

SPACE NEWS

OpEd: Restore NPOESS Space Weather and Climate Sensors

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Due to dramatic and increasing cost overruns on the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program, U.S. government agencies have taken steps to restructure the program in drastic ways. As has been widely reported in the press and in policy circles (Space News June 12, 2006), the cost growth on NPOESS was sufficiently large -- more than 25 percent -- to trigger the so-called Nunn-McCurdy review of the program.

As a result all climate instruments in the NPOESS suite and many space weather, or space environment, sensors were summarily removed from the payload. Ironically, the climate and space environment instruments were on schedule and on budget and were not driving cost, schedule or management problems on NPOESS to any material degree.

The loss of climate instruments on NPOESS is a scientific and programmatic disgrace, and it remains uncertain how the nation will respond to the break in important data records.

The National Academy of Sciences Decadal Survey on Earth Science and Applications from Space was nearing the completion of its study when the NPOESS climate sensors were de-manifested earlier this year.

NPOESS was to provide several important climate data records well into the next decade, including solar irradiance, the most precise and the longest continuous climate data record in existence. Now the Decadal Survey must reassess its goals and priorities in light of these losses with little time to react before the report is due later this year, and few options for a cohesive strategy to recoup the losses. Even less clear is whether many policymakers, agency heads, or average citizens have recognized the significant consequences of the loss of space weather sensors in the NPOESS fiasco.

The Total Solar Irradiance data set, with its long and continuous high-precision record, constrains the total energy available to drive the Earth's climate system; the Solar Spectral Irradiance measurements provide the details to resolve the underlying mechanisms and terrestrial interactions responsible for driving climate processes. Both are invaluable components for understanding the natural influences on climate, and thus both were selected as part of the Total Solar Irradiance Sensor to fulfill the requirements for the NPOESS Solar Irradiance Environmental Data Record.

The magnitude of this loss of data affects overall uncertainty in the factors that drive climate variations and limits our ability to distinguish between natural and anthropogenic causes of climate change. Policy decisions with societal impacts will depend on this knowledge.

The pre-Nunn-McCurdy concept of NPOESS was to have three orbital planes so that equatorial crossings would occur at three key times of day (local times): 1:30 p.m., 5:30 p.m. and 9:30 p.m.

In the post-Nunn-McCurdy configuration the number of orbit planes was reduced to two (1:30 p.m. and 5:30 p.m.) and reliance on the European Metop satellite in the 9:30 p.m. orbit increased. Even in the pre-Nunn-McCurdy configuration, substantial compromises had been made with regard to some of the space environmental measurements to be made by NPOESS.

For example for accommodation and cost reasons, magnetometer measurements, measurements of the geomagnetic field and its variability, were not being made on NPOESS. However, most of the other 14 key auroral, ionospheric and atmospheric Environmental Data Records were preserved in the Space Environment Sensor Suite (SESS) measurements planned for NPOESS.

In the post-Nunn-McCurdy version of the NPOESS payload, nearly all of the SESS sensors have been eliminated. Only a few of the low- and high-energy particle measurements are still under consideration for possible flight in only one NPOESS orbit, plus the Metop portion of the greatly reduced NPOESS constellation. The proposed SESS architecture for NPOESS represents a significant reduction in capability from that currently available and does not meet the minimum requirements for Defense Department ionospheric specification set forward in the 1999 National Security Space Architect Study.

This loss of national capability for space environment monitoring is highly damaging and is quite unsupportable. Full and complete measurements of key space weather parameters into the indefinite future are arguably as crucial for our national posture and well being as are tropospheric weather measurements.

In a decadal report on space weather released June 2006 by the U.S. Office of the Federal Coordinator for Meteorology, the roles of continuing measurements from polar-orbiting operational spacecraft were carefully assessed. Among the two highest-priority findings of the Decadal Review was the indispensable need for "continuity of critical data sources needed for space weather forecasts and operations." The report makes clear that the U.S. government must ensure that critical data continue to be provided from U.S. platforms. To do less would be a complete abrogation of federal agency responsibility.

Obviously, NPOESS has suffered staggering cost growths, going from an initial price tag of \$6.5 billion to well over \$13 billion before its restructuring. However, this cost growth was not significantly driven by space weather or climate sensor demands. It should be of highest priority for Congress, U.S. government agencies and taxpayers to see to it that the space weather and climate sensors and capabilities of NPOESS are fully and promptly restored.

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