A Fundamental Climate Data Record SSMI and SSMIS Science Data Stewardship
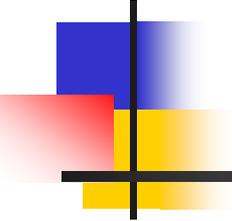
Christian Kummerow and Wes Berg
Colorado State University

Fuzhong Weng
NOAA/NESDIS
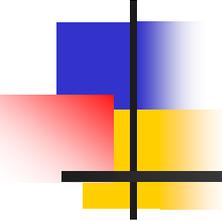
Jay Hnilo and Mathew Sapiano
Colorado State University

Outline

❀ *Project Philosophy and Implementation Plan and relationship to other products*

❀ *Base files (Jay Hnilo)*

❀ *Quality Control (Wes Berg)*

❀ *Calibration (Fuzhong Weng and Matt Sapiano)*

❀ *Documentation (Wes Berg)*

Philosophy

✧ *Science Data Stewardship must be an open and transparent process involving the broad science and user communities*

✧ *After an initial development period, we envision Science Data Stewardship to consist of a sustained level effort by the community that leads to occasional reprocessing of the data*

✧ *SDS is not a real time activity although some tools are being developed to monitor instrument stability. Because users will always press for faster release of products, it is important to plan for this from the onset of the activity.*

Fundamental Climate Data Records

Data Availability
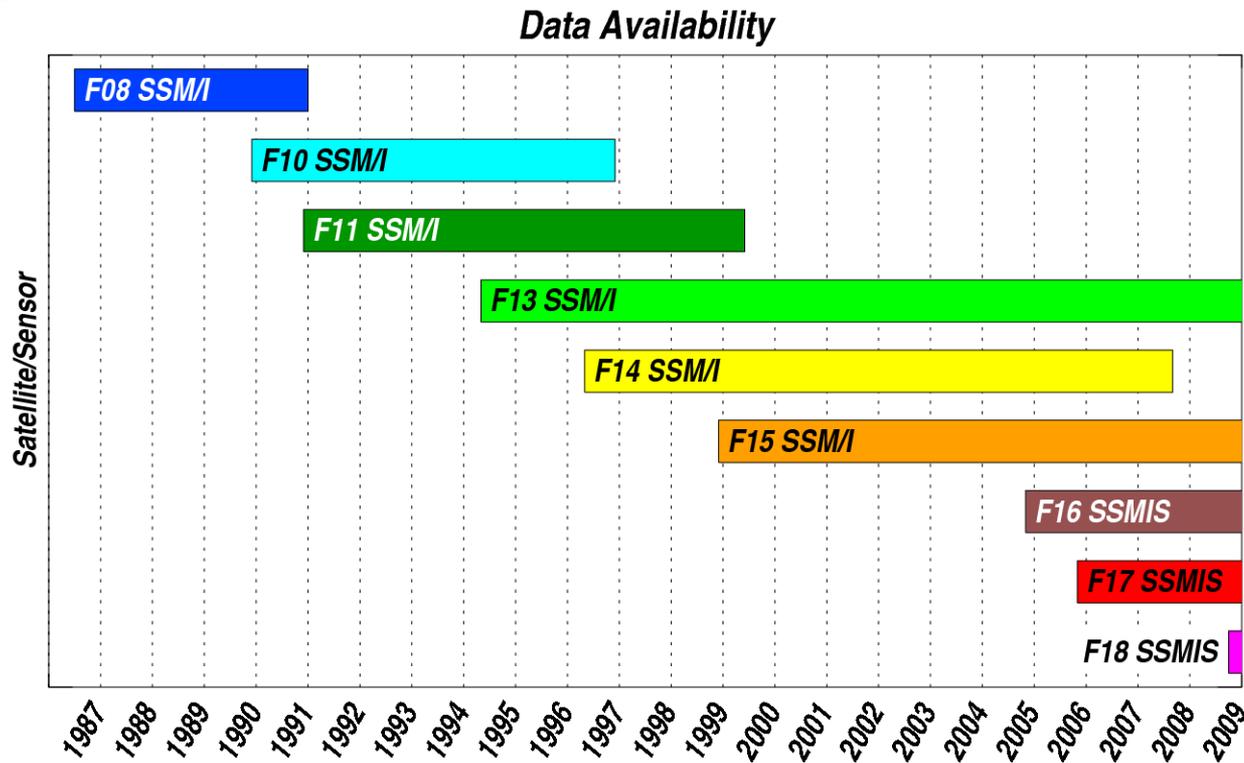
- Fundamental CDRs (FCDRs) are sensor data (e.g. calibrated radiances, brightness temperatures, radar backscatter) that have been improved and quality-controlled over time, together with ancillary data used to calibrate them
  - The sensor data is physically consistent, but sensor dependent due to differences in frequencies, view angles, resolution, observation time etc.
  - Geophysical retrieval algorithms must take into account sensor differences in order to create TCDR.
  - Feedback from TCDR developers is critical to ensure best possible dataset for a wide variety of applications.
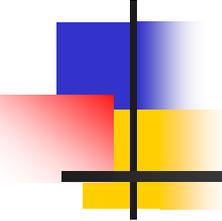
Current Status of data

✧ *TDR files were scattered but have recently been collected and reformatted by NCDC. Files are still messy due to SSMI operations*

✧ *Remote Sensing Systems has a high quality data set available for purchase with very good quality control and uniform calibration. Primary issue is the proprietary nature of the product. Calibration does depend upon methods used!*

✧ *GPM has a complimentary activity (level 1C) to create uniform data format and calibration.*
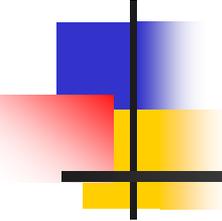
Lessons from GPM Intercalibration Activities

✧ *Two distinct users communities exist*

  ➢ *Expert users (typically producers of climate quality products). They need all the data, perfectly calibrated, and preferably yesterday. They know what they are doing and tend to be willing to work with the implementation team in return for beta versions of the data.*

  ➢ *Broader community that wants assurances that they can use documented data that is easy to use and referenced as a standard product.*

✧ *Absolute Calibration is a noble goal but not currently achievable to better than perhaps 1-2K. Relative calibration is better with goals of perhaps 0.1K if the bar is to be kept high for now.*
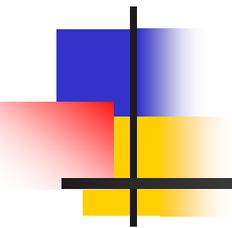
Project Description

➢ *Start by reformatting SSMI/SSMIS TDR files. These files contain **all** the original data and **nothing is modified** except to make orbit granules, add some ephemeris and incidence angle information, and reformat to NetCDF. We designate these as "**Base files**".*

➢ *The Stewardship effort will consist of a **well documented software** package that ingests the Base files, applies **QC procedures, applies calibration procedures** if necessary, and writes output that can be used by the broader community.*

➢ *Expert users can be given access to the base files and the "stewardship code" at any time in the process. This gives them access to the beta versions without confusing the general users who need carefully ontrolled version numbers.*
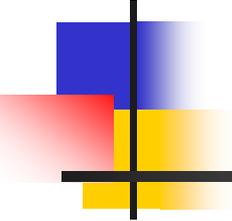
The Base Files

✧ *Jay Hnilo will present details but essentially orbit granules (for simpler management of stewardship code) with a few added fields and self documenting format (NetCDF).*

➢ *Nothing is deleted or modified from original TDR files*

➢ *Added ephemeris data from 2-line elements. This will improve QC procedures*

➢ *Computed Earth incidence angle for each pixel position.*

➢ *Write output in NetCDF for NCDC*

✧ *Will also present FCDR data content and format. This will be reviewed by Wes Berg at end of presentation.*
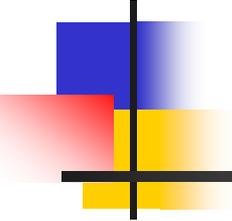
Quality Control

✧ *Wes Berg will present details*

 ➢ *Have some experience with GPM activity*

 ➢ *Will expand on Geolocation (incidence angles)*

 ➢ *New issues with geostationary broadcast interference*
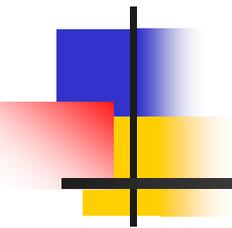
Intercalibration

✧ *Fuzhong Weng and Matt Sapiano and Chris Ruf will present*

  ➢ *Coincident overpasses over polar regions*

  ➢ *Geophysical parameter (wind) retrievals as well as coincident overpasses to common instrument (TRMM TMI)*

  ➢ *Vicarious Calibration*

✧ *Goal is to understand any differences and use sensor information to select correct solution. If not possible, will select one method and use others to describe uncertainty in Version 1 of the FCDR.*
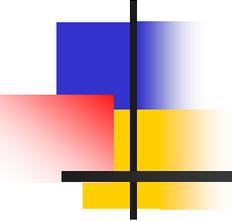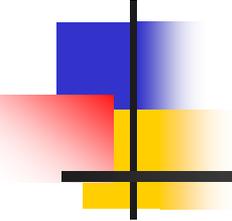
Documentation/Comments

✧ *Wes Berg will present*

➢ *Plans for documenting in the code itself. Not everything can be documented internally so some ancillary files will be required for full documentation*

➢ *Review FCDR output format for comments*

➢ *Receive input on any aspect of the plan*

SSM/I Calibration Offsets

Sat	19V	19H	22V	37V	37H	85V	85H
F11	-0.8	-2.1	-1.5	-0.3	-1.5	-1.4	-2.8
F13	-1.3	-2.1	-1.9	-1.2	-2.2	-0.8	-1.3
F14	-1.2	-1.7	-1.8	-1.8	-2.0	-0.9	-1.3
F15	-0.1	-1.9	-1.2	-0.9	-1.8	-0.1	-0.8