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Crisis in Earth Observation

SATELLITE SENSORS HAVE BEEN IMAGING EARTH'S LAND SURFACE, OCEANS, AND ICE FIELDS since the early 1970s. The data sets derived from these observations have chronicled transformations on the planet's surface, ranging from urban sprawl to tropical deforestation, covering even the most remote regions of the globe. Scientists in the United States, supported by the National Aeronautics and Space Administration (NASA) and other agencies, have demonstrated the utility and societal benefits of the data in a wide range of applications, including community planning, crop monitoring, coral reef mapping, water-quality assessment, disaster management, and homeland security. Sadly, this is about to change.

The workhorses of operational Earth observation, the Landsat series of satellites, now face a crippling data gap. Landsat-7, launched by the United States in 1999 as the latest in the series, suffered a sensor malfunction in 2003 that severely limits its utility. Landsat-5, launched in 1984, has far outlived its 3-year design life and will run out of fuel before the launch of the next satellite in the series, the Landsat Data Continuity Mission (LDCM), which will occur in 2011 at best. If LDCM fails to launch (Landsat-6 pitched into the Pacific in 1993), then the societal benefits that have resulted from the Landsat program will come to an abrupt end. An equally troubling situation faces the next generation of U.S. observational weather satellites. The National Polar-Orbiting Operational Environmental Satellite System (NPOESS) is experiencing large cost overruns, and funding for the instruments designed to fly on these satellites for the study of Earth's climate has been cut.

John Marburger, director of the White House Office of Science and Technology Policy, apparently agrees that a strategy for ensuring future Earth observations is badly needed. In response to a memo he issued in April 2005, a Future of Land Imaging Interagency Working Group was formed. That group's draft recommendations are due out this year. In the meantime, India, China, and Brazil are launching Landsat-class satellites. Others countries, such as Libya and Nigeria, are experimenting with microsatellite systems for Earth observation.

Just at a time when monitoring changes on the land surface (due to changing land use or climate) should be a national priority, how can continued U.S. technological leadership in satellite remote sensing be in question? While other nations are advancing their technologies, the United States appears unable to maintain its own capabilities. The U.S. Department of Agriculture now must resort to buying crop-monitoring data from Indian satellites. This dependence on foreign assets may well increase: Even NASA may buy foreign data to fill the gap in its Landsat data.

This crisis in Earth observation underscores the need for a more strategic approach. The U.S. Integrated Earth Observation System strategic plan, released in 2005, notes the "need for high-quality, global, sustained information on the state of the Earth as a basis for policy and decision making in every sector of our society." Unfortunately, a current focus of NASA—the "new vision" of a manned mission to Mars—is taking priority over securing necessary Earth observations. The U.S. National Research Council's (NRC's) recent assessment of Earth observation capabilities and prospects concludes that $500 million per year is needed to restore NASA's earth science program, and major changes are needed to salvage NPOESS. According to the new chairman of the House Science Committee, Bart Gordon, the United States will be "flying blind" if we don't ensure that its Earth observation satellite system can continually collect data "to guide our policy decisions."

The U.S. Earth-observing strategy should prioritize the NRC recommendations, ensure continuous monitoring, and enable the development of lower-cost experimental systems to measure critical variables. International partnerships in satellite development and operations should also be leveraged to extend limited resources. Society—both the United States and the global community—must have continuous data about our home planet for priority societal applications and policy-making. A clear vision and the associated resources are urgently needed, first to extricate the United States from the current crisis and then to guarantee that a similar situation might not come back to haunt us later.

– Scott Goetz

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