Roles and Responsibilities for Observing, Collection, and Distribution Systems: Federal Viewpoint

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ABSTRACT

The three main themes of this presentation deal with (1) the need to establish a common set of requirements for effective environmental monitoring on an international basis; (2) the need to make real-time weather and climate data more accessible to communities outside of the environmental community by becoming more integrated with the National Spatial Data Infrastructure; and (3) the need to identify current or planned sensors to measure key parameters and encourage the transition of existing critical research systems to operational status. While the presentation gives a view from the federal sector it must by its nature also focus on key national and international partnerships that go beyond the realm of the federal government.

The Organic Act of 1890 as well as other legislation such as 49 USC 4720 "Weather Support of Aviation" provide NOAA with the basis for why we care about these issues and why we are so involved. Weather and climate data and information are essential for supporting a wide range of commercial, industrial, agricultural, and common every day activities across the U.S. Global environmental modeling involves a complex spectrum of relatively long-term *in situ* observations from the atmospheric, oceanographic, and terrestrial domains, as well as a relatively shorter history of space-based remote sensing observations that cut across those three domains. A good summary of observing systems in the U.S. can be found in the recently published report in August 2001, entitled "The U.S. Detailed National Report on Systematic Observations for Climate." This report can be found at http://www.eis.noaa.gov/gcos

In situ atmospheric observations have the longest historical record but are limited to land areas covering only 30% of the earth's surface. Operational systems collect data primarily in support of weather prediction, while research systems are more focused on climate studies. There is no comprehensive system designed specifically for monitoring climate change, and while the international trend in atmospheric observing is in decline, the trend in the U.S. is stable and even increasing with the recent emphasis on regional and state observing systems (e.g., the Oklahoma Mesonet).

In situ oceanographic observations also have a long historical record but have sparser coverage especially in deep water areas. These observations are critical to the understanding of ocean processes as they relate to weather and climate, and as such in 1997 the need for sustained ocean observations was recognized with the establishment of the National Oceanographic Partnership Program (NOPP). In 1998, the Congress requested a plan for an integrated ocean observation system, and last year the NOPP established an interagency program office consisting of NASA, the Navy, NOAA, and the National Science Foundation in order to implement such a system. The outlook for *in situ* oceanographic observations is positive, especially in light of internationally supported programs such as ARGO floats.

In situ terrestrial observations also have a relatively long historical record; however, this domain has much less focus and a greater diversity of environmental parameters that are measured. These include snow and ice monitoring, streamflow and surface water gauging, water quality analyses, soil climate, and ecological and fire monitoring. The responsibilities for these observations are in a number of federal and state agencies and while the outlook for these observations looks stable, without a comprehensive national focus and strategy in place for these, it is more difficult to gauge.

Space-based observations have a much shorter historical record that cuts across the atmospheric, oceanographic, and terrestrial domains. There are real-time environmental and longer-term climate applications from both polar and geostationary platforms that provide continuous coverage on a variety of spatial and temporal scales. There is great international growth in the extent and use of satellites for environmental monitoring.

The state of global environmental monitoring has many long-term satellite and *in situ* observing programs underway, but a comprehensive requirements process is required. Databases must be easily accessible both within and beyond the environmental community, and a guaranteed process for the transition of R&D space observations into operations is also required. This monitoring requires partnerships on the international and national levels. On the international level for example, NESDIS partners with space environmental agencies from a number of nations through the Committee on Earth Observation Satellites (CEOS); in addition the International Global Observing Strategy provides a venue for the development of requirements for studying various environmental thematic areas (e.g., Oceans, Carbon, etc.). The National Weather Service through its Telecommunication Gateway (NWSTG) is a significant node for the exchange of weather observation data via the World Weather Watch. The NWSTG also serves to facilitate the exchange of national observation data from a number of federal agencies.

Access to this data follows a free and open policy. Some prime examples of that are: (1) NOAAPort; (2) HRPT Direct Broadcast; (3) the Emergency Managers Weather Information Network (EMWIN), and (4) the NOAA Weather Wire. However, weather and climate data needs to begin moving into the realm of Geographic Information System (GIS) work and there are a few examples of this beginning in NOAA primarily through work in AWIPS (http://isl715.nws.noaa.gov/mapdata/newcat) and NESDIS' Satellite Active Archive (http://las.saa.noaa.gov) which allows users to obtain static and java web maps on the fly. While a number of initiatives are underway at the federal level to have a fully integrated electronic and spatially enabled National Spatial Data Infrastructure (NSDI) for real-time data, unfortunately weather and climate data are a bit behind in being incorporated into the NSDI. The environmental community must move ahead in better documenting its data through searchable metadata that is part of the NSDI and also move to make data available in more spatially enabled GIS-friendly formats such as GeoTIFF and SHAPE. NESDIS serves as a clearinghouse for metadata management across NOAA and works with other federal organizations on this. The GeoSpatial Data and Climate (GDCS) Services group under the

NESDIS Office of the CIO is a key focal point for that. If you want to learn more, please contact Howard Diamond, the GDCS group leader, at howard.diamond@noaa.gov. Some sites of interest related to this topic are the Federal Geographic Data Committee at http://www.fgdc.gov; the National Atlas at http://www.nationalatlas.gov; and the OpenGIS Consortium at http://www.opengis.org; and the NOAAServer metadata clearinghouse available via http://www.eis.noaa.gov.

Through the GDCS group at NESDIS, NOAA is an active member in all these organizations and efforts. There are many centers of excellence in the federal government, including NOAA, related to GIS and web mapping activities, and a goal should be for real-time weather information to be better integrated into the overall NSDI. Many external communities such as emergency management is actively looking for better access to spatially enabled weather data; this is particularly important in light of the events of September 11th.

The need to identify current or planned sensors in order to measure key parameters is a vital part of the R&D process, and as such we must encourage the transition of existing critical research systems to operational status. The required end-to-end activities involve work that takes the development from the requirements phase up through operational customer use and the associated archive and access functions required for proper data management. A number of transition activities are underway in this area and they include the following: (1) the evolution of NOAA's sounding suite of data and NASA's Atmospheric Infrared Sounder (AIRS) to the development of the Crosstrack Infrared Sounder (CrIS) slated for the upcoming National Polar-orbiting Operational Environmental Satellite System (NPOESS) and NPOESS Preparatory Project (NPP) missions; (2) the evolution of imagery and ocean color sensing from NOAA's Advanced Very High Resolution Radiometer (AVHRR) instrument and NASA's Moderate Resolution Imager Radiometer (MODIS) instrument to the new Visible Infrared Imager Radiometer Suite (VIIRS) slated for the upcoming NPP and NPOESS missions; (3) the evolution from the Total Ozone Mapping Spectrometer (TOMS) to the more advanced Ozone Mapping and Profiler Suite (OMPS); and (4) the efforts to migrate the French/U.S. Jason altimetry mission to operational status, both NOAA and EUMETSAT are poised to join NASA and the French Space Agency CNES in the development and operation of the next generation Jason-2 altimetry mission.

In conclusion, we must work toward the following important goals: (1) organize a common set of international environmental monitoring requirements; (2) make real-time weather and climate data more accessible to communities outside of the environmental community by being more integrated with the greater National Spatial Data Infrastructure; and (3) identify current or planned sensors to measure key parameters and encourage the transition of existing and critical research systems to operational status.