

Overview of the CCSP Research Elements



The CCSP participating agencies coordinate their work through seven interdisciplinary “research elements,” which together support scientific research across a wide range of interconnected issues of climate and global change. These research elements pertain to major components of the Earth’s environmental and human systems, which are undergoing changes caused by a variety of natural and human-induced causes. The CCSP will encourage evolution of the research elements over the coming decade in response to new knowledge and societal needs.

Atmospheric Composition

Focuses on how the composition of the global atmosphere is altered by human activities and natural phenomena, and how such changes influence climate, ozone, ultraviolet radiation, pollutant exposure, ecosystems, and human health. Specific objectives address processes affecting the recovery of the stratospheric ozone layer from reduced ozone levels observed in recent decades; the properties and distributions of greenhouse gases and aerosols; long-range transport of pollutants and implications for regional air quality; and integrated assessments of the effects of these changes.

Climate Variability and Change

Focuses on how climate elements that are particularly important to human and natural systems—especially temperature, precipitation, clouds, winds, and storminess—are affected by changes in the Earth system. Specific objectives include improved predictions of seasonal to decadal climate variations (such as predictions of El Niño and La Niña events); improved detection, attribution, and projections of longer term changes in climate; the potential for changes in extreme events at regional to local scales; the possibility of abrupt climate change; and development of approaches (including characterization of uncertainty) to inform national dialogue and support public and private sector decision making.

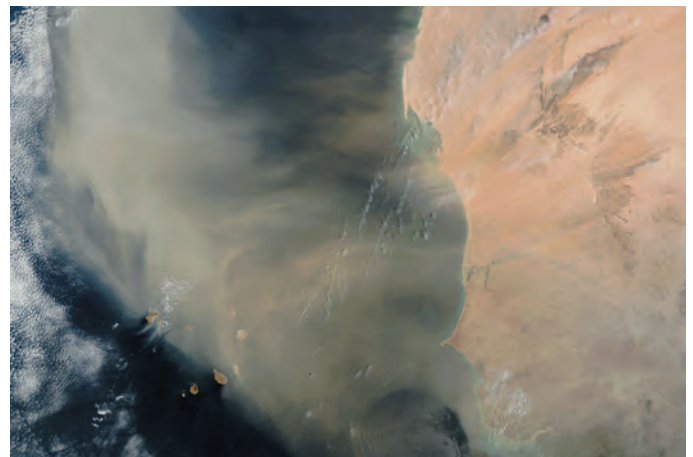


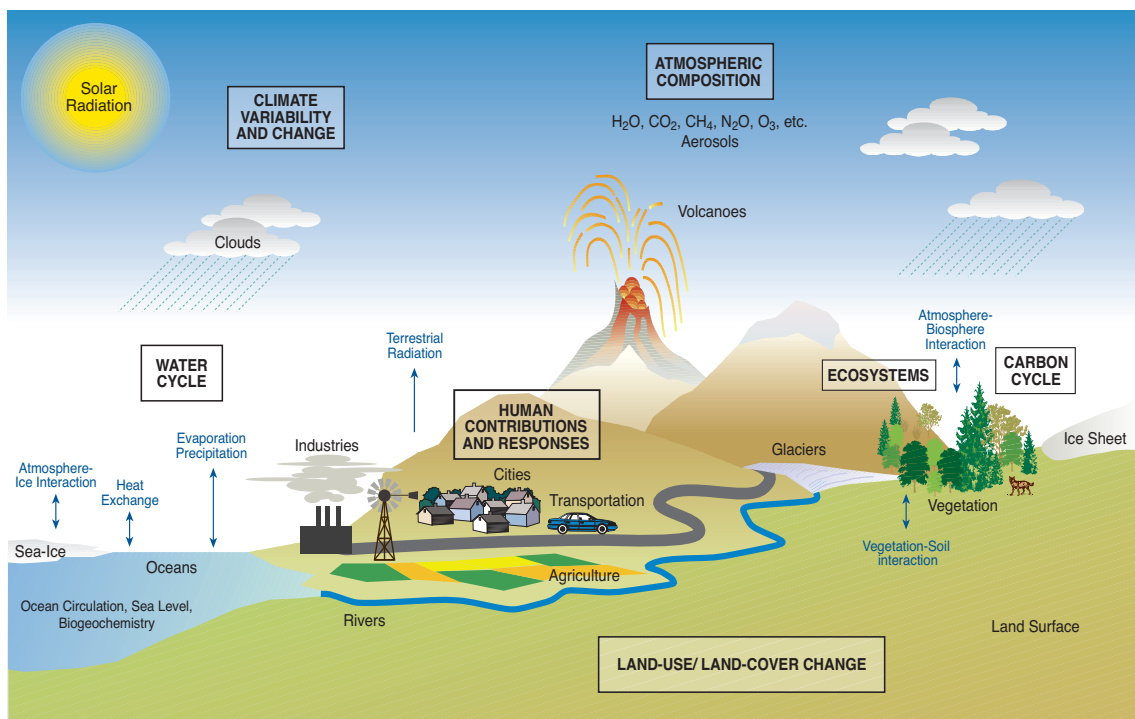
Global Water Cycle

Focuses on how natural processes and human activities influence the distribution and quality of water within the Earth system, whether changes are predictable, and the effects of variability and change in the water cycle on human systems. Specific areas include identifying trends in the intensity of the water cycle and determining the causes of these changes (including feedback effects of clouds on the global water and energy budgets as well as the global climate system); predicting precipitation and evaporation patterns on time scales of months to years and longer; and modeling interactions between water and physical, biological, and socio-economic processes to facilitate efficient resources management.

Land-Use/Land-Cover Change

Focuses on the processes that determine the temporal and spatial distributions of land cover and land use at local, regional, and global scales, and how and how well land use and land cover can be projected over time scales of 5-50 years; and how changes in land management,





Major components needed to understand the climate system and climate change.

use, and cover may affect local, regional, and global environmental and socio-economic conditions, including economic welfare and human health, taking into consideration socio-economic factors and potential technological change. Specific focus areas include identifying and quantifying the human drivers of land-use and land-cover change; improving monitoring, measuring, and mapping of land use and land cover, and the management of these data; and developing projections of land-cover and land-use change under various scenarios of climate, demographic, economic, and technological change.

Global Carbon Cycle

Focuses on identifying the size, variability, and potential future changes to reservoirs and fluxes of carbon within the Earth system; and providing the scientific underpinning for evaluating options to manage carbon sources and sinks. Specific programs and projects focus on North American and oceanic carbon sources and sinks; the impact of land-use change and resource management practices on carbon sources and sinks; projecting

future atmospheric carbon dioxide and methane concentrations and changes in land-based and marine carbon sinks; and the global distribution of carbon sources and sinks and how they are changing.

Ecosystems

Focuses on how natural and human-induced environmental changes interact to affect the structure and functioning of ecosystems (and the goods and services they provide) at a range of spatial and temporal scales, including those

ecosystem processes that in turn influence regional and global environmental changes; and what options society may have to ensure that desirable ecosystem goods and services will be sustained, or enhanced, in the context of still uncertain regional and global environmental changes. Among the specific focus areas are the cycling of nutrients such as nitrogen and how these nutrients interact with the carbon cycle; key processes that link ecosystems with climate; and options for managing agricultural lands, forests, and other ecosystems to sustain goods and services essential to societies.

Human Contributions and Responses

The current focus of this research is on the potential effects of climate variability and change on human health and welfare; human influences on the climate system, land use, and other global environmental changes; analyses of societal vulnerability and resilience to global environmental change; decision making under conditions of significant complexity and uncertainty; and integrated assessment methods.

This fact sheet was generated by the Climate Change Science Program Office in collaboration with an interagency working group composed of representatives of the 13 Federal agencies participating in the U.S. Climate Change Science Program.

For further information, see <www.climate-science.gov>.