

BOOK REVIEW

HUMAN IMPACTS ON WEATHER AND CLIMATE. 2ND EDITION. WILLIAM R. COTTON AND ROGER A. PIELKE SR. CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, UK, 2007. 308 PAGES. £65/US\$120 HARDBACK, ISBN-13978-0-521-84086-6. £29.99/US\$55 PAPERBACK, ISBN-13978-0-521-60056-9, C Kidd

This second edition has been published 12 years after the first edition that was reprinted in 1996. Unlike many second editions the authors have not highlighted the changes made between the editions though this becomes apparent when they are seen side by side. The main differences appear to be a radical updating of most of the common material and a considerable amount of new material which will be noted below. To keep this book to approximately the same size (it is 20 pages longer) some material in the first edition has been excised: a section on man-made lakes, detailed explanation of global climate models, and a chapter on greenhouse theory. These are not too much of a problem as there is still a sufficient summary of them within the present edition.

The book aims to discuss ‘the concepts behind deliberate human attempts to modify the weather through cloud seeding, as well as inadvertent modification of weather and climate ... through the emission of aerosols and gases and changes in land-use’. It is divided into three parts comprising 11 chapters and an epilogue.

Part I discusses the rise of cloud seeding from Project Cirrus in the late 1940s, through the two methodologies that developed during the 1960s and 1970s for the modification of warm and cold clouds, hail suppression and finally tropical storm modification (Project Stormfury). It then documents its decline in the 1980s because of the removal of federal funding in the United States due in part to overselling, poor experimental designs, unsubstantiated claims and wasteful expenditures.

Part II considers the inadvertent human impacts on regional weather and climate. Anthropogenic emissions of aerosols and gases now include a new section on dust. The effects of urban development, landscape changes (new), irrigation, dryland agriculture (new), desertification, deforestation, regional vegetation feedbacks (new) are all described using recent research based in the USA, Africa, Australia and the Amazon. Table VI.2 *regional land-use/land-cover effects on weather and climate* lists 280 references on these topics, most of them published since the first edition and the majority in the 21st century. The authors conclude that whilst there is substantial evidence for inadvertent human modification of weather and regional climate there is now a need to strengthen both the

physical understanding and the statistical methodologies used.

Part III moves on to human impacts on the global climate. It has lost a section on modelling global change and a specific chapter on greenhouse gas theory that were in the first edition but these are replaced by sections on various climate feedbacks and a discussion of the Intergovernmental Panel on Climate Change report (2001) and the National Research Council reports (2003, 2005). These reports differ in that whilst the Intergovernmental Panel on Climate Change (IPCC) considers only radiative forcing the National Research Council (NRC) has a wider definition of climate forcing. It still includes the chapter on the nuclear winter hypothesis because this allowed a discussion of models of varying complexities since, fortunately, the world has not yet experienced a nuclear war. The authors also use it to reiterate the way in which science can be subverted to political ends. The final chapter in this edition considers the global effects of land-use/land-cover change and vegetation dynamics. It emphasizes the biological components (biophysical, biogeochemical, biogeographic) of the climate system and points out that their parameterization are in their infancy so that it is not easy to determine their net climate effects. In the Epilogue, we are treated to discourse on natural variability and political interference in science. There is ammunition here for both sides of the climate change discussion. The authors seem to infer that the climate change debate is getting in the way of pure science. They say that ‘the bottom line in examining potential human-caused effects is: are these effects large enough in magnitude to be extricated from the “noise” of the natural variability of the [climate] system’ and they ask if scientists should be advocates of subsets of scientific results or be honest brokers who present the spectrum of scientific understanding (see Pielke, 2007). One is left at the end of Part III with a feeling that the climate change community and their models are overstating most of their claims as regards global-scale effects but are on safer ground when describing regional and local-scale effects. As the authors point out (page 220–221) an increase of the albedo of the earth’s land surface by 4% would result in a *lowering* of the earth’s equilibrium temperature by 2.4 °C whilst a decrease of albedo by 4% would *increase* the temperature by 2.4 °C – this is the same order as modelling estimates of a doubling of CO₂. Thus, there is a real need to understand and quantify the landscape energy budget.

This reviewer found the book an interesting read with very few typographical errors (but see page 242). It manages to explain cloud microphysics without a single

equation but depends heavily on a mathematical approach to surface energy and moisture budgets that are not easily related to the schematic illustrations in Figures 6.2 and 6.3. There are 12 colour plates at the end of the book that are much better than their grey-scale clones in the body of the text. One assumes this was done as a matter of cost but it produces ambiguities as the legends to Figures 4.3 and 11.1 describe a series of colours that are all shades of grey! The bibliography runs to 49 pages. Incidentally a review of the first edition can be found in Volume 16 of this Journal (Perry, 1996).

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