Cooperative Institute for Climate and Satellites-Maryland

Circular JUNE 2013

DIRECTOR'S MESSAGE

I am pleased to present a new issue of the CICS-MD Circular. In March the NOAA Science Advisory Board approved the CICS midterm review with a performance rating of Outstanding. This is indeed great news for all and, in particular, for CICS-MD, which is recognized for its contributions to the NOAA Center for Weather and Climate Prediction (NCWCP). The outcome of the review means that, in the coming months, CICS will be preparing a new NOAA-UMD cooperative agreement that will extend until 2019.

As of July 1st, Fernando Miralles-Wilhem replaces Phil Arkin as CICS Executive Director. Fernando is a hydrologist and water resources engineer and has recently joined the University as a Professor. I look forward to working with Fernando and wish the best of luck to Phil in his future endeavors. I would also like to welcome Debra Baker, our new CICS-MD Coordinator. Deb received her M.S. in atmospheric science from the University of Maryland and a law degree from Harvard Law School.

Hugo Berbery, CICS-MD Director

SUMMER AT CICS-MD

CICS-MD has launched a summer program to provide training and outreach opportunities for both graduate and undergraduate students. Thanks to the effort of our people, and particularly of Scott Rudlosky, we are in the midst of our first *CICS-MD Summer Initiative*, in which we paired undergraduate and graduate students with mentors to conduct original scientific research and help train future NOAA scientists.

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 Research

CICS-MD BACKGROUND

CICS is a partnership led by the University of Maryland at College Park engaged in collaborative research with several NOAA Centers and Laboratories. CICS comprises two main research centers, CICS-MD at the University of Maryland, and CICS-NC in Asheville, NC, which is administered by North Carolina State University. The CICS Consortium includes another 15 institutions as partners, including academic, non-governmental, and private research enterprises.

CICS-MD consists of about 60 scientists that implement the Institute's mission of supporting NOAA's ability to use satellite observations and Earth System models to advance the national climate mission.

RESEARCH TOPICS

CICS-MD research strengths focus in the following topic areas:

Data Fusion and Algorithm Development. This is research focused on the use of satellite and complementary observations to create geophysical data sets related to various aspects of the global climate system.

Calibration/Validation. This area of research is aimed at calibration and validation of satellite radiance data as well as products of algorithms that derive geophysical parameters to best represent the state of the Earth System.

Future Satellite Programs. Activities under this topic are directed at developing and implementing new NOAA meteorological satellite systems, particularly GOES-R and JPSS.

Climate Research, Data Assimilation and Modeling. This research topic aims at improving the understanding of the physics of climate through integration of information by data assimilation, particularly satellite-derived data sets, with models of the Earth System and its components.

Land and Hydrology. The focus of this topic area is on the enhancement, refinement and validation of algorithms that derive land surface products from satellite observations with the purpose of improving global land-atmosphere feedback mechanisms that impact all living forms on the planet.

Earth System Monitoring from Satellites. Research in this topic area focuses on the derivation and curation of data sets that describe crucial aspects of the Earth System (Atmosphere, Land, Ocean, Cryosphere) and the application of those data sets in the detection and monitoring of significant climate events.

Education, Climate Literacy, and Outreach. Activities include mentoring of undergraduate and graduate students on themes of relevance for NOAA, increasing awareness of climate science and changes in the climate system, and raising the understanding of how climate data is collected, observed, analyzed, and used in research purposes.

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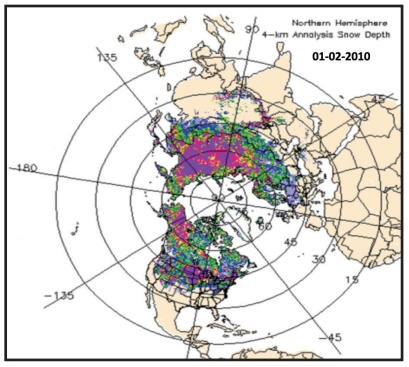
An Innovative Snow Depth Analysis for Numerical Weather Prediction

(Contributed by Cezar Kongoli)

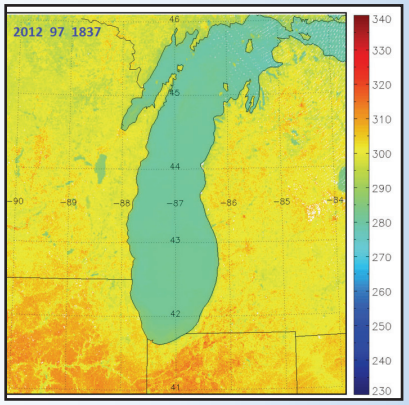


A new snow depth analysis over the Northern Hemisphere using optimal interpolation is being developed by CICS Scientist Dr. Cezar Kongoli in collaboration with Sean Helfrich at NOAA's National Ice Center and integrated into a new version of the Interactive Multi-Sensor Snow and Ice Mapping (IMS) System. IMS snow cover and the new snow depth analysis are critical applications for NCEP's Numerical Weather Prediction (NWP) models. The snow depth analysis is computed on the IMS's 4-km grid covering the Northern Hemisphere at its snow cover-classified grid points. It blends snow depth from various sources including the AMSRE2 and Microwave Integrated Retrieval System (MiRS), in-situ surface reports and human analysts by their relative errors to generate an optimal 4-km snow depth analysis.

The methodology used marks scientific progress compared to existing approaches and is innovative in several key aspects. Estimates of snow depth and associated confidence values derived interactively from the IMS analyst are integrated into the objective analysis. Additionally, snow depth climatology (in the form of snow depth-elevation equations) is also ingested into the objective analysis as pseudo-observations to improve analysis over data sparse high-elevation areas; and finally, microwave-derived snow depth is downscaled at 4-km over high-elevation terrain using the climatologically derived snow depth-elevation relationships.

Figure shows a snow depth analysis example over the Northern Hemisphere on January 2, 2010 blending NASA's AMSRE-derived snow depth with in-situ snow depth observations.

Satellite Land Surface Temperature Development (Contributed by Yuling Liu)

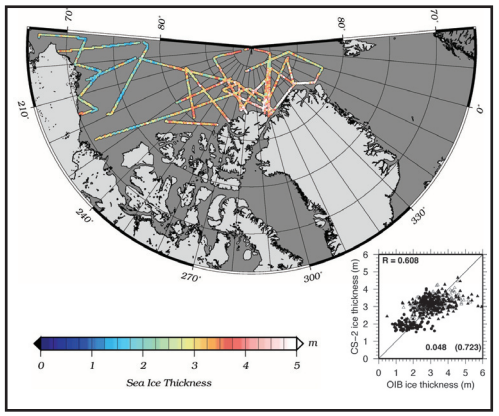


CICS scientist Yuling Liu is collaborating with NOAA scientist Yunyue Yu to develop a Land Surface Temperature (LST) Environmental Data Record (EDR) for the Visible Infrared Imaging Radiometer Suite (VIIRS) aboard the Suomi National Polar-orbiting Partnership (SNPP) satellite launched in October 2011. VIIRS is a multi-disciplinary sensor providing data for a majority of the EDRs. The LST EDR provides the measurement of the skin temperature over global land coverage including coastal and inland water, a critical parameter in the weather and climate system controlling surface heat and water exchange with the atmosphere. The major tasks are pre-launch and the post-launch evaluation and refinement of the LST algorithms. The LST EDR of beta quality was released at the end of December 2012 and the LST EDR of provisional maturity was released in June 2013. The LST data has been available on the Comprehensive Large Array-data Stewardship System (CLASS), ready for the operational evaluation. The next milestone will be the release of LST product for validation "level 1" maturity. The LST EDR will be sustained for JPSS-1 and JPSS-2 after SNPP, the three satellites in the Joint Polar Satellite System (JPSS) program.

Figure shows the VIIRS LST Image on April 6, 2012 at 18:37 UTC time.

Investigating Arctic Sea Ice Thickness and Volume Change

(Contributed by Sinéad L. Farrell)



Cryospheric scientists at CICS work with the NOAA/NESDIS/STAR/SOCD Laboratory for Satellite Altimetry to assess how well Arctic sea ice thickness can be mapped using space-borne polar altimeters. Measuring ice thickness change is technically challenging due to the small sea ice freeboard signal and the rough surface structure of the ice pack. A "nested approach" is utilized to validate the satellite altimetry data, employing both small-scale in situ measurements and larger-scale coincident airborne data. NOAA together with NASA has conducted airborne surveys of Arctic sea ice since 2002 to acquire datasets that are spatially and temporally coincident with altimetric acquisitions from ERS-2, Envisat, ICESat and CryoSat-2. Commencing in 2009, the NASA Operation IceBridge (OIB) mission, which uses multi-instrumented research aircraft, has increased the scope of Arctic sea ice surveying in the Western Arctic basin. CICS and NOAA scientists are currently utilizing IceBridge data to assess the accuracy and precision of CryoSat-2 waveform data and the derived sea ice thickness estimates. This work contributes to the longer-term goal of assimilating satellite estimates of ice thickness into Arctic Ocean forecasts and models.

Figure shows 2012 wintertime Arctic sea ice thickness estimated from NASA OIB data. [Inset shows correlation between OIB and CryoSat-2 (CS-2) sea ice thickness estimates for the same period (Credit: Laxon et al., GRL, 2013)].