

SMITHSONIAN INSTITUTION

National Museum of Natural History (NMNH)
 National Zoological Park (NZP)
 Smithsonian Tropical Research Institute (STRI)
 Smithsonian Environmental Research Center (SERC)

Principal Areas of Focus

Within the Smithsonian Institution, global change research is conducted at the Smithsonian Astrophysical Observatory, the National Air and Space Museum, the Smithsonian Environmental Research Center, the National Museum of Natural History, the Smithsonian Tropical Research Institute, and the National Zoological Park. Research is organized around themes of atmospheric processes, ecosystem dynamics, observing natural and anthropogenic environmental change on daily to decadal time scales, and defining longer term climate proxies present in the historical artifacts and records of the museums as well as in the geologic record at field sites. The Smithsonian Institution program strives to improve knowledge of the natural processes involved in global climate change, provide a long-term repository of climate-relevant research materials for present and future studies, and to bring this knowledge to various audiences, ranging from scholarly to the lay public. The unique contribution of the Smithsonian Institution is a long-term perspective—for example, undertaking investigations that may require extended study before producing useful results and conducting observations on sufficiently long (e.g., decadal) time scales to resolve human-caused modification of natural variability.



Program Highlights for FY 2004 and FY 2005

Climate Variability and Change

Research at the National Air and Space Museum will emphasize the use of remote-sensing data to improve theories of drought, sand mobility, soil stability, and climate change in the eastern Sahara. Studies at NMNH and STRI will focus on the paleoecology of climate change.

Atmospheric Composition

At SERC, measurements will be made of spectral UV-B in Maryland (>25 year record), Florida, Arizona, and other sites in the United States. These data will be electronically disseminated to meet the needs for assessing the biological and chemical impact of varying UV exposure. During FY 2004 and FY 2005, results will be used to update trends in surface UV radiation and will be reported in national meetings and peer-reviewed publications (Question 3.4 of *CCSP Strategic Plan*).

Terrestrial and Marine Ecosystems

Several Smithsonian programs will examine biological responses to global change. At SERC, research will be conducted on the responses of global ecosystems to increasing carbon dioxide (also a contribution to the Global Carbon Cycle program), invasive species, and solar UV-B. Biodiversity education and research will be performed at STRI, NMNH, and NZP. Tropical biodiversity research programs monitor global change effects through repeated sampling of flora and fauna in tropical forests, and identifying the physical and biological processes of growth and decline of species. Other studies on ecosystem response

Appendix

to increasing habitat fragmentation will be conducted at NZP. During FY 2004 and FY 2005, results will be reported from a study on long-term changes in Amazonian tree communities, which are evidently related to climatic or atmospheric drivers (Question 8.2 of *CCSP Strategic Plan*).

Human Dimensions of Global Change

The general public and research community will be informed of global change research conducted by Smithsonian and other USGCRP agencies via exhibits. During FY 2004 and FY 2005, exhibits will be displayed at NMNH in the “Forces of Change: Global Links” series concerning El Niño events, the atmosphere, and the Arctic, with accompanying educational programs and other ancillary information accessible through the internet (see Chapter 14 of the *CCSP Strategic Plan*).

Related Research

Much of the global change research performed at the Smithsonian is not supported by funds appropriated directly to the Smithsonian, and instead is supported by other public and private sources (including other CCSP participating agencies). These projects are nonetheless organized around the CCSP research elements and thus amplify the scope and impact of research supported directly by the CCSP. These include programs at the Smithsonian Astrophysical Observatory studying stratospheric trace species that play an important role in ozone photochemical cycles, as well as studies of solar activity and irradiance. SERC and STRI receive agency support via competitive grants programs to perform studies of the ecosystem responses to increased carbon dioxide, UV-B, and invasive species. Other contributing activities include research conducted by several units within the Smithsonian in a variety of habitats concerning natural and human-induced variations in species, populations-communities, and ecosystems. These studies help clarify the relative importance of global change effects as one of several agents of ecological change. Studies of environmental change over long time periods are aided by the Smithsonian Institution’s collections. Utilized by researchers around the world, these materials provide raw data for evaluating changes in the physical and biological environment that occurred before human influences.