

Air Quality and Human Health

Description

This SBA provides atmospheric forecasts of dust, aerosol, and ozone conditions by assimilating Earth observations data into weather models and provides reliable 2-3 day forecasts of air quality so authorities can intervene to reduce human health responses diseases. Another critical objective is to relate statistically the frequency and severity of air quality episodes with health outcomes from hospital records and patient complaints to better understand the transmission pathways of human respiratory diseases. Methods include:

1. retrieving satellite measurements of ground level conditions that control the concentrations of air pollutants;
2. assimilating these measurements into forecast models embedded in operational weather models to replace outdated measurements; and,
3. broadcasting air quality information via GEONETCast and other communication networks on actionable time scales.

Several types of surface and near-surface air quality measurements are made routinely from satellites and ground networks. Among the more useful are the total area and distribution of dust sources; soil moisture at the surface; the timing, amounts, and patterns of rainfall; topography; the speeds and directions of wind; and anthropogenic sources. Early achievements indicate that replacing outdated land cover maps with satellite observations improves the performance of regional dust models for forecasting the time and severity of air quality episodes. Such improvements have augmented the interest of national health authorities and air quality compliance agencies to include environmental conditions at the Earth's surface in daily weather forecasts. Augmenting these capabilities with vertical profile measurements of smoke from fires and anthropogenic emissions from agricultural and industrial sources will further improve forecasts and improve understanding of epidemiology and intervention mechanisms.

Figure 1 shows elements of the air quality and human health system-of-systems. Some elements are operational (GEONETCast and SERVIR); others are quasi-operational (red dots); and still others (yellow dots) are conceptual, but expected to be implemented by 2009.

Added Value

GEO has assisted these early achievements by stimulating collaborations between organizations that provide Earth observations, those who process data and information into useful products, the modeling communities who assemble products into forecasts, and those who disseminated results as early warning broadcasts of air quality conditions. Routine forecasts of dust and aerosol events will add to the global Earth observing system-of-systems for both the air quality and human health Societal Benefit Areas. Finally, continued development of GEOSS abilities to identify and monitor major air quality events will help long-term efforts to understand international transport of both dust and aerosols on a global scale.

Relevance to GEO

The Northern Hemisphere mid latitudes are known as being dusty and polluted by a ring of unhealthy aerosols. The Northern Hemisphere is also labeled as a breeding ground for emerging infectious diseases, some of which begin as respiratory syndromes capable of progressing into human health epidemics. The threat of these possibilities translates into adverse consequences on national gross domestic products (GDP) and cost of rising health care needs.

GEO Work Plan reference:

- SBA: Air quality; Human health and well-being
- Task: HE-07-02 – Environment and Health Monitoring and Modeling

Participants

Members: • USGEO;
Participating Organizations: • WMO; ICSU; ISPRS;

Current Status and Next Steps

Gaps include data missing in current satellite measurements, gaps in geographic coverage, sensor technology gaps, standards, and interoperability, among others.