SERVIR: putting Earth observation science and technology into practice

Carrie Stokes, US Agency for International Development

Unlike their neighbours in North and South America, the countries of Central America do not have their own satellites or space agencies. They have traditionally had to make important decisions affecting their populations and diverse natural resources in absence of the significant information that Earth observation can provide. Recently, however, the countries of the region have been able to leverage the satellite resources of other countries, such as the United States, to implement a unique system which makes available Earth observation data, monitoring tools and the capability to visualize Earth information in three dimensions. Known as SERVIR (the Spanish acronym for Regional Visualization and Monitoring System), the system is based in and serves all seven Central American countries and southern Mexico. It is the first regional system of its kind in the world and is a testament to leveraging North-South and South-South collaboration for putting Earth observations toward the benefit of society.

How it works

Each participating country contributes to the implementation of SERVIR by submitting its own geospatial data to a central hub in Panama, located at the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC). The SERVIR team integrates this data and links it to various types of satellite imagery collected regularly over the region. Once integrated, the data is disseminated to decision-makers, researchers, educators, students and the public via a web portal (www.servir.net) in both Spanish and English. The portal allows for online map-viewing and makes available for cost-free download intuitive tools that help the user understand the data. Additionally, the centre in Panama that houses the SERVIR computers provides training to environment ministries and meteorological services of the region to build their capacity to use SERVIR tools in their everyday work. With information and tools concerning biodiversity, climate change, disaster management, ecosystems, health, water and weather, SERVIR provides previously inaccessible information that can be applied to directly benefit society. Importantly, it also encourages the standardization of disparate data sets from multiple sources and the sharing of data across international boundaries.

Photo: Science@NASA

The SERVIR team at CATHALAC

What it does

With so many different kinds of data accessible via a single web portal, SERVIR can be used to address many different problems faced by society and its leaders. In the two years since SERVIR has been operating, it has been used in numerous ways, and the demand for what it can do is growing. The most common application of the system is to analyse the weather, arguably the single most important factor influencing economic development in Central America.

Weather forecasting — The SERVIR system provides cost-free products for both monitoring and forecasting weather conditions on an hourly basis. The system's servers ingest data provided by the region's meteorological services to produce 48-hour forecasts of a host of variables, including temperature and precipitation. In a region possessing very few weather radar stations, the system also makes available cutting-edge research products, such as a satellite-based 'virtual radar' system which can forecast thunderstorm development an hour in advance, with important

implications for flash flood forecasting. In Panama and El Salvador, weather forecasters on the major television stations make use of SERVIR forecasts in their daily televised weather reports.

Disaster response — The SERVIR system has become an important tool for policy makers in times of emergency. In November 2006, a stationary front in the Caribbean caused severe flooding and landslides in Panama. Roughly 1,300 people were left homeless, while 13 were reported dead or missing. Faced with further damage to the country as the storm continued to develop, the President and Vice President of Panama, along with the Ministers of Housing and Health, visited the SERVIR facility in Panama to get assistance with formulating a course of action to address the crisis. The analysis by the SERVIR team regarding potential scenarios of the storm provided the Panamanian Government, for the first time in the nation's history, with important information to issue advisories to the communities at risk. To ensure that the vulnerable populations received evacuation notification, the civil protection authority worked with private phone companies to send warnings via cell phone text messaging. As a result of the advisories, the inhabitants of Panama's northwestern provinces were prepared for the flooding and landslides, which occurred as forecast. Among others, the SERVIR team has also provided decision support in the case of Hurricanes Stan and Dean, in the flooding of the Sixaola River between Costa Rica and Panama, and the 2007 Mountain Pine Ridge fires in Belize.

Fire monitoring — SERVIR is used by managers of protected areas throughout Central America. By monitoring hotspots throughout the region, the system's Web Fire Mapper, implemented in partnership with the University of Maryland, detects burning fires and can alert users via e-mail about the location of the fires. In Nicaragua, the forestry department sends out ground crews to assess the situation upon receipt of fire alerts from the system. Fire alerts can be made available to anyone who requests them through the SERVIR web portal.

Red tides — Harmful algal blooms in the ocean indicate toxic conditions for fishing. Commonly referred to as red tides, algal blooms can be detected with remote sensing technology. The SERVIR system makes available satellite data that can be used to monitor the ocean tides. In El Salvador, for instance, the Ministry of Health uses SERVIR to check potentially unsafe areas, thereby avoiding health problems for fish consumers and maintaining an economically healthy market for domestic consumption and export.

Air pollution — In May 2007, the countries of Guatemala, Costa Rica and Nicaragua alerted their citizens of a toxic cloud hovering overhead that was perceived to have blown across the Atlantic Ocean from Africa. Concerned about breathing the outdoor air, people remained indoors and authorities considered keeping children out of school and even closing businesses. Amid multiple reports in the media of the toxic African cloud, the SERVIR team was asked to conduct analyses of the cloud to better understand the potential threat to the population. Using satellite and model data from the SERVIR system and recreating the region's weather patterns, the team was able to show that the cloud did not originate in Africa, but within Central America. The 'toxic cloud' was actually smoke from areas burning in Central America, and had circulated back over the land due to an unusual calming of the trade winds. Once the media obtained the SERVIR analysis, news reports allayed public concern about the cloud, and people returned to normal life.

SERVIR provides resource managers across Mesoamerica with access to information on daily fire hotspot locations, shown here as red dots

Who is involved

The innovative SERVIR system is the result of collaboration between many partners. The US Government, through direct technical and financial support from the National Aeronautical and Space Administration (NASA) and the US Agency for International Development (USAID), and indirect support from the National Oceanic and Atmospheric Administration (NOAA) and the US Geological Survey (USGS), works with CATHALAC, the Central American Commission on Environment and Development (CCAD), and participating countries to implement the system. Key partners include the World Bank, the United Nations Environmental Programme (UNEP), the Nature Conservancy (TNC), the Institute for the Application of Geospatial Technology (IAGT), the University of Alabama in Huntsville (UAH), the University of Maryland (UMD), and others.

Future plans

The SERVIR system is expanding functionality to provide decision support for climate prediction, coral reef monitoring, biodiversity conservation, agricultural crop forecasting, and air quality monitoring. Upon request, the system can be replicated and tailored to the needs of other geographic regions. Current expansion efforts are focused on Africa.[1]