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G. Thomas Farmer

Modern Climate Change Science

An Overview of Today's Climate Change Science

Springer

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G. Thomas Farmer
Farmer Enterprises
Las Cruces, NM
USA

ISSN 2191-5547 ISSN 2191-5555 (electronic)
ISBN 978-3-319-09221-8 ISBN 978-3-319-09222-5 (eBook)
DOI 10.1007/978-3-319-09222-5

Library of Congress Control Number: 2014945257

Springer Cham Heidelberg New York Dordrecht London

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

An Overview and Update of Climate Change Science
(From January 2013 through February 2014)

Earthrise from the Moon, taken in 1968 by William Anders and Frank Borman as they circled the Moon. (From NASA, Public Domain)

Perhaps the most important function of climate science on an issue of broad interest like global warming is to help educate the public and to provide useful input into the policy process. Governments, corporations, and individuals should listen to and learn from the science, just as intelligent people listen to their physicians when their health is in question. Good science input can inform wise policymaking. The role of scientists is to help assess the science and present it in an intelligible way that is policy relevant.

The Forgiving Air: Understanding Environmental Change, (2008) by Richard Somerville, Distinguished Professor Emeritus at Scripps Institution of Oceanography, University of California, San Diego, CA, USA

Preface

This book has been a challenge to write because I attempt what at first seems to be an impossible task because of two main causes for concern: (1) presenting the reader with a topical survey of the science of climate change and (2) directing the reader to the agencies and researchers at the forefront of the science; so why impossible?

(1) It is impossible to survey climate science adequately because it consists of an integration of complex subjects such as the physics and chemistry of the atmosphere, geophysics, geochemistry, geology, biology, ecology, biogeochemistry, computer science, paleoclimatology, and others. One small volume cannot do each of these topics justice in the context of "climate science" or make them a cohesive whole. However, there is an academic entity known as "climate change science" that is being studied today because the climate is changing. It is not the same as "climatology" or "climate science," it is the study of a changing climate, ergo climate change science.

(2) It is also impossible to direct the reader to all the agencies and researchers in the forefront of climate change science. There are simply too many of them.

The emphasis throughout the book is on research being conducted in the United States. This is because the writer is most familiar with the agencies and scientists doing work in the USA. Outstanding research institutions and individual researchers in other countries are included but the emphasis is on work being done at U.S. agencies and institutions.

There are two chapters in the book:

Chapter 1, an Overview of Climate Change Science, is a survey of what is changing with our current global climate. This chapter covers several topics, none of them in depth, but each with enough material that the reader is prepared to seek out and have an appreciation for a more advanced and thorough treatment of the subject.

Chapter 2, Status of Climate Change Research, leads the reader to sources of climate change information such as government agencies, colleges, and universities, and some of the leading researchers in climate change science.

The writer has kept the citing of URLs to a minimum because of the short lifespan of many of them.

Perhaps it is impossible to attempt to present such a wealth of information in one small volume. To attempt it has been a great challenge. Only the reader can judge as to whether it has been successful or not. This work may be considered a "bridge document" as it contains climate change information that updates Farmer and Cook's *Climate Change Science: A Modern Synthesis, Volume 1, The Physical Climate* published by Springer Publishers on January 12, 2013.

Homo sapiens is a destructive species. Since evolving around 200,000 years ago, it has set about on a course of destroying Planet Earth. It began using Earth's resources as soon as it learned it could tame fire to burn down areas of forest. As it learned to grow its own food it needed more land and the Agricultural Revolution was born around 12,000 years ago. It is not known when coal was first used as a source of energy but its use was vastly increased during the Industrial Revolution that began around 1750. *H. sapiens* discovered that coal, having taken millions of years to form, could easily be dug from its resting place in Earth, burned at Earth's surface, adding carbon dioxide to the active carbon cycle. Petroleum was made a popular fuel by the internal combustion engine and production went up for petroleum in the 1850s. Still more carbon was added to the carbon cycle from materials buried deep within the Earth. *H. sapiens* is continuing to disrupt the natural balance of the planet by burning fossil fuels, clearing forest lands, and manufacturing cement.

Las Cruces, USA, February 2014 G. Thomas Farmer

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