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GEOSS – Opportunities for Air Quality

More than 50 nations have formally adopted a ten-year implementation plan for a Global Earth Observation System of Systems (GEOSS) to help all nations produce and manage environmental information in a way that benefits all.

In July 2003, the United States hosted the Earth Observation Summit in Washington, DC. The summit brought together 33 nations and the European Commission, with the aim to adopt a declaration of a political commitment toward the development of a comprehensive, coordinated, and sustained Earth Observation System that would collect and disseminate improved environmental data, information, and models to stakeholders and decision makers.

Nine months later, in Tokyo, Japan, a second Summit was held. More than 50 nations formally adopted a ten-year implementation plan for GEOSS, to help all nations produce and manage environmental information in a way that benefits the environment and humanity.

GEOSS is a large cooperative effort to bring together existing and new hardware and software, making it all compatible in order to supply data and information at no cost. The more-developed nations have a unique role in developing and maintaining the system, collecting data, enhancing data distribution, and providing models to help all of the world's nations. The third and final Summit meeting is planned for February 2005 in Brussels.

Environmental aspects

On March 9-10, 2004, the U.S. Environmental Protection Agency (EPA) convened a panel of experts to make recommendations pertaining to the possible role of air quality in conjunction with the U.S. contributions to GEOSS. In this context, "air quality" encompasses measurements, data assimilation, modeling and forecasting, including the relevant air chemistry, meteorological and emissions aspects.

The panel recognized that other governmental and non-governmental organizations would also be contributing to the design and implementation of GEOSS, and that many related observing initiatives may already be in place. Thus the panel sought to consider unique

Air Quality Panel Members and Affiliation

- Gregory Carmichael - University of Iowa, Iowa City, IA
- Mary Anne Carroll - University of Michigan, Ann Arbor, MI
- Jason Ching - National Oceanic and Atmospheric Administration, on assignment to EPA, Research Triangle Park, NC
- Walter Dabberdt - Vaisala, Inc., Boulder, CO (co-convener)
- Jack Fishman - National Aeronautics and Space Administration, Langley, VA
- Alex Guenther - National Center for Atmospheric Research, Boulder, CO
- Jeremy Hales - ENVAIR, Pasco, WA
- Robert Imhoff - Baron Advanced Meteorological Systems, Asheville, NC
- Sharon LeDuc - National Oceanic and Atmospheric Administration, National Climate Data Center, Asheville, NC
- John McHenry - Baron Advanced Meteorological Systems (co-convener), North Carolina State University (Visiting Scholar), Raleigh, NC
- Richard McNider - University of Alabama, Huntsville, AL
- Nelson Seaman - Pennsylvania State University, on assignment to NOAA National Weather Service, Silver Spring, MD
- James Szykman - Environmental Protection Agency, on assignment to NASA Langley Research Center, Hampton, VA
- Anne Thompson - National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD

contributions to GEOSS that could be made by the U.S. EPA.

Major recommendations were made in numerous areas:

- Measurements and sampling
- Data assimilation
- Integrated biogenic assessments
- Surface characterization and parameterization
- Strategies for improved emissions estimates
- Special urban challenges
- International air quality forecasting
- Testbeds
- Database management and information systems
- Education and outreach

Summary

Several overarching themes emerged during the workshop, which have broad implications for the traditional meteorological community:

First, air quality and air quality forecasting are receiving increased recognition and priority throughout the world. Operational air quality forecasting is being implemented by an increasing number of countries.

Second, meteorology is the single most important determinant of hourly and daily variations in air quality levels. As such, many operational meteorological resources – observations and modeling – can and do make important contributions to predicting changes in air quality.

And third, air quality measurements such as ozone and carbon dioxide are also important for meteorological and climate forecasting, as well as air quality forecasting. In addition to all of its many potential contributions to the improved understanding of the global environment, GEOSS can play a valuable role in bringing closer together the meteorological and air quality communities with their complementary resources. ●

Panel's Recommendations

The panel's recommendations to EPA concerning its future role in GEOSS are summarized here according to various high-level thematic elements (not prioritized). Important details are provided in the various sections of the full summary report, and interested readers are encouraged to consider the entire report when evaluating the scope and focus of the individual recommendations. The full report is available at www.vaisala.com in the Vaisala News 167/2005 section.

- EPA should adopt air quality forecasting as a major focus of its contributions to GEOSS.
- Urban air quality forecasting should receive special emphasis, especially urban needs pertaining to characterizing sub-grid-scale processes and variability.
- Development, improvement, and testing of data assimilation schemes for air chemistry demand additional effort within GEOSS.
- Improved, dynamic emissions inventories are very important, and need to consider multiple aspects: urban, rural, anthropogenic, and biogenic.
- A focused effort is needed to design and establish multi-sensor three-dimensional measurement networks and observing strategies for air chemistry, meteorology, and surface characteristics (bootstrapping on existing meteorological measurement networks).
- Additional effort is required to improve the use of current and future satellite data for air quality forecasting, dynamic emissions inventories, and surface characterization.
- Testbeds are a critical component in the development of a successful GEOSS program and its ability to transfer technology from research to operations; EPA has much relevant experience and should take a leading international role.
- EPA, in cooperation with NASA and NOAA, should participate in the design, implementation, operation, and support of a central real-time GEOSS database management system.
- EPA (and other participating GEOSS agencies) should play a major role in preparing future interdisciplinary scientists for participation in local, regional, and global observing programs.
- GEOSS will be extremely beneficial to the global community for its ability to transfer technology to developing countries, and EPA should play a key role. ●

More information on EPA, the Earth Observation Summit and GEOSS is available at http://www.epa.gov/geoss/index.html