

SMITHSONIAN INSTITUTION

National Air and Space Museum (NASM)
 National Museum of Natural History (NMNH)
 National Zoological Park (NZP)
 Smithsonian Astrophysical Observatory (SAO)
 Smithsonian Environmental Research Center (SERC)
 Smithsonian Tropical Research Institute (STRI)

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, to 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 2009

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 ultraviolet radiation exposures.

Climate Variability and Change

Research at NASM will emphasize the use of remote-sensing data to improve theories of drought, sand mobility, soil stability, and climate change in the Mojave Desert and Simpson Desert, Australia. Studies at NMNH and STRI will focus on the paleoecology of climate change.

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 concentrations (also a contribution to the Global Carbon Cycle program). This SERC program will also focus on 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 and temperate forests, and identifying the physical and

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biological processes of growth and decline of species. Other studies on ecosystem response to increasing habitat fragmentation will be conducted at NZP.

Human Dimensions of Global Change

The general public and research community will be informed of global change research conducted by Smithsonian and other CCSP agencies via exhibits. During FY 2009, an exhibition on soils developed by staff at NMNH and SERC will continue to be displayed at NMNH. Part of the “Forces of Change” series, the exhibition includes soils’ role as atmospheric sources and sinks. FY 2009 will also see the debut of the new Ocean Hall (SI-NOAA joint collaboration) that deals with issues such as loss of sea ice habitat and coral reef ecosystems due to global warming and ocean acidification.

Related Research

Much of the global change research performed at the Smithsonian is not supported by direct Federal appropriation (i.e., CCSP cross-cut funding) and instead is supported by other public and private sources (including other CCSP-participating agencies). These projects are nonetheless organized around CCSP program elements, thus amplifying the scope and impact of research supported directly by CCSP. At SAO, there are extensive measurement programs for stratospheric and tropospheric composition. These include pollution measurement from space and its eventual development into continuous global monitoring. This work contributes to global climate observations, enhances climate modeling systems, quantifies greenhouse gas sources and sinks, and reduces scientific uncertainties of aerosol effects. There are continuing studies on solar activity and its relationship to climate. SERC and STRI receive agency support via competitive grants programs to perform studies of 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 Institution’s collections. Used by researchers around the world, these materials provide raw data for evaluating changes in the physical and biological environment that occurred before human influences.