The future study of hurricanes at risk

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6 November 2012

Following the end of the current generation of the weather and environment satellites, there will likely be a gap lasting 10 to 53 months of adequate satellite weather coverage, according to reports from the Government Accountability Board and the Commerce Department's inspector general issued in recent months.

This has taken on new significance in the past two weeks, given that satellite observations of Hurricane Sandy were critical in predicting the path of the hurricane and forecasting where evacuations needed to take place.

The first weather satellite, the Applications Technology Satellite, was launched in 1966 and based on the radiometry work of Verner E. Suomi. Soon after, the National Oceanic and Atmospheric Administration (NOAA) launched the Polar-orbiting Operational Environmental Satellite (POES) system, designed as meteorological observation platforms.

These immediately became a critical component not just of weather predictions, but of studying the status of Earth's environment as a whole, including observing droughts, watching vegetation levels, measuring ozone levels and observing the effects of global warming.

Data on large-scale weather systems, such as tropical storms and hurricanes, is primarily collected using polar satellites. Smaller storms are primarily influenced by local weather patterns and terrain, and can be observed using ground-based weather stations. In contrast, the intensity, direction and origins of hurricanes are influenced by much more large-scale features, like the massive underwater currents of the oceans, air currents caused by the Earth's rotation, the impact of the Rocky Mountains on global airflow and the constantly evolving dynamics of the global climate.

Accurate data to account for all of these features requires continuous input from polar satellites, which view the entire surface of the Earth twice a day in the course of making 14 orbits. This provides the data needed for the numerical computations needed to predict the trajectory and power of a hurricane: in the case of Hurricane Sandy, 84 percent of the data used to track it was gathered using polar satellites.

The last of the POES generation of satellites was launched in February 2009, with an expected lifetime of three years. The next generation of satellites, a combined project of the NOAA and the Department of Defense, dubbed the National Polar-orbiting Operational Environmental Satellite System (NPOESS), began development in 2002. However, the effort was canceled in 2010 because of launch delays and cost overruns that more than doubled the expense of the program to $15 billion.

It was then decided that the NOAA attempt another polar satellite system, the Joint Polar Satellite System (JPSS). The Defense Department canceled any plans it had for its own system earlier this year. However, as a result of the interval before launching the new project, the earliest the NOAA will have the first JPSS satellite ready to collect data will be March 2018. This assumes no further delays.

As a stop-gap measure, the NOAA launched what had originally been a test case mission for the NPOESS, the Suomi National Polar-orbiting Partnership (Suomi NPP). Its mission objective is to ensure continuity of climate measurements performed by the Earth observation satellites. While there were sensor anomalies found after launch, and full calibration is not expected to be completed until late 2013, the NPP is collected data that can be used to track hurricanes.

However, the Suomi NPP is only expected to operate until October 2016, a full five months before JPSS-1 is slated to be launched, and ten to seventeen months before it is calibrated to collect data. This will cause a gap in satellite monitoring of the Earth's environment that the NOAA and NASA have already determined cannot be made up be the existing and extremely old

satellite fleet. There is also the worry that if Suomi NPP fails and/or the launch of the JPSS-1 is delayed at all, the length of time that satellites will not be observing the Earth could go up to 53 months.

Without polar satellite coverage, the four day forecast that that accurately predicted and warned state and local governments about the impact of Hurricane Sandy would not have existed. The confluence of climate patterns—the Arctic winds, the high ocean temperatures and the storm from the West—would not have been properly taken into account.

At best, the East Coast of the United States would have had a day to prepare if only ground-based weather stations were watching Hurricane Sandy. Forecasters could not have predicted, for example, the massive storm surges that occurred at Battery Park. Preparations such as evacuations and sandbagging, that need days to properly execute, would have been rendered ineffectual.

The need for satellites watching for hurricanes takes on a greater urgency given the impact of global warming on weather systems. An article in the journal *Oceanography* discusses how the higher rate of melting Arctic ice can influence the Atlantic jet stream. If a blast of Arctic wind caused by this melting comes down during a hurricane, it in fact increases the power of the hurricane, which is what happened with Sandy. All evidence points to events like this becoming more commonplace.

Polar satellites also observe a much broader spectrum of Earth's climate-based phenomenon: among them are polar sea ice levels, wildfires, ozone depletion, oceanic temperatures, drought conditions, ocean wave height, worldwide atmospheric currents, and global vegetation and land use. They are also key to understanding the long-term impact of global warming.

The problems involved in launching a fully functional satellite system to observe the Earth's climate are purely political, not scientific or technical. In line with the slow erosion of public funding for basic scientific research since the fall of the USSR, polar weather and environmental satellites have taken a backseat to ballooning the US defense budget and Wall Street paychecks.

Since their inception, polar satellites have been recognized as the best tools to research the biosphere of Earth. Fully operational polar-orbiting satellites are absolutely necessary in understanding all aspects of the Earth's climate, from preparing for hurricanes and watching ozone depletion to keeping track of global warming. That such socially critical projects are not undertaken speaks to the reactionary nature of capitalist society and the need for a revolutionary transformation.