

2004-05 AAPG Distinguished Lecture

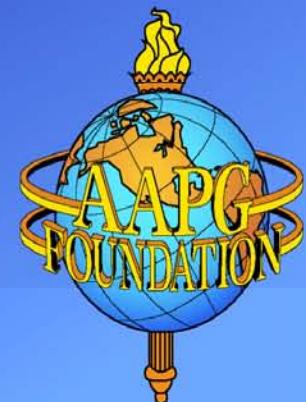
Funded by the AAPG Foundation through the J. Ben Carsey Endowment

The Sun / Earth Climate System

A Geoscience Perspective

Arthur R. Green, Chief Geoscientist

ExxonMobil Exploration Co., Retired
Houston, Texas



The Sun / Earth Climate System

A Geoscience Perspective



Illustrations: Dolores Claxton

Conclusions

- The climate of Planet Earth is in a continuous state of either cooling or warming as the elegant sun-earth climate system equilibrates the surface temperature within a range of ~16° Centigrade.
- We are currently living in a not-yet-completed interglacial stage and we are experiencing a minor warming trend. Glacial periods tend to have more rapid climate changes. In the last 15 thousand years, there have been two types of climate change - 1) Moderate and gradual, 2) Major and abrupt.
- The last decade of climate research has taught us what we don't know and has revealed that we are only at the beginning of the learning curve. “We do not understand the fundamentals of abrupt climate change well enough to predict them.” (NRC Abrupt Climate Change 2002)
- The deep difficulty of conducting climate and global change research is that it requires the non-linear complex integration of a wide spectrum of the sciences - meteorology, physics, chemistry, geology, botany, biology, mathematics and sophisticated computer modeling.
- Climate is not weather - it is infinitely more complex.

The Sun / Earth Climate System

A Geologic Perspective

- Scientific Methods and Context
- Climate Forcing Mechanisms of the Sun - Earth Climate System
 - External Mechanisms
 - + Solar and Galactic Forcing
 - + The Earth's Orbital Changes
 - + Asteroid Impacts
 - + The Moon
 - Internal Mechanisms
 - + Atmosphere
 - + Hydrosphere
 - + Biosphere
 - + Cryosphere
 - + Lithosphere
- The non-linear complexity of Global Climate Science - Forcing Mechanisms, Sensitivities and Interdependencies
- Future Research and Global Sensing Data and Information
- Climate Change Consequences
- Summary
- Climate Change Debate

Reports of the US National Research Council Natural Academy of Science



The Solar-Terrestrial Connections Space Weather

