact Research is NOT ...

- **The processing of static scenarios** in the sense that certain maps are given by the "producers" to the "users" without ongoing interaction. "Users" must know the conditions under which the scenarios are valid and the inherent limitation of such model generated data.
- **"CO_2" scenarios.** The expected climate change is a gradual process. It will not be a sudden jump from one stationary state to another stationary state. That is, the important aspect is the rate of change.
- **The limitation to anthropogenic change.** Climate varies on all time and space scales because of internal dynamics. Also such internally excited changes affect climate-sensitive systems. Anticipated impacts due to man-made climate change should be compared to experienced impacts of past natural variations.



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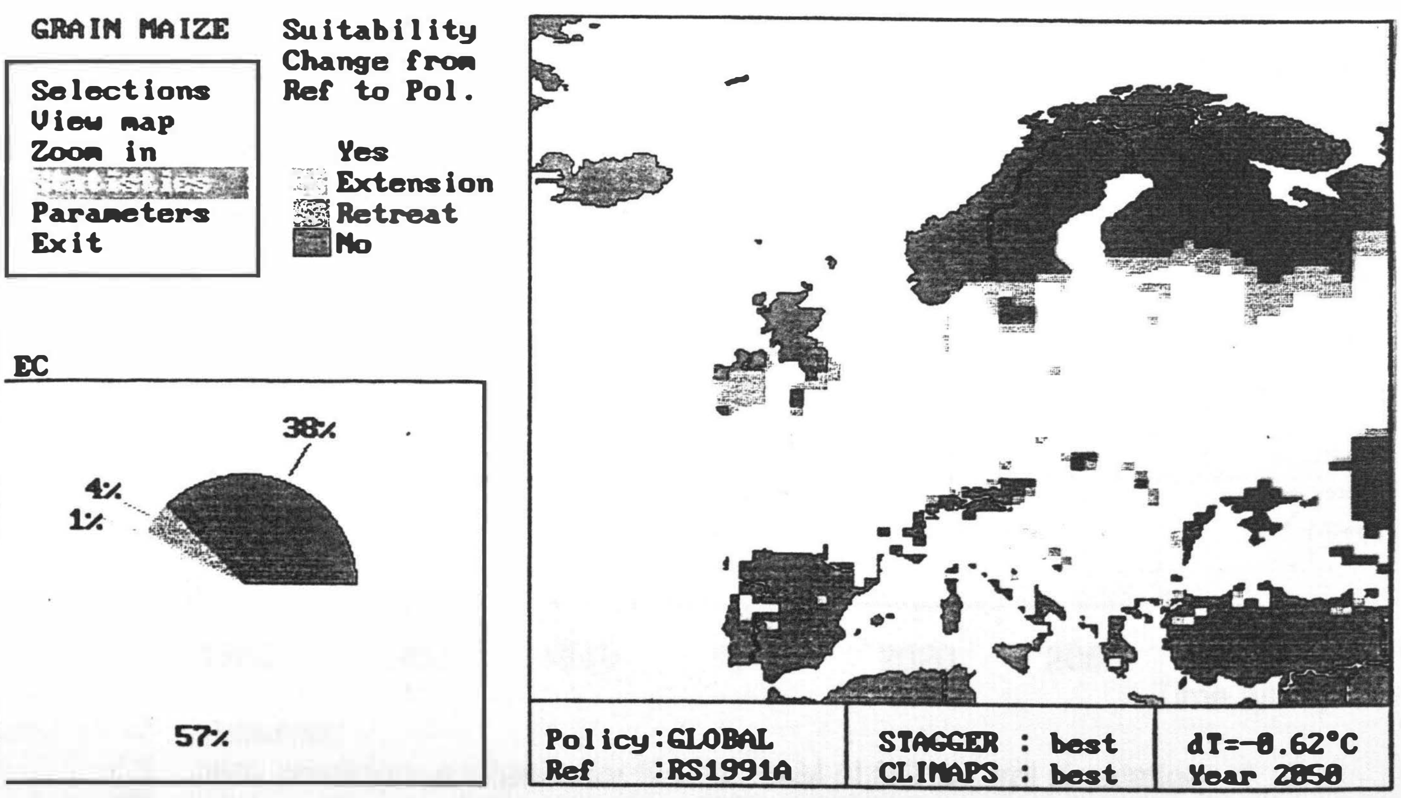

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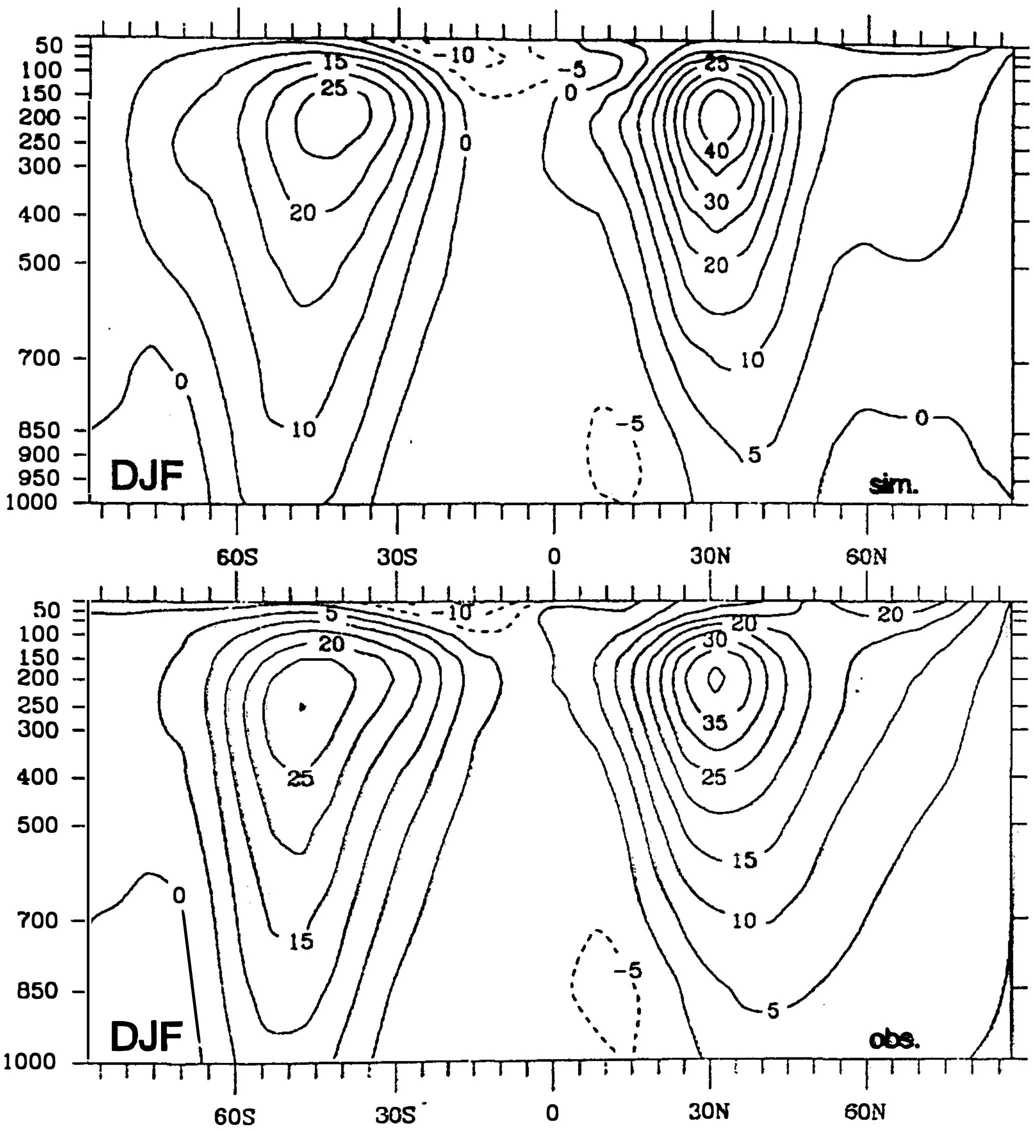
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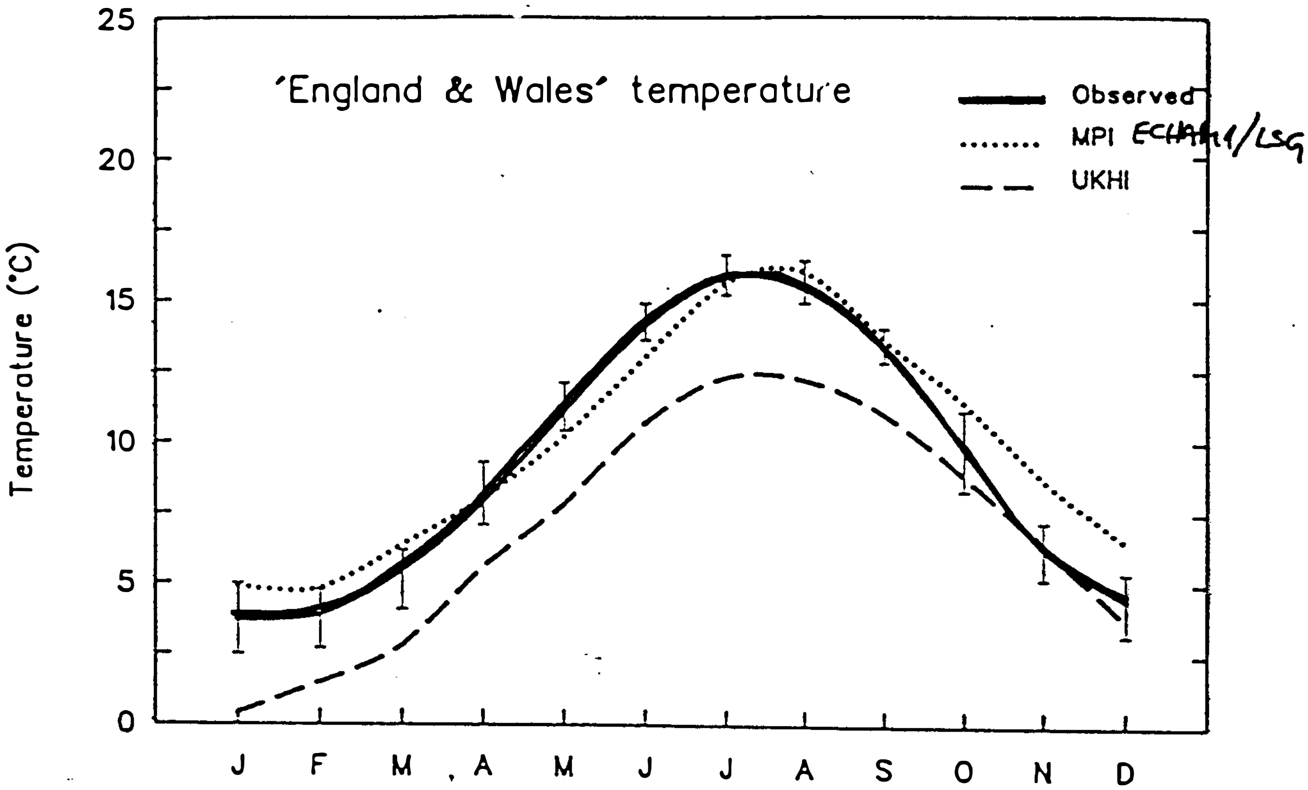


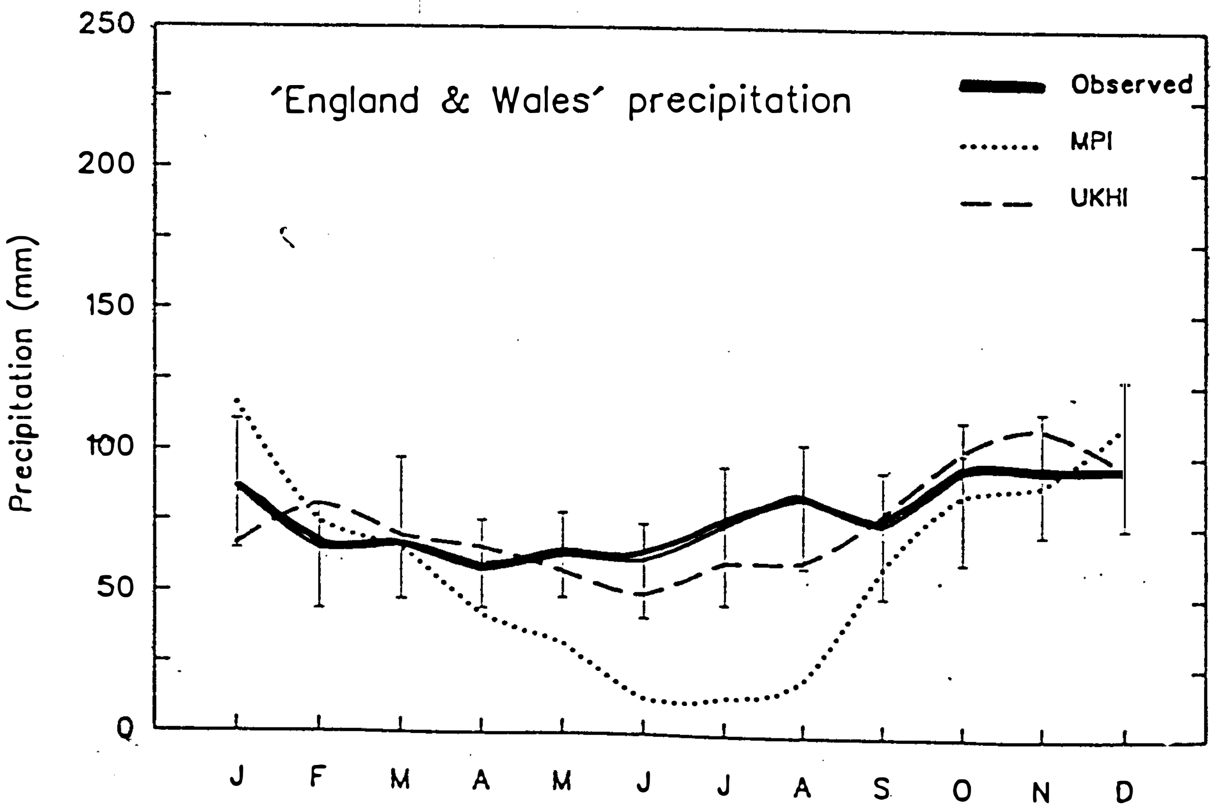


Figure 5: Observed monthly mean temperature and precipitation over an area representative of England & Wales and simulated data for a 5° gridbox centred at 52.5°N and 2.5°W (models; see Figure 1). The observed temperature data are from Manley (1974; updated by Parker *et al.*, 1992) and the precipitation data from Wigley *et al.* (1984; updated by Gregory *et al.*, 1991). The range bars on the observed lines are calculated as in Figure 3 from the 110-year observed records from 1881 to 1990.

Hulme et al, 1992

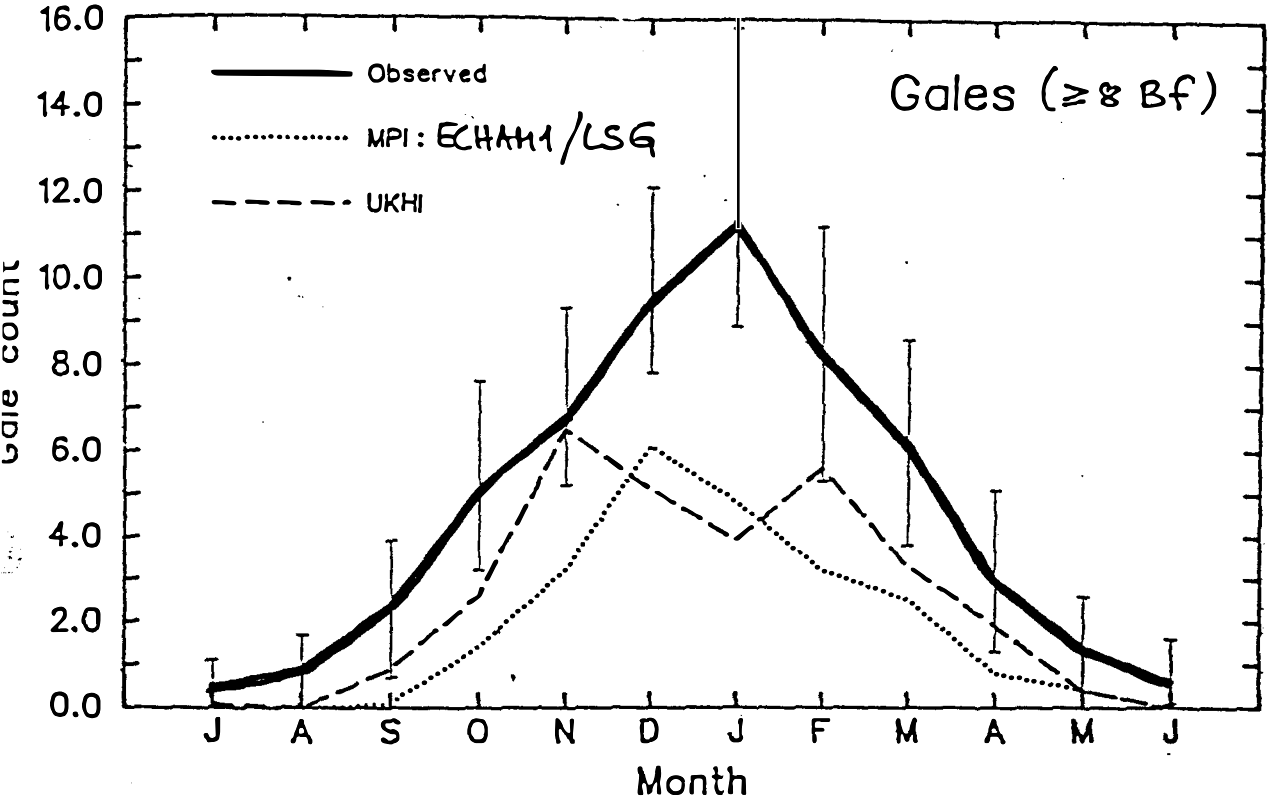
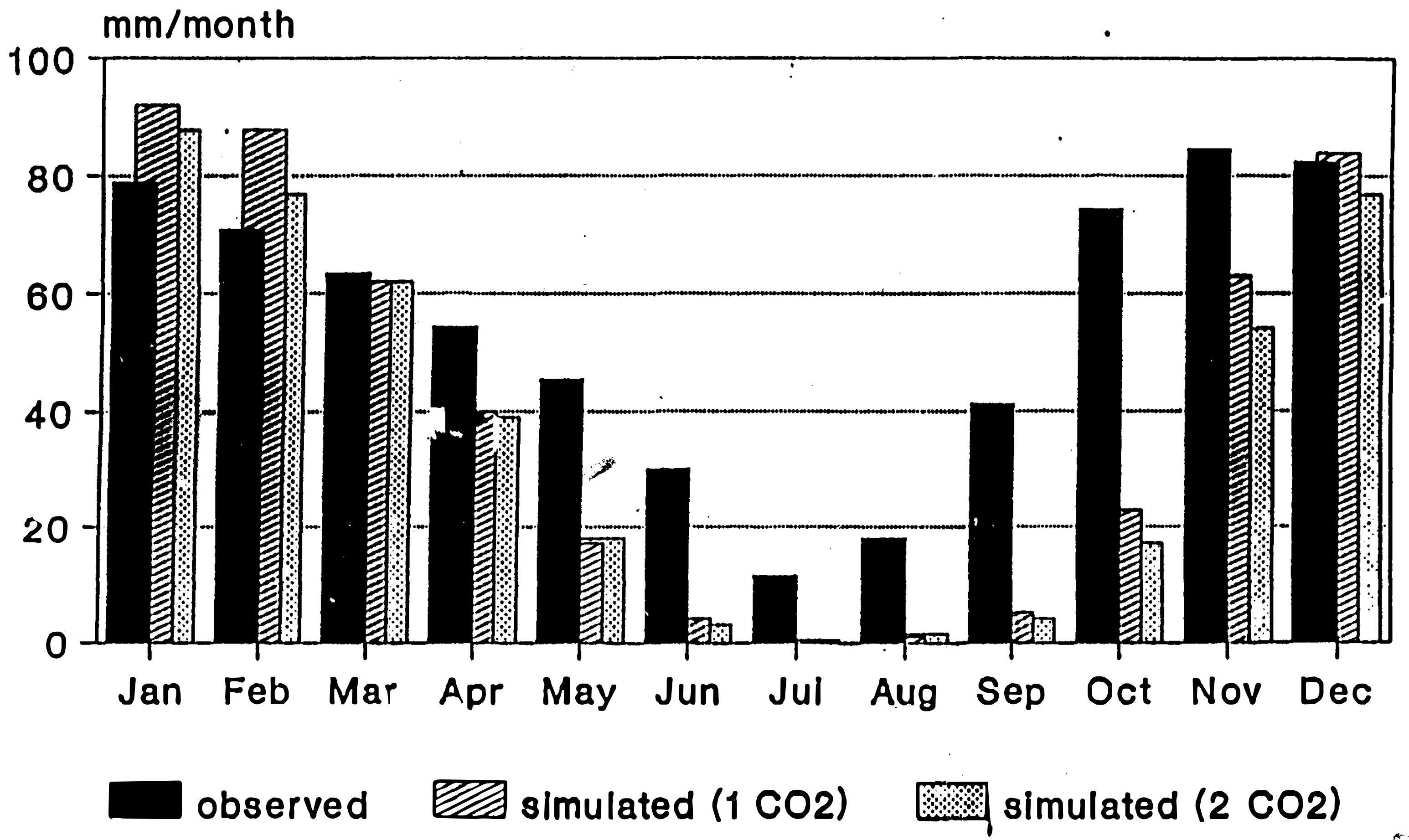


Figure 6: Observed and model-simulated mean monthly frequencies of Gales over the British Isles. The range bars on the observed line are calculated as in Figure 3 from the 110-year observed record from 1881 to 1990. Note that the 'gale year' runs from July to June.

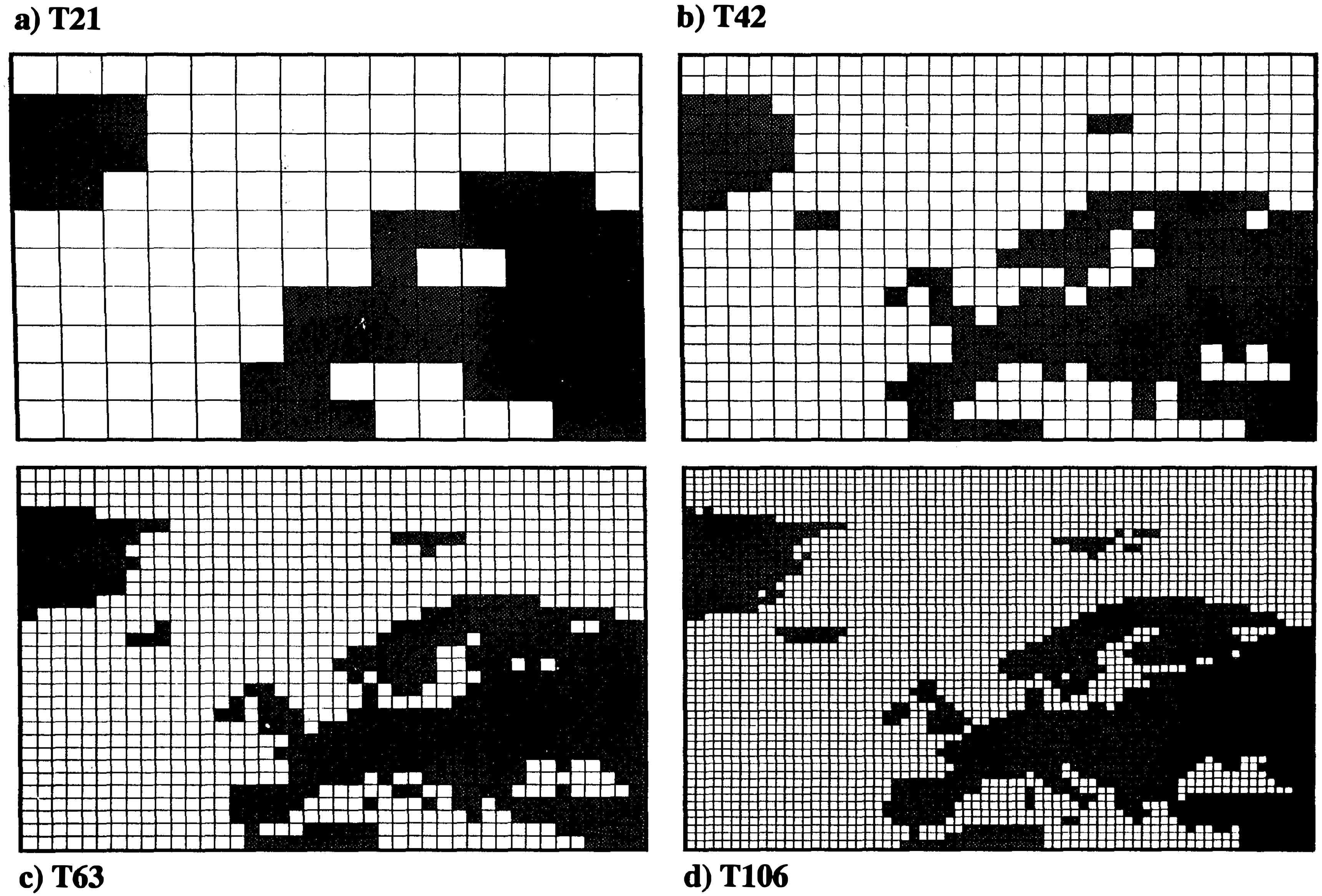
Hulme et al, 1992

Iberian Rainfall
Observed and Simulated



ECHAM

European part of the land-sea mask for different T-model resolutions



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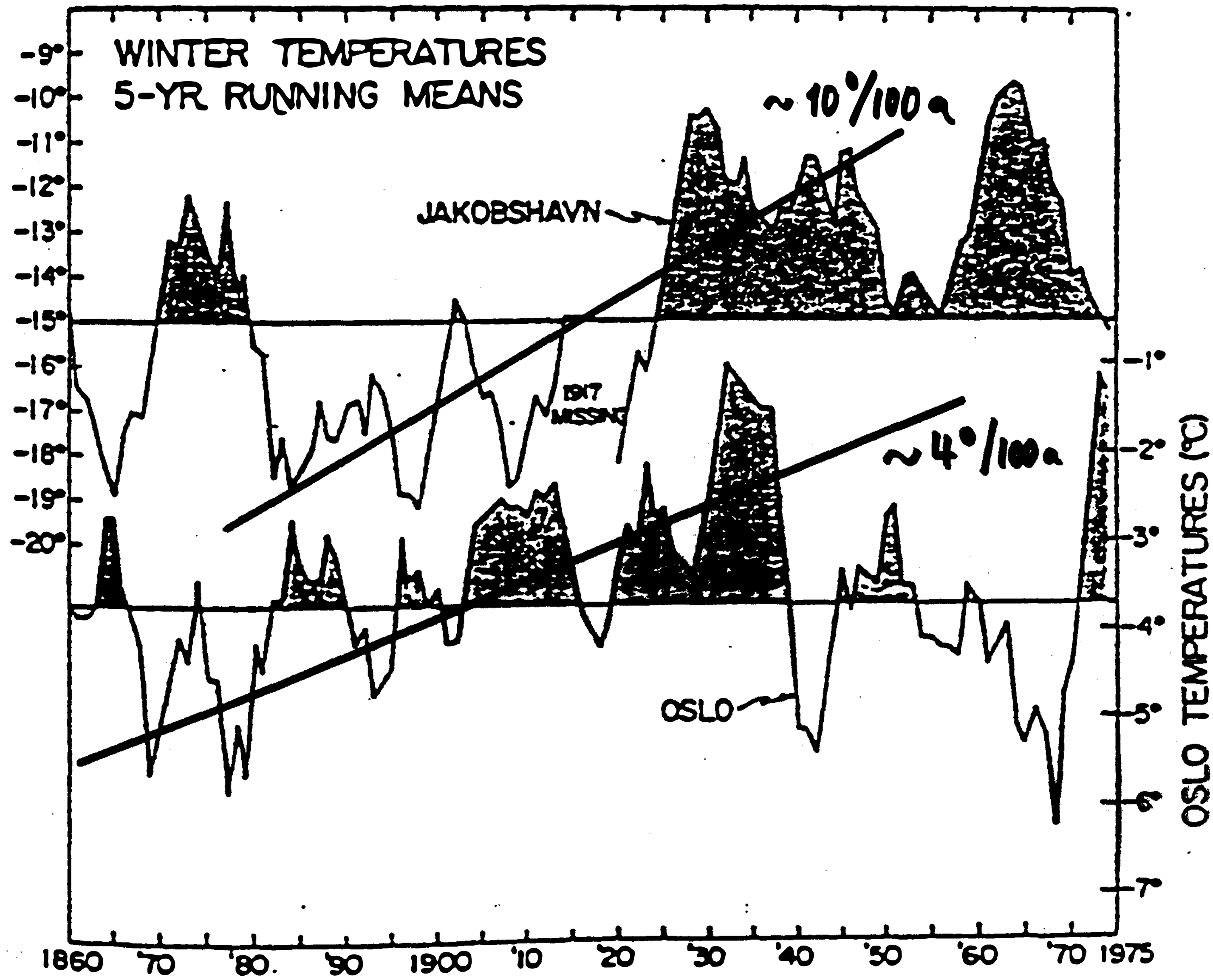
from: Chris Huntingford 1993

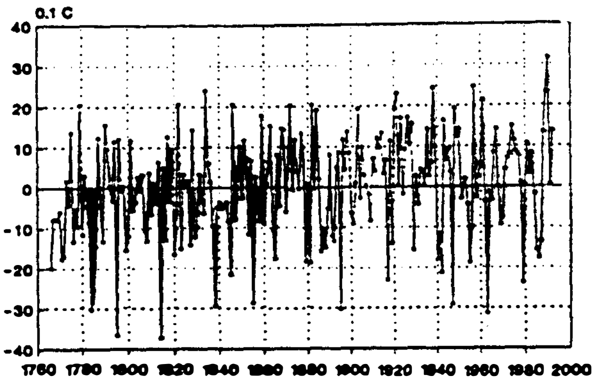


Five-year running means of winter temperature at Jakobshavn and Oslo (°C).

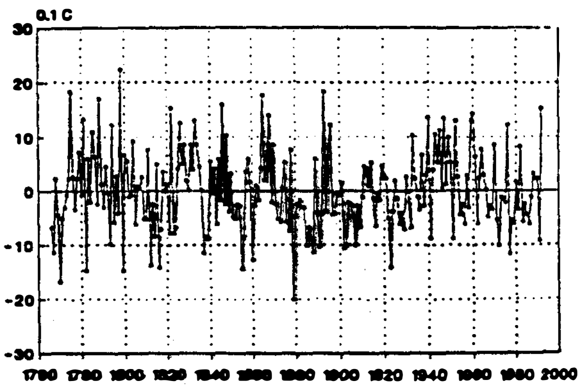
Case 2 : Significant warming trend in N Europe ... no public response (Arrhenius' CO_2-theory ~ 1898)

van Loon & Rogers 1978

Mean of Jan[illegible]-February-March

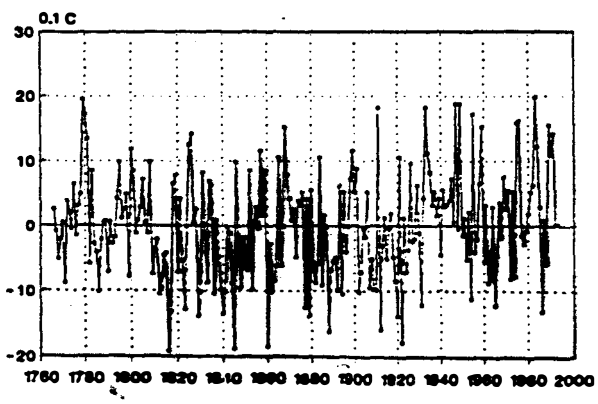


Mean of April-May-June

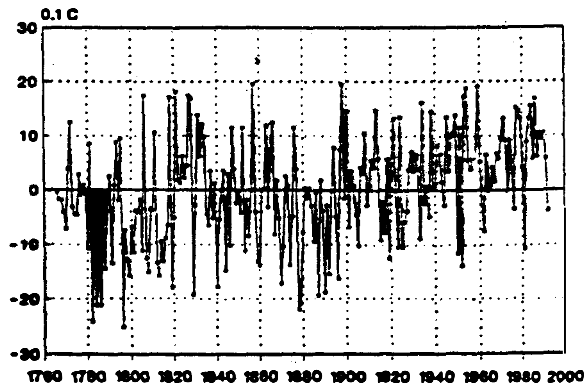


Middle England Temperature

Mean of July-August-September



Mean of October-November-December



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The Great Challenge

Climate impact research is an interdisciplinary business. The fundamental problem is the transfer of information across the borderline of otherwise well separated (and even well entrenched) "science states".

- **Today,** and to some extent for the past, we can have information with high space-time accuracy, so that the climate-related input into (mathematical or conceptual) models is no problem.
- **Scenarios for the future,** however, are inherently uncertain with respect to quantities and space and time. This uncertainty is not the result of unable climate researchers but a fundamental problem.
- **Climate impact models** (independently whether they are mathematical models run on a computer or conceptional models) must meet this uncertainty of the input. Models useful for the representation of the present state are not necessarily equally useful for the assessment of future changes. Possibly, models have to be de-complexified in order to serve as an climate impact assessment tool.