Air and Water Monitoring for Homeland Security

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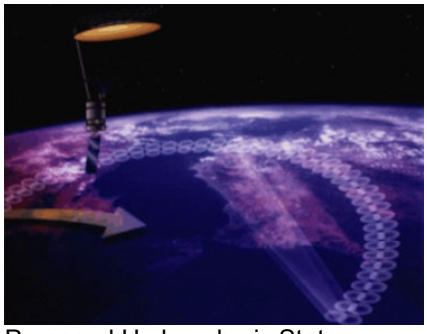
Last year's terrorist attacks on the World Trade Center and on the Pentagon have heightened our awareness of actual and potential threats to our nation's safety and security. Assuring homeland security has become a national priority (Bush, 2001), meaning that we must take decisive actions both to prevent and to mitigate future homeland security threats. On 8 October 2001, President George W. Bush established the Office of Homeland Security with the mission to "…develop and coordinate the implementation of a comprehensive national strategy to secure the United States from terrorist threats or attacks" (Executive Order 13228). Homeland security is a challenge of monumental scale and complexity, requiring a comprehensive, long-term strategy that involves partnership with State and local governments, the private sector, and citizens. The president's strategy will build an emergency management system that is better able to manage not just terrorism but all hazards affecting our nation and its people.

A critical element of homeland security lies in the vitality of our environment, which is primarily defined by the availability and quality of our air and water resources. Homeland security efforts must therefore include advanced understanding, assessment, and prediction of natural and human-induced variations in our environment, enabling retooled policies and planning, allocation of resources, and partnership strategies. Whether the cause is a terrorist, an accident, or a natural disaster, the efforts needed to avoid and to alleviate air- and water-related threats are similar. We must be able to identify and assess the magnitude of current threats, to evaluate various preventative and corrective actions, and to predict future threats.



Proposed Hydrospheric State Mission to observe soil moisture and soil freezing.

Over the past few decades, we have made substantial progress in our ability to monitor, assess, and predict air quality and water resources. However, only the scientific community has effectively realized these developments with marginal returns to management and operations. Now, more than ever, we must take action to make the necessary links for improved homeland security through knowledge-added disaster preparation, assessment, and mitigation. We must also view homeland air and water security at the global and multi-national levels, encompassing not only terrorism and vandalism but also natural disasters and potential adversities from human-induced change.

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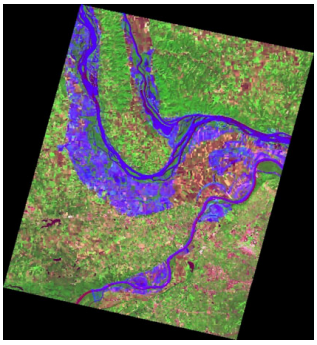
Planning, Communication, and Implementation

A traditional disconnect between the environmental management and the scientific research communities has prevented the definition of a mutually beneficial research agenda and the free flow of information to address new threats. As a result, a significant time lag occurs before scientific advancements are implemented to the benefit of society. Environmental management policy is often based on outdated knowledge and technology. Further, scientific research is often performed without understanding stakeholder needs. This paradigm lock has come about because the two main groups have become isolated: scientists by the lack of proven utility of their findings and stakeholders by legal and professional precedence and by disaggregated institutions. For example, global change research is largely focused on mean climate impacts (such as global temperature) of century-scale greenhouse gas changes, while environmental managers need a reliable prediction of extreme event variations (such as floods and droughts) in the seasonal to decadal timeframe.

We must take decisive action to eliminate this paradigm lock. It is essential that we continuously modernize and integrate our air and water observation, assessment, and prediction tools to provide reliable and timely information for homeland security. But this information is meaningless unless accompanied by timely and adequate mitigation action. Communication must be established to transmit information to users quickly, to evaluate various response options in a prediction system, to enable planning, and to take decisive mitigation action. The NOAA weather radio and the network of media resources can deliver hazard emergency messages to the public effectively. We must encourage and demonstrate similar bridge-building dialogue between scientists and policy makers to establish real pathways to define a society-relevant research agenda and to transfer state-of-the-art data and tools to the users who need them.



Flood images in the area around St. Louis, Missouri, in July and August 1993 produced by the Institute for Technology Development/Space Remote Sensing Center (ITD/SRSC). The broad blue areas, derived from ERS-1 radar data, show the extent of the flooding and are overlaid on an older SPOT image to delineate the rivers under normal circumstances.

We will likely be surprised by future attacks and by environmental variability, but we do not have to be unprepared. One way to reduce the adverse impact of surprise is to maintain an acceptable level of preparedness at all times. We must improve terrorism and hazard response plans so that when improved warnings become available, decision makers will know how to take action. Improving both air and water monitoring, prediction, and preparation will allow warning and response to work synergistically, providing enhanced homeland security.