CICS-MD

Cooperative Institute for Climate and Satellites

December 2012

BACKGROUND

The Cooperative Institute for Climate and Satellites (CICS) is a multi-institution partnership led by the University of Maryland at College Park (UMCP) and engaged in collaborative research with several Centers and Laboratories of the National Oceanic and Atmospheric Administration (NOAA). CICS comprises two main research centers, one at the University of Maryland (CICS-MD) and the other in Asheville, NC which is administered by North Carolina State University (CICS-NC). The CICS Consortium includes another 15 institutions as partners, including academic, non-governmental, and private research enterprises. Phil Arkin is the Executive Director of CICS, Hugo Berbery is the CICS-MD Director, and Otis Brown is the CICS-NC Director.

VISION

CICS performs collaborative research aimed at enhancing NOAA's ability to use satellite observations and Earth System Models to advance the national climate mission, including monitoring, understanding, predicting and communicating information on climate variability and change.

MISSION

CICS conducts research, education and outreach programs in collaboration with NOAA to:

- Develop innovative applications of national and international satellite observations and advance transfer of such applications to enhance NOAA operational activities;
- Investigate satellite observations and design information products and applications to detect, monitor and understand the impact of climate variability and change on coastal and oceanic ecosystems;
- Identify and satisfy the satellite climate needs of users of NOAA climate information products, including atmospheric and oceanic reanalysis efforts;
- Improve climate forecasts on scales from regional to global through the use of satellite derived information products, particularly through participation in the NOAA/NWS/NCEP Climate Test Bed;
- Develop and advance regional ecosystem models, particularly aimed at the Mid-Atlantic region, to predict the impact of climate variability and change on such ecosystems; and
- Establish and deliver effective and innovative strategies for articulating, communicating and evaluating research results and reliable climate change information to targeted public audiences.

NOAA Center for Weather and Climate Prediction

DIRECTORS' MESSAGE

A warm welcome to our research partners, the Center for Satellite Applications and Research (STAR), the National Centers for Environmental Prediction (NCEP), and the Air Resources Laboratory (ARL), who have completed their move to the new NOAA Center for Weather and Climate Prediction in College Park. As expected, having our partners close by has resulted in a notable increase of visits and meetings, which no doubt will be a catalyst for new and closer collaborations.

In early September, we had our First CICS-MD Science Meeting: From Satellite Observations to Climate Prediction. The objectives were straightforward: spotlight the research activities carried out at CICS-MD, identify and promote new areas of research, help establish new collaborations within CICS-MD and with other UMD and NOAA units, and foster a sense of community among University and NOAA scientists. The meeting had a very positive response from both the University and NOAA people, and plans are being developed to carry out routinely this type of meetings. I want to thank all and everyone that participated in the meeting, but particularly the Organizing Committee (Li Chuan Chen, Viviana Maggioni, Martina Ricko, Scott Rudlosky, Tom Smith, and Wenze Yang) for their enthusiastic support that helped the meeting to become a success.

As you must be aware, in early November CICS went through its mid-term review, which consisted of an evaluation of our administrative performance and an examination of our research, education, and outreach programs. The preparation for the review demanded exceptional teamwork, and I am very pleased that everybody understood its importance and responded accordingly. The Review Panel recognized that we have enthusiastic early career scientists making important contributions related to CICS science themes and outreach to the public, and concluded the research being conducted at CICS is excellent and internationally recognized in several areas. My sincere thanks to all for your dedication and support!

Best regards,
Hugo Berbery

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RESEARCH THEMES

Theme 1: Climate and Satellite Research and Applications incorporates the development of new observing systems, or new climate observables from current systems.

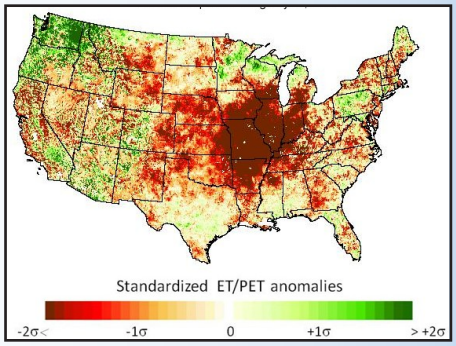
Theme 2: Climate and Satellite Observations and Monitoring focuses on: (a) development and improvement of climate observables from current systems, and (b) development of all continental and global fields of climate parameters that can be used for climate analysis and climate model initialization.

Theme 3: Climate Research and Modeling is the research component that brings together (a) climate observables, modeling and validation in a comprehensive integrated whole, and (b) observational products with model development efforts to enable research into the improvement of forecasts of climate system variability on space scales ranging from regional to global, and time scales from a week or two to centuries.

NOAA SPONSORS

- Center for Satellite Applications and Research (STAR)/National Environmental Satellite, Data and Information Service (NESDIS)
- Climate Prediction Center/National Centers for Environmental Prediction/National Weather Service
- National Climatic Data Center/NESDIS
- National Oceanographic Data Center/NESDIS
- Air Resources Laboratory/Office of Oceanic and Atmospheric Administration

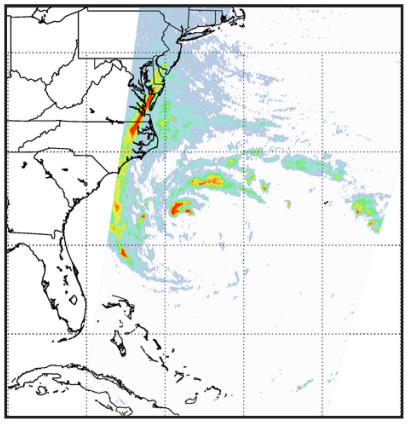
Monitoring Drought and Evapotranspiration from Geostationary Satellite Platforms (Contributed by Christopher Hain)



Observations of land surface temperature (LST) retrieved from thermal infrared (TIR) sensors, such as GOES, can convey extremely valuable information related to monitoring drought and evapotranspiration (ET). CICS scientist Christopher Hain, along with colleagues at the USDA Hydrology and Remote Sensing Laboratory (HRSL) and the NOAA/NESDIS Center for Satellite Applications and Research (STAR) have developed the Evaporative Stress Index (ESI), based on surface flux estimates from the Atmosphere Land Exchange Inverse (ALEXI) model, describing the departure of modelled flux estimates of ET from the potential rate expected under non-moisture limiting conditions. The ESI is computed as standardized temporal anomalies in the ET/PET ratio, and shows good correspondence with standard drought metrics and with patterns of antecedent precipitation, but at significantly higher spatial resolution due to limited reliance on ground observations and without the need for knowledge of antecedent precipitation. As a diagnostic indicator of actual ET, accounting for both precipitation and non-precipitation related inputs to the plant-available soil moisture pool (e.g., irrigation, shallow groundwater); the ESI is a measure of actual vegetation stress rather than potential for stress. Additionally, because precipitation is not used in the construction of the ESI, the index provides an independent assessment of drought conditions and metrics based on observed precipitation, and has particular utility for real-time monitoring in regions with sparse rainfall data or significant delays in meteorological reporting.

Figure shows the ALEXI Evaporative Stress Index 1-month Composite ending July 21, 2012. Red shading indicates anomalous dry (or stressed) conditions. Current and retrospective ESI maps are available at http://hrsl.arsusda.gov/drought.

AMSR-2 Environmental Data Records (Contributed by Patrick Meyers)



CICS scientists Patrick Meyers and Jundong Park are collaborating with NOAA scientists Ralph Ferraro, Paul Chang, and Zorana Jelenak to develop Environmental Data Record (EDR) algorithms for the Advanced Microwave Scanning Radiometer 2 (AMSR2). This passive microwave sensor was launched in May 2012 by the Japanese Aerospace Exploration Agency aboard the Global Change Observation Mission – Water 1 (GCOM-W1) satellite as the first in a series of six climate monitoring satellites as part of the JPSS program. Preliminary data has begun flowing from AMSR2 for system testing and calibration by CICS scientists Tiger Yang and Ninghai Sun. The calibrated brightness temperatures will be ingested into the EDR algorithms. The Goddard Profiling Algorithm (GPROF2010) will produce global estimates of precipitation rates for AMSR2. The existing procedures for surface screening over land have been modified to make use of climatological datasets to flag pixels where retrievals are unreliable, for instance where the primary surface cover is snow or sand. Additionally, the update screening checks reduce the occurrence of false identification of snow and sand surfaces in convective precipitation in the mid-latitudes. The future plan for AMSR2 is to integrate all EDR algorithms to ensure consistency between individual products. The Day-1 EDR products are scheduled to be released in September 2013.

Polarization Corrected Temperature at 89 GHz on October 28th 2012 over Hurricane Sandy observed by AMSR2. Regions shaded in red indicate likely regions of heavy precipitation.