

OUR CHANGING CLIMATE

1. **DESCRIPTION:** Participants will demonstrate an understanding of the following:

- The earth, planetary and physical systems that influence climate on planet Earth
- The state of both science and policy relating to climate change
- The potential effects of climate change on planet Earth
- Potential control strategies that have been at the forefront of scientific research or political discourse

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS:** Each participant may bring any kind of (non-graphing) calculator. No other resources are permitted.

3. **THE COMPETITION:** Topics may include, but are not limited to:

- a) Composition and evolution of Earth's atmosphere with emphasis on how composition can affect climate (greenhouse gasses, volcanic particulates, carbon cycle etc.).
- b) Solar radiation and the Earth's energy balance. Albedo and long wave radiation. Pertinent equations from atmospheric physics, e.g. Stefan-Boltzmann Law, Wien's Displacement law. Students may be asked to calculate energy balance using a 1-layer model. *Math skills at an Algebra II level are assumed.*
- c) Climate monitoring. Paleoclimates and climate proxies.
- d) Sources of natural climate variability. Effects of land masses and water bodies. Milankovich cycles. Solar cycles.
- e) Sources of anthropogenic climate variability. Greenhouse gases, aerosols, alterations to the carbon cycle, etc.
- f) Observed and predicted effects of climate change. Sea-level rise, arctic ice, planetary albedo, other alterations to the biosphere. Abrupt climate change.
- g) The current state of the science pertaining to climate change. The Intergovernmental Panel on Climate Change.
- h) Proposed control strategies. Mitigation vs. adaptation. The Kyoto Protocol.

4. **REPRESENTATIVE ACTIVITIES:**

- Examine graphs of Earth's mean global temperatures, which encompass significant events (industrialization, volcanic eruptions, solar maximums and minimums) and interpret their impact on climate.
- Examine various different climate projections and interpret their underlying assumptions and impacts on the planet.
- Calculate the energy balance of Earth using a 1-layer atmospheric model.

5. **SCORING:** Points will be awarded according to the quality and accuracy of responses and the quality of supportive reasoning.

RESOURCES: The IPCC AR4 WG1 SPM is the benchmark for the state of the science. Put those acronyms into Google and you will find this report. This is a must-read for students who wish to do well in this event. *The Science and Politics of Global Climate Change: A Guide to the Debate* by Andrew E. Dessler and Edward A. Parson is a good reference for much of the material. Additional web-based references will be posted on the Texas Science Olympiad website as they are discovered.

James Tobin, 11/14/2008