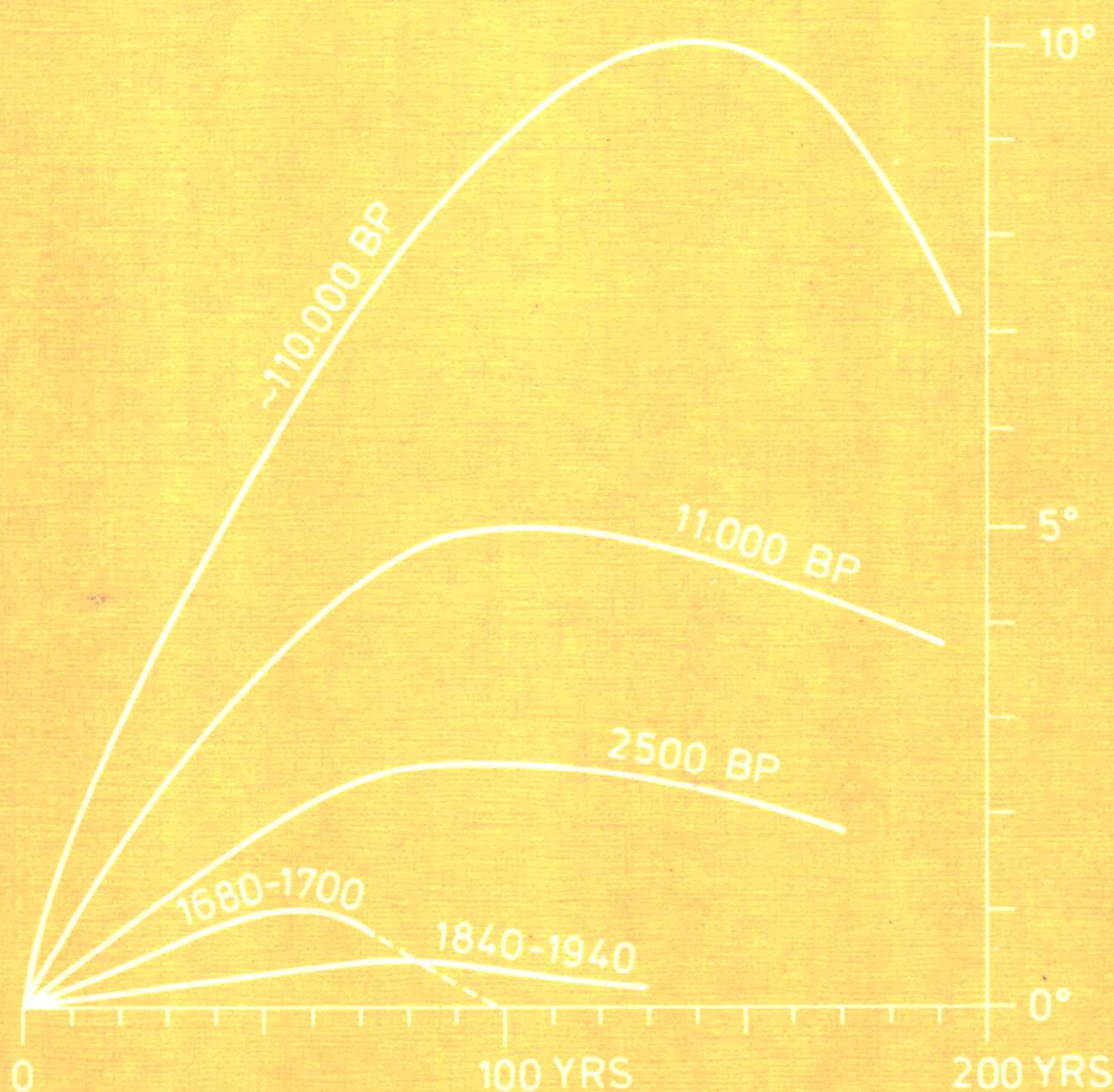


Climatic Changes on a Yearly to Millennial Basis

N.-A. Mörner and W. Karlén (eds.)



D. Reidel Publishing Company

Dordrecht / Boston / Lancaster

Climatic Changes on a Yearly to Millennial Basis

Geological, Historical
and Instrumental Records

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D. Reidel Publishing Company

A MEMBER OF THE KLUWER ACADEMIC PUBLISHERS GROUP



Dordrecht / Boston / Lancaster

Library of Congress Cataloging in Publication Data

Main entry under title:

CIP

Climatic changes on a yearly to millennial basis.

Proceedings of the Second Nordic Symposium on Climatic Changes and Related Problems, held in Stockholm, Sweden, May 16–20, 1983.

Bibliography: p.

Includes index.

1. Climatic changes—Congresses. 2. Climatic changes—Scandinavia—Congresses.
3. Geology, Stratigraphic—Recent—Congresses. I. Mörner, Nils-Axel. II. Karlén W.
III. Nordic Symposium on Climatic Changes and Related Problems (2nd : 1983 : Stockholm, Sweden)

QC884.2.C5C575 1984

551.6

84-8214

ISBN 90-277-1779-6

Published by D. Reidel Publishing Company
P.O. Box 17, 3300 AA Dordrecht, Holland

Sold and distributed in the U.S.A. and Canada
by Kluwer Academic Publishers,
190 Old Derby Street, Hingham, MA 02043, U.S.A.


In all other countries, sold and distributed
by Kluwer Academic Publishers Group,
P.O. Box 322, 3300 AH Dordrecht, Holland

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Printed in The Netherlands



PREFACE

Nils-Axel Mörner & Wibjörn Karlén

Organizers of the Stockholm Symposium in 1983
Stockholm University, Sweden

This book is the Proceedings of the SECOND NORDIC SYMPOSIUM ON CLIMATIC CHANGES AND RELATED PROBLEMS held in Stockholm, Sweden, May 16-20, 1983 (Frydendahl et al., 1983; Mörner, 1983). This was "an international interdisciplinary symposium with special reference to Nordic records and their relation to global climatic changes".

The first NORDIC SYMPOSIUM ON CLIMATIC CHANGES AND RELATED PROBLEMS was held in Copenhagen in 1978 (Frydendahl, 1978) and had a very broad scientific program. The SECOND NORDIC SYMPOSIUM was specifically directed to certain problems, time ranges and sources of information, as discussed below.

Scandinavia is a classical area for the study of climatic fluctuations during the last 20,000 years. A major part of the basic data for the international theories and synthesis originate from Scandinavian data. This applies, for example, to:

- (1) The drastic climatic fluctuations in connection with the recession of the land-ice giving rise to the alternation of interstadials (warm periods with rapid ice recession) and stadials (cold periods with readvances or retardations in the ice recession).
- (2) The climatic changes during the Holocene with its well-known sub-division according to the Blytt-Sernander system (nowadays being used far outside the boreal region for which it was originally defined).
- (3) The Holocene climatic optimum and the subsequent climatic deterioration at around 2500 BP (well-established already at the beginning of this century).

The Nordic countries, therefore, have a great responsibility for critically examining available data, improving the data, synthesizing them and placing them in their correct global context. Of course, the Nordic countries, too, have a lot that must be

revised and up-dated. It is of fundamental importance to compare and distinguish between local, regional, hemispherical and global climatic changes; i.e. between the climatic changes in the Nordic countries and the corresponding changes elsewhere over the globe (within Europe, within the northern hemisphere and between the two hemispheres).

We, therefore, decided that the SECOND NORDIC SYMPOSIUM ON CLIMATIC CHANGES AND RELATED PROBLEMS should be focused on the processes and data that are typical for the Nordic countries and that this material should be placed in its correct global perspective, so that the driving mechanisms could be investigated and, maybe even, deciphered. A large group of international experts were therefore invited to the symposium.

During the last decade, paleoclimatology has mainly been focused on the so-called Milankovitch variables (several symposia, many papers, much discussion, etc.), whilst climatology has naturally been focused on the present "weather machine". The climatic and paleoclimatic changes of intermediate length or cyclicity have, because of this, largely been forgotten. We, therefore, put the emphasis on the yearly to millennial type of climatic changes.

Our program - and hence this proceeding - is, therefore, highly interdisciplinary and addressed to people working with geological (and other paleo-records), archaeological, historical and instrumental data, as well as geophysicists (including astronomers) and modellers trying to find the causation mechanisms.

Out of the original 64 contributions (Frydendahl et al., 1983), we are here happy to be able to print 52 of them, plus 3 additional ones (from invited speakers who could not attend). These papers can be divided into four main groups; viz. one on paleoclimatologic records, one on historical records, one on instrumental records and one on theories, models and geophysical explanations.

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ACKNOWLEDGEMENTS

The SECOND NORDIC SYMPOSIUM ON CLIMATIC CHANGES AND RELATED PROBLEMS was organized by the two Editors in co-operation with Knud Frydendahl and Erik Rasmussen from Denmark, who organized the first Nordic Symposium in 1978, and under the scientific auspices of the International Commission on Climate (ICCL) of IAMAP, the Paleoclimatic and Holocene Commissions of INGUA and Project 158 of IGCP.

The main symposium was held at the Wennergren Center. Each day ended with a concluding summary and general discussion. One day was devoted to a field excursion in the Stockholm area (and evidence of deglaciation, shorelevel displacement, neotectonics, etc.) and a boat trip to the island of Björkö with a visit to the old city or village of Birka from the Viking Age (often termed "capital" of Sweden at that time) guided by Mörner (geology) and Ambrosiani (archeology). "Geologklubben", the organization of students in geosciences at Stockholm University, hosted an evening in the Old Observatory of Stockholm.

The symposium was financed by a major contribution from "Nordisk Kulturfond", a grant from the Swedish Department of Education and a small contribution from UNESCO via ICCL.

We are indepted to Ulla Mörner for preparing everything for our out-door reception-meeting, Jonas Mörner for taking care of the registration problems, Jessie Karlén for linguistic correction of several manuscripts, Ylva Brolin for re-typing several manuscripts, and, above all, Gunnar Johansson who - with neverfailing skill and enthusiasm - took care of most of the practical problems.

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CLIMATIC CHANGES ON A YEARLY TO MILLENNIAL BASIS AN INTRODUCTION

Nils-Axel Mörner

Stockholm University, Sweden

1. INTENTIONS, GOALS AND MEANS

The climate changes and shifts in a broad spectrum of cycles and time ranges (Fig. 1). The effects of such changes may be local, regional, hemispherical or global, as illustrated in Figs. 1 and 2.

At the Stockholm Symposium, we did not want to discuss the Milankovitch variables or the present weather machine, but rather to concentrate on the climatic changes and shifts that cover decades, centuries and millennia. We wanted to study the past, present and future by means of geological, historical and instrumental records, and finally to be able to separate and distinguish changes that are induced locally, regionally, hemispherically and globally, as illustrated in Fig. 2.

The instrumental records give evidence of local as well as regional and hemispherical changes. The last glaciation maximum at about 20,000 BP seems to represent a globally (directly or indirectly) induced climatic deterioration. During the symposium, we wanted to investigate the character of the main Late Glacial and Holocene climatic changes and shifts by analysing and comparing our Nordic records with respect to available global information. As illustrated in Figs. 1 and 2, it was established that the Late Glacial and Holocene climatic changes and shifts, besides local effects, seemed to give evidence of regional as well as hemispherical effects, but probably no strictly global effects.

Everyone who works with paleoclimate must be aware of the fact that we are all, so to say, "short-term visitors in the past" and bring back impressions that, however true they are, may not necessarily be significant over a longer time or space range (as was the case with the sudden thunderstorm we were all subjected to when we walked among the graves from the Viking Age at Birka on the island of Björkö).

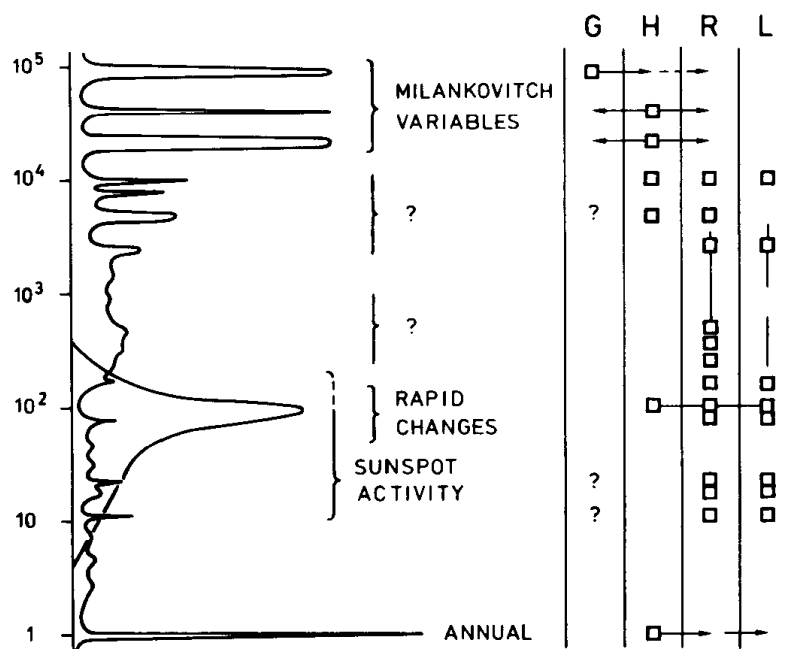


Fig. 1. Semiquantitative spectrum of climatic cycles and changes and their tentative geographic scale of equal effects; G (global), H (hemispheric), R (regional) and L (local). Rapid climatic changes in the order of around 100 years are particularly investigated.

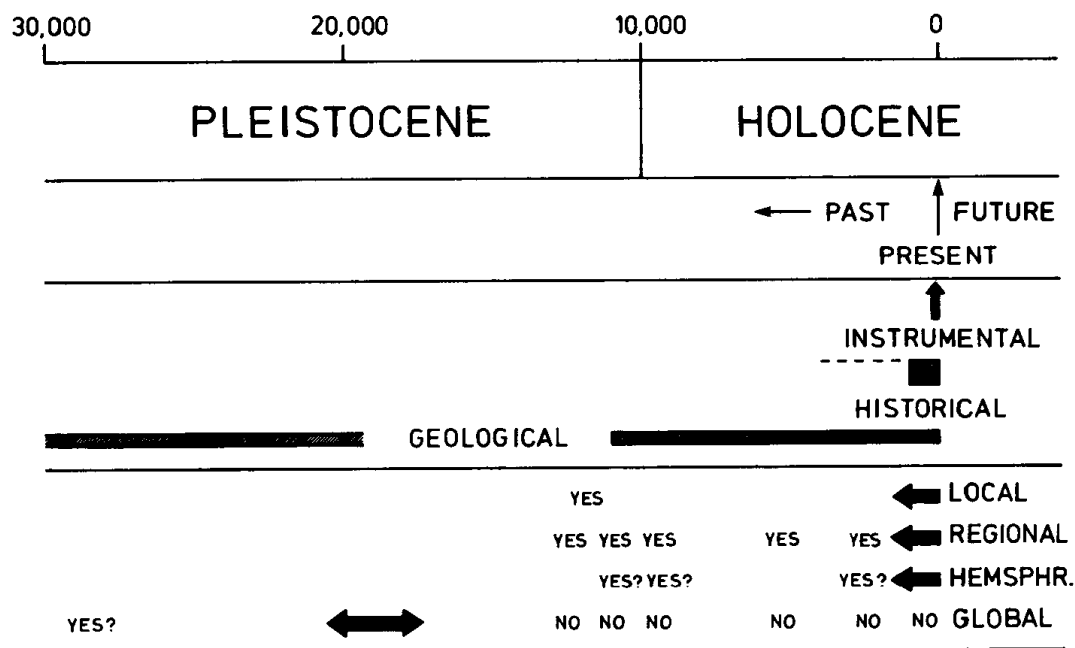


Fig. 2. Time scale and range of analysis, type and range of methods applied, and geographical range of the paleoclimatic changes and shifts (Fig. 1) studied.