MISSION TO PLANET EARTH: PAST PROGRESS AND FUTURE PROSPECTS

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During the 1980s ambitious plans were laid out for the beginning of a new era in Earth studies. Presidential Initiatives in the 1990's created the U.S. Global Change Research Program, including as its largest component, Mission to Planet Earth (MTPE) led by the National Aeronautics and Space Administration (NASA). Mission to Planet Earth efforts are aimed at improving our understanding of the Earth as a system, and our ability to assess and predict the environmental, social and economic impacts of natural and human-influenced processes. The overall goal is to establish the scientific basis for national and international policymaking in response to changes in the Earth system.

The MTPE is primarily focused on obtaining global observations from spaceborne instruments and modeling the Earth as an integrated and coupled system of atmosphere, continents and oceans. MTPE will support focused and exploratory studies of the physical, chemical and biological processes that influence the. Earth system. Improvements over current capabilities in the range, detail, and frequency of observations are also needed to develop and test integrated, conceptual and predictive models of the Earth system.

NASA has defined the following three major tasks for success in MTPE: improve observations, responsibly manage all associated data and information, and support research and analysis. The first task is the development of an integrated observational system from spacecraft, aircraft, and on the Earth's surface. Second is to build a comprehensive data and information system to make data useful and readily available. Third is to support and train scientists to analyze the data collected to build models of the Earth system, and to provide interpretations that will improve our understanding and predictive capabilities.

The initial phase of the MTPE is well underway, with these three tasks integrated within a series of flight missions. The second phase begins in 1998 with the coordination of these tasks within the Earth Observing System (EOS) Program. A major focus of the MTPE/EOS program is to understand the energy and radiation budget of Earth.

Absorption of solar irradiance by the Earth's atmosphere, oceans and surface is the ultimate energy source for the Earth system. For this reason it is important that Earth system scientists develop an understanding of the temporal and spectral variability of solar irradiance and how it is physically related to parameters which describe the system. Measurements of solar variability are especially important during the same time frame in which intensive observations are being made of those system elements which affect the absorption of solar irradiance. The most fundamental of the Earth system observations is the Earth's radiation budget. "Top of the atmosphere" reflected solar and emitted irradiances are inferred from broadband (0.3 to S.0 μm and 5.0 to 50+ pm) scanning radiometer measurements made from earth orbiting satellites. Estimates of these quantities have been made from the earliest satellites and are a significant component of MTPE/EOS.

Elements of the Earth system with variable characteristics and which most significantly affect the absorption of solar irradiance include clouds, aerosols, water vapor, and surface reflectance. Over the past decade, satellite and surface based instruments have provided estimates of these elements based on remote sensing analyses of the reflected solar and emitted radiances. Many of these remote sensing approaches assume accurate knowledge of the spectral distribution of the solar irradiance.