Atmospheric and Environmental Research, Inc.

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AER Provides Key Technologies for Next Generation Environmental Satellite System (GOES-R)

GOES-R is the next generation of the National Oceanic and Atmospheric Administration's (NOAA) ongoing Geostationary Operational Environmental Satellite (GOES) System. GOES-R is scheduled to join the current GOES constellation in 2015. The current GOES system includes two operational spacecraft in geostationary orbits over the equator at 75 degrees West and 137 degrees West longitude.

GOES-R represents a new technological era in operational geostationary environmental satellite systems, with a significant increase in image/data resolution and refresh-rate. GOES-R will provide the nation with a 45-fold increase in data covering the western hemisphere, and will include such products as:

- Visual and infrared imagery of the entire hemisphere every 5 minutes at up to 0.5km resolution.
- Coverage of severe weather events with 30-second refresh intervals with simultaneous routine hemispheric and CONUS imaging.
- Hemispheric detection of cloud-to-cloud and cloud-to-ground lightning events.
- Enhanced space weather and solar monitoring and event detection.


(Courtesy of: Lockheed-Martin)

AER is proud to support the development and deployment of the new GOES-R Ground System (GS) as a key member of the Harris GOES-R Core GS Team. AER will be instrumental in transitioning Government provided algorithms to 24/7/365 operational software designed to provide all calibrated imagery/data (Level 1b products) from the six GOES-R sensors as well as all of the GOES-R operational data (Level 2+ products). These products include:

- Aerosol Products: Aerosol detection suspended matter/optical depth and particle size.
- Aviation Products: Volcanic ash detection and height.
- Cloud Products: Cloud clear sky mask, phase, optical depth, particle size distribution, cloud liquid water.
- Land Products: Land temperature and fire/hot spot characterization.
- Lightning Products: Lightning events, groups and flashes.
- Radiation Products: Downward and reflected solar insolation.
- Soundings Products: Legacy vertical moisture and temp profiles, stability indices and total precipitable water.
- Sea Surface Products: Sea surface temperature.
- Wind Products: Derived motion winds and hurricane intensity.

AER's remote sensing and software expertise leads the transition of these algorithms from Government provided scientific descriptions to fully tested software ready for integration into GOES-R Product Generation (PG) environment. In addition, AER plays key roles in the advancement of the GOES-R GS system performance, the design of the GOES-R Rebroadcasting (GRB) sub-system, and the implementation of the GS system architecture through the co-development of the GOES-R Data Model Interface (DMI) and Algorithm Framework.

AER's remote sensing and systems engineering experience, combined with the knowledge and expertise of all members of the Harris GOES-R Team, will help NOAA provide the next generation state-of-the-art GOES system and maintain this key national asset.

For more information about the research mentioned in this article, contact: **Dr. Scott Zaccheo, Director, Software & Systems Engineering Group, at +1.781.761.2288 or szaccheo@aer.com.**

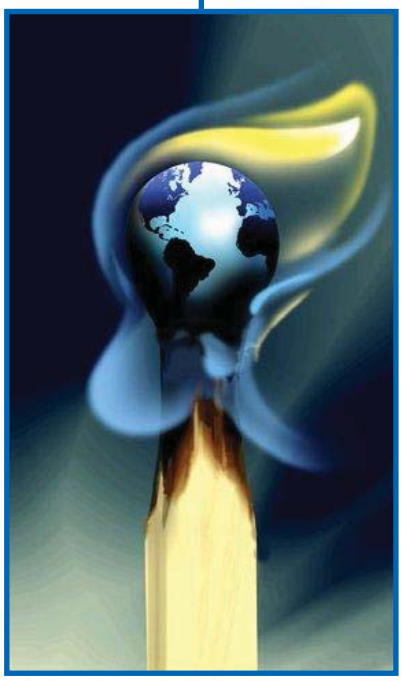
Future Energy Consumption

Greenhouse gases (GHGs) are the major, widely accepted forcing of global warming, and temperature changes from greenhouse gas forcing will be greatest at higher latitudes. Warming in the 20th century is now known to be greater than initially thought. The annual temperature over the U.S. has actually increased the most in the very recent years, showing a warming acceleration. For the globe, even if increases in GHGs had been stopped at year 2000, we are already committed to 0.4-0.6 °C (depending on model) more global warming by year 2100 compared to 0.6°C of warming for the 20th century (IPCC 2007) while for the US those values are higher.

We have determined that, based on the average of a set of complex atmospheric model projections, the temperature will increase in the United States in each of its

Future Energy Consumption

regions throughout the first half of the twenty-first century in both winter and summer. The spread in the set of models indicates a substantial uncertainty in the average amount. Space heating energy requirements will be reduced and air-cooling requirements will be increased in all regions of the United States, though the net effect will be energy savings in the North and energy increases in the South and West. Overall, we estimate future energy consumption for space heating and cooling to increase for the U.S. by up to 10% by the 2040's. Temperature increases impact a number of other activities including energy production by power plants, hot water heating, transportation, and demand for electricity.



Though the projected rise in temperatures that we note here have particularly strong impacts for energy, land use, ecology, and the overall economy, these are not the only factors that may be projected to occur in a climate-changed world. Other quantities of note are increases in sea level, storminess and the water cycle (USCCP). Cooling water supplies for power plants will be affected by changes in the hydrological cycle. Areas in the Western U.S. and elsewhere may be especially affected by changes in the hydrological cycle because the expected precipitation changes may amplify the impacts of social and population changes.

All climate change projections, and hence all climate change impacts, have some degree of uncertainty. Further, many of the elements of weather that make up the climate have large variability. Not only are there uncertainties in the input scenarios to the climate change analysis methods and in the climate models, there may be structural uncertainty in the analysis methods and models themselves. In our analyses even for a well-resolved parameter—surface air temperature we find large uncertainties for regional projections. Improvements to reduce the model component of the uncertainty are anticipated, but prediction of GHG scenarios remains a major challenge.

For more information about the research mentioned in this article, contact: **Dr. Judah Cohen, Director, Seasonal Forecasting, at +1.781.761.2288 or jcohen@aer.com.**

AER Presenters at the 90th Annual AMS Meeting

Monday, 18 January 2010

George D. Modica, S. Lowe, T. Nehrkorn, J. Wensell, J. Baldwin, G. McMullin, and R. Hoffman - 4:00PM - 5:30PM, 2.1. Typical Day Meteorological Data in Support of ATD Modeling.

James M. Griffin, H. E. Snell, and T. Connor - 2:30PM - 4:00PM, 210. Upgraded Auroral Model for Inferring and Forecasting Globally the Precipitating Electron Dosing To Drive Space Weather-Based Models.

Richard A. Quinn, P. P. Whelan, and N. A. Bonito - 2:30PM - 4:00PM, 211. Space Environment and Effects Tool for STK (STK-SEET) technical primer.

James M. Griffin, H. E. Snell and T. Connor - 2:30PM - 4:00PM, 210 - Poster Session. Upgraded Auroral Model for Inferring and Forecasting Globally the Precipitating Electron Dosing To Drive Space Weather-Based Models.

Richard A. Quinn, P. P. Whelan and N. A. Bonito, 211. 2:30PM - 4:00PM, 210 - Poster Session. Space Environment and Effects Tool for STK (STK-SEET) technical primer.

Tuesday, 19 January 2010

Ross N. Hoffman, P. Dailey, **S. Hopsch,** J. Cox, **R. M. Ponte, and K. J. Quinn - 8:30AM - 9:45AM, 3.3.** Quantification of increased storm surge risk to property as sea level rises.

John J. Holdzkom, T. Nehrkorn, J. F. Galantowicz, S. Lowe, M. Horn, **G. D. Modica, and S. M. Leidner - 11:00AM - 12:00PM, 5A.1.** WRF-based hurricane simulation in the Environmental Data Cube Support System.

S. Mark Leidner, J. Ardizzone, J.C. Jusem, E. Brin, **R. Hoffman,** and R. Atlas **- 3:30PM - 5:15PM, 6B.8.** Ocean-surface wind impacts on hurricane forecasting, regional and global.

Wednesday, 20 January 2010

George D. Modica, R. d'Entremont, E. Mlawer, and G. Gustafson - 4:30PM - 5:30PM, J12.3. Short-Term Solar Radiation Forecasts in Support of Smart Grid Technology.

Thursday, 21 January 2010

John F. Galantowicz, J. J. Holdzkom, T. Nehrkorn, R. P. d'Entremont, and S. Lowe - 8:30AM - 9:45AM, B218. Satellite imagery and virtual globe cloud layer simulation from NWP model fields.

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