

Von Storch, Hans and Götz Flöser (Eds.): Anthropogenic Climate Change. GKSS School of Environmental Research. — Springer, Berlin etc., 1999. XIII+351 p., 124 fig., 15 tab., H/C DM 189,-; öS 1380,-; sFr 171,-. ISBN 3-540-65033-4.

This is the first book of a new series which is called "GKSS School of Environmental Research". This school has been initiated by the Institutes of Hydrophysics and of Atmospheric Physics of the Research Laboratory GKSS in Geesthacht (near Hamburg), Germany in order to disseminate their research activities as well as to start a broad discussion among scientists in the field of climate research. The present volume contains lectures from the first meeting in the frame of the above-mentioned school with the title "Anthropogenic Climate Change" in April 1997. The book contains 9 contributions from four German, three US American, and two Canadian scientists.

The first contribution by Hans von Storch, entitled "The Global and Regional Climate System", discusses the interconnections between the global climate and regional climates. It addresses questions whether the global climate is the sum of all regional climates, and how regional climates influence the global climate. To the end of the contribution, a quite appealing idea, the (partly) randomized parameterization of subgridscale turbulence is introduced, although, it has not been tested yet.

The second chapter by Warren Washington summarizes the basic physical equations which constitute a climate model. This includes also basic equations for the ocean and the sea ice. The chapter just presents the well-known standard equations. More elaborated formulations — as e. g. for additional drag of mountains on the atmosphere — are mentioned only very briefly.

The third lecture by Eric F. Wood gives a qualitative overview on aspects of hydrological modelling from local to global scales. His contribution mainly summarizes the work from international experiments in the framework of the World Climate Research Program. The reader has to deal with a large number of acronyms which designate the experiments and the scientific programs to which they belong. Apart from the water balance equation and an energy equation, both in symbolic notation, no equations are presented.

The first part of the book, which is designed to describe the climate system, concludes with a paper on climate variability by Jin-Song von Storch. She starts with two definitions of climate variability. One definition is based on the evolution of the mean state of climate over long time periods, the other considers second moments or frequency-decomposed covariances around the mean present climate. Both concepts are given in mathematical notation and are accompanied by several examples. The possible origin of the variability is discussed, but not all features can be explained so far.

The second part of the book on "Climate Change" is made up by two contributions. The first one is by William R. Cotton on weather modification by cloud seeding. He reviews the different ways of influencing the rain formation in clouds and tries to find conclusions which do also apply to the modern climate research. These points include the importance of natural variability, the dangers of overselling, the capricious administration of science and technology, and the scientific credibility and advocacy. In the discussion of these conclusions he is shedding some light on interactions between society and science.

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The second paper in this part is on the detection of climate change by Francis Zwiers. This contribution reviews some of the mathematical techniques that have been proposed for climate change detection in the past fifteen years. Two methodologies are presented: those that use 'optimal detectors' and those that use 'pattern similarity' statistics. In both cases simulations with climate models have been made to find the signals that are to be searched for in measured climate data. The recent application of these methods has revealed evidence for anthropogenic climate change.

The book ends with a part on implications containing three contributions. The first by Klaus Hasselmann is on strategies of optimizing greenhouse gas emissions. He reports on a simple Structural Integrated Assessment Model (SIAM) consisting of a simplified climate model and an economic model. This assessment model is applied in order to find optimal emission paths with minimal climate change impact and mitigation costs. The main result is that long-term strategies must be found because of the long time scales of climate response. For further investigations a more complete Global Environment and Society Model (GES) is needed.

The next chapter by Nico Stehr also addresses interactions between sciences and society. He discusses questions like: Is climate research a new scientific discipline? (he says: no, but it is a forgotten one), is it sensible to consider the social consequences of global warming as an optimization problem? (again he says: no), and can one reconcile ecological, economic and modern life-styles imperatives? (he says yes, but societies may have drastically changed until then). He thinks it is imperative to bring social sciences to the center of climate research.

The last contribution by Dennis Bray and Hans von Storch gives the evaluation of about 400 questionnaires circulated among scientists in Germany, Canada, and the USA. The questions asked how well the tools of the researchers operate, how far they believe in climate change, and how far their work influences the thinking of policy makers.

The book seems to be well edited, it is uniformly typeset, the black and white graphs and figures are of good quality. The book is not suited for beginners in climate research, undergraduate students, or for policy makers, but for scientists involved in climate research. Several chapters (especially 1, 4, and 6) require considerable mathematical knowledge. The title of the book might be a little misleading. The book does not contain a review on how man is changing the climate, or how far it has changed already due to his influence. The book rather discusses the tools used in climate research and social implications of climate research. For those who work in this field or in closely related fields of atmospheric and climate sciences the book contains a lot of inspiration for their further work.

STEFAN EMEIS, Weilheim