Implementation of Geostationary Surface Albedo (GSA) Algorithm with GOES Data

Task Leader	Jessica Matthews
Task Code	
NOAA Sponsor	
NOAA Office	
Contribution to CICS Themes (%)	Theme 1: %; Theme 2: %; Theme 3: %.
Main CICS Research Topic	Climate Data and Information Records and Scientific Data Stewardship
Contribution to NOAA Goals (%)	Goal 1: 100%; Goal 2: 0%; Goal 3: 0%; Goal 4: 0%; Goal 5: 0%

Highlight: The GSA algorithm is being implemented as the American contribution of an international collaboration between Europe, Japan and the US to produce a joint climate data record.

BACKGROUND

Surface albedo is the fraction of incoming solar radiation reflected by the land surface, and therefore is a sensitive indicator of environmental changes. To this end, surface albedo is identified as an Essential Climate Variable (ECV) by the Global Climate Observing System (GCOS). In support of the Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM), NCDC is implementing the GSA algorithm for GOES data to contribute to an international effort in collaboration with EUMETSAT and JMA. Currently, the GSA algorithm generates products operationally at EUMETSAT using geostationary data from satellites at 0° and 63°E and at JMA using 140°E geostationary data. To create the stitched global Level 3 product as illustrated in Figure 1, NCDC is tasked with implementing the algorithm for GOES-E (75°W) and GOES-W (135°W).

Previously the GSA algorithm was run with GOES data only for viability studies with 10 days of data. To effectively and efficiently generate products with this algorithm over large time periods, much effort must be extended to understand the application to GOES data specifically. The effort may be divided into two general categories: Operations and Science. Examples of Operations tasks include: porting code developed in the EUMETSAT computing environment to be functional in the NCDC computing environment, code development to work with GOES data format imagery, code development for ancillary NWP input data, etc. Examples of Science tasks include: calibration of GOES data, evaluation of the effect of different spatial and temporal resolutions of GOES as compared to the resolutions of EUMETSAT and JMA satellites, validation of the algorithm as applied to GOES data with external data sets, development of uncertainty bounds for the product, etc.

ACCOMPLISHMENTS

This project was one of only 10 selected by the SCOPE-CM Executive Panel from last year's competition. The project proposed to extend the international collaboration into Phase 2 which is planned to last 5 years and includes activities such as: a common cloud mask approach, a common intercalibration method, exploration of different temporal resolutions and formats of output, and validation of Level 2 products. In August 2013, Alessio Lattanzio and Joerg Schulz of EUMETSAT visited NCDC and the project group made plans for the work to be accomplished by both EUMETSAT and NCDC in 2014.

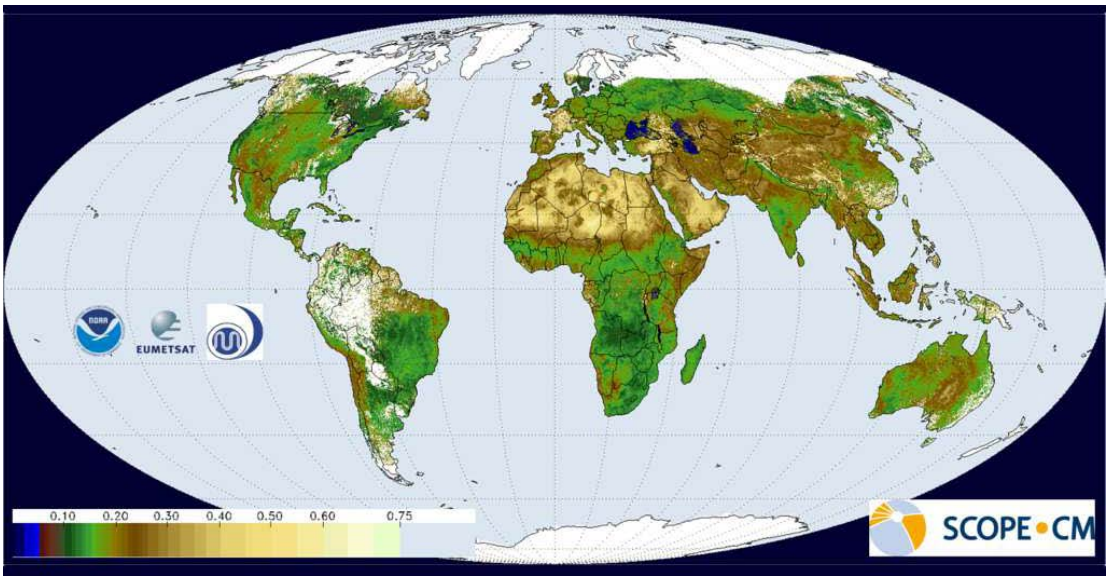

Figure 1: Broadband black sky albedo spatial composite product for the period 1-10 May 2001.

One of the main tasks for 2014 is to have a unified approach to calibration. It was decided that to use the GSICS approach of deep convective cloud (DCC) method. Because the Global Space-based Inter-Calibration System (GSICS) community is already pursuing this, this project will not duplicate their efforts. Contact was made with FangFang Yu, the NOAA representative working with GSICS for GOES calibration, who agreed to share calibration information for GOES.

Another main task for 2014 is to use the same global data set for total column ozone and water vapor inputs into the algorithm. To date, each agency has been using their reanalysis dataset. Moving forward, all agencies have agreed to use the ECMWF reanalysis data.

In January of 2014, Jessica Matthews began collaborating with Brian Reich and Elizabeth Mannshardt of the Statistics Department at North Carolina State University to develop a validation framework for this data set. The group selected a methodology capable of comparing the geostationary-based GSA albedo data to both the polar-orbiting MODIS albedo data and ground-based Ameriflux albedo data. This methodology is flexible to account for issues such as spectral, spatial footprint, and temporal compositing differences between the datasets.

PLANNED WORK

- Update algorithm code to store daily products
- Implement and test code for using ECMWF ozone and water vapor data
- Implement and test cloud mask as developed by the Satellite Application Facility on Climate Monitoring
- Reprocess data with updated calibration coefficients using the DCC method
- Perform validation of GSA products with MODIS and in situ observational data

OTHER

Selected as SCOPE-CM Phase 2 project.

PERFORMANCE METRICS

	FY13
# of new or improved products developed following NOAA guidance	0
# of products or techniques transitioned from research to ops following NOAA guidance	0
# of new or improved products developed without NOAA guidance	0
# of products or techniques transitioned from research to ops without NOAA guidance	0
# of peer reviewed papers	0
# of non-peered reviewed papers	0
# of invited presentations	0
# of graduate students supported by a CICS task	0
# of graduate students formally advised	0
# of undergraduate students mentored during the year	0