Navigating Meteorological Remote Sensing Committees and Working Groups: A Satellite Fire Detection Perspective

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Recap of Meeting Overview

- Navy, NCEP, ECMWF, UKMO, etc. all have operational mandates for aerosol/air pollution forecasts, but little operational infrastructure.

- Issues prohibit collaboration: funding stress, tribalism, scientists can be difficult to work with.

- In a world of limited resources we need to work together.

- Everyone wants to be relevant/needed, but don't know what is needed.

- Need to be aware of what is being done in different agencies.

Recap of Meeting Overview

- Example of Biomass Burning Co-Op Issues
  - Difficult to align projects between organizations.
  - Agencies are hesitant to sign on to a recommendation (cost, obligations, precedent, etc.)

- Need for interaction between observations (Tier 0), modeling (Tier 1), products (Tier 2), and applications/decision makers (Tier 3).

- Protocol for requesting new products or changes in operational products is daunting.

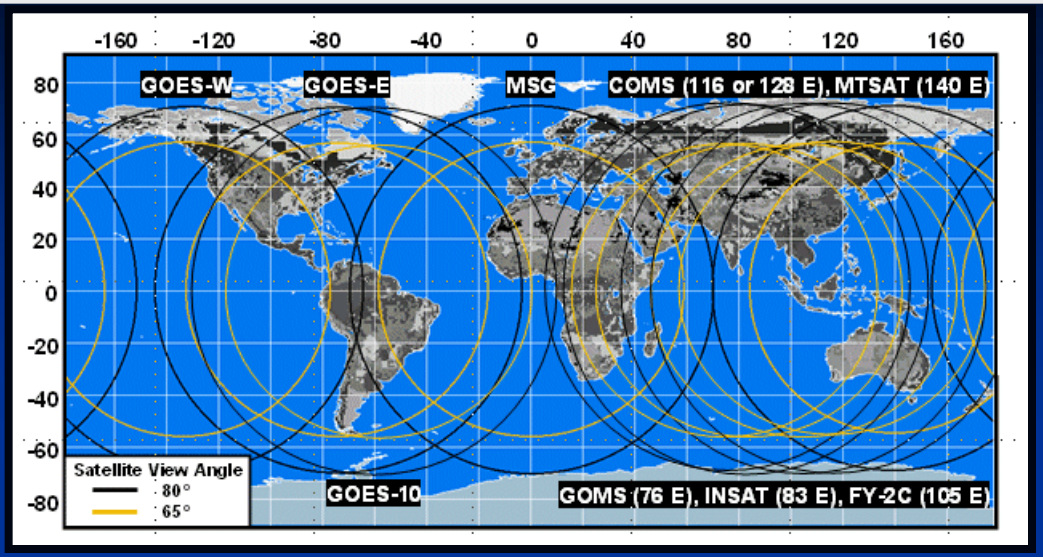
- Future satellite missions do not have specific measurements required to support new requirements for aerosol particle analyses and prediction.

Can we utilize existing committees and working groups to address some of these issues and advance our goals?

- Examples from a journey through the alphabet soup of meteorological remote sensing committees and international charters/groups.
  - GEO/GEOSS
  - CEOS
  - GOFC/GOLD
  - CGMS
  - NESDIS SPSRB
  - Alphabet soup of impacting future sensors
  - Others?

- Examples from the modeling community
  - JCSDA?
  - Others?

- What is the strategy for this working group?



Global Geostationary Fire Monitoring Network

Satellite	Active Fire Spectral Bands	Resolution IGFOV (km)	SSR (km)	Full Disk Coverage	3.9 μm Saturation Temperature (K)	Minimum Fire Size at Equator (at 750 K) (hectares)
GOES-E/-W Imager (75ºW / 135ºW)	1 visible 3.9 and 10.7 μm	1.0 4.0	0.57 2.3	3 hours (30 min NHE and SHE)	>335 K (G-11) >335 K (G-12)	0.15
GOES-10 Imager (60ºW) (Ceased operation December 2009, replaced with GOES-12 in May 2010)	1 visible 3.9 and 10.7 μm	1.0 4.0	0.57 2.3	3 hours (Full Disk) 15 min (SA)	~322 K (G-10) >335 K (G-12)	0.15
Met-8/-9 SEVIRI (9.5 ºE, 0º)	1 HRV 2 visible 1.6, 3.9 and 10.8 μm	1.6 4.8 4.8	1.0 3.0 3.0	15 minutes	~335 K	0.22
FY-2C/2D SVISSR (105 ºE / 86.5ºE)	1 visible, 3.75 and 10.8 μm	1.25 5.0		30 minutes	~330 K	
MTSAT-1R JAMI (140ºE) MTSAT-2 (HRIT) (145ºE) Operational 2010	1 visible 3.7 and 10.8 μm	1.0 4.0		1 hour	~320 K (MTSAT-1R) 330 K (MTSAT-2)	0.15
INSAT-3D (83 ºE ?, TBD) (Launch 2010)	1 vis, 1.6 μm 3.9 and 10.7 μm	1.0 4.0	0.57 2.3	30 minutes	?	
GOMS Elektro-L N1 (76 ºE) (2010) GOMS Elektro-L N2 (14.5 ºE) (2011?)	3 visible 1.6, 3.75 and 10.7 μm	1.0 km 4.0 km		30 minutes	?	
COMS (128 ºE) (Launch 2010)	1 visible 3.9 and 10.7 μm	1.0 km 4.0 km		30 minutes	~350 K	

Global Observation of Forest and Land Cover Dynamics (GOFC/GOLD Fire Monitoring and Mapping)

http://www.fao.org/gtos/gofc-gold/f_fire.html

- **GOFC - GOLD proposed and initiated by CEOS as a pilot project.**

- **GOFC-GOLD is now a panel of GTOS (Global Terrestrial Observing System) and provides a forum for international exchange of information, observation and data coordination and serves as a framework for establishing long-term monitoring systems.**

- **The GOFC-GOLD Fire Implementation Team is an international forum for ensuring the provision of long-term, systematic satellite observations necessary for the production of the full suite of fire products for applications in fire management, policy decision making, and global change research.**

- ***Geostationary Goal:*** **Develop and foster the implementation of a near real-time operational global geostationary fire monitoring network using current (GOES, MSG, MTSAT, FY-2C/2-D) and future geostationary platforms (INSAT-3D, Russian GOMS Elektro-L, Korean COMS).**

Committee on Earth Observation Satellites (CEOS)

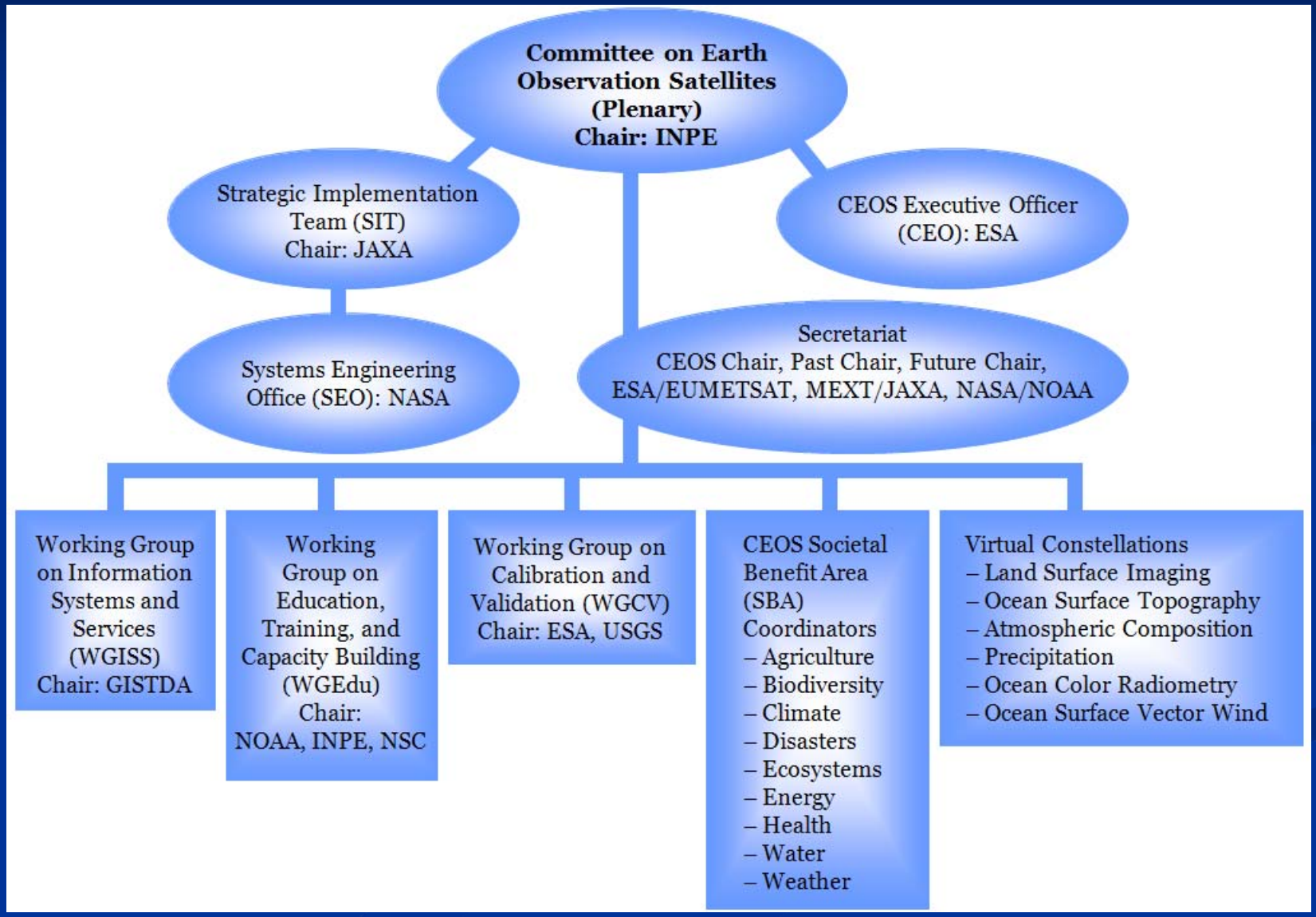
- Established in 1984 to coordinate civil space-borne observations of the Earth. Membership includes 28 space agencies along with 20 other national and international organizations.

- Utilizes 'best efforts' approach. Funding and resources are contributed by participating CEOS agencies. CEOS does not have a budget or permanent staff.

- Access to CEOS is typically through the Plenary, a Working Group, or the Secretariat.

- CEOS working together with GEO to establish a Global Earth Observation System of Systems.

Committee on Earth Observation Satellites (CEOS)



Group on Earth Observations

http://www.earthobservations.org/index.html

- GEO initiated as part of the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight).
- GEO membership includes 80 Governments and the European Commission and various organizations (e.g. WMO, CGMS, CEOS, EUMETSAT, ECMWF, GTOS)
- GEO is a voluntary partnership of governments and international organizations.
- Framework for partners to develop new projects and coordinate their strategies and investments.
- Focus of GEO is to coordinate efforts to build a Global Earth Observation System of Systems (GEOSS) to support decision making in nine societal benefit areas: disasters, health, energy, climate, water, weather, ecosystems, agriculture and biodiversity .
- GEO is constructing GEOSS on the basis of a 10-Year Implementation Plan (2005 to 2015).

Group on Earth Observations

http://www.earthobservations.org/geoss_imp.shtml

Group on Earth Observations

http://www.earthobservations.org/index.html

- **Task HE-09-02: Monitoring and Prediction Systems for Health**

- **Task HE-09-02A Aerosol Impacts on Health and Environment: Research, Monitoring and Prediction** (Lead - WMO).
  - "Facilitate research and development activities that lead to the delivery of new services related to monitoring of the atmospheric cycles of various aerosols and their improved forecast in operational numerical models of the atmosphere."

- **Task HE-09-02B Air Quality Observations, Forecasting and Public Information** (Lead –US EPA)
  - "Provide near real-time air quality observations and forecasts for the purposes of air quality and public health management, research and public information. Assimilate Earth observations data into weather models and provide reliable 2-3 day forecasts of air quality."

- **Task DI-09-03b: Warning Systems for Disasters: Implementation of a Wildland Fire Warning System at Global Level** (Various Leads). Recent GOFC/GOLD Fire Team Meeting in Fran reported back to GEO.

Coordination Group for Meteorological Satellites (CGMS)

http://www.wmo.int/pages/prog/sat/CGMS/CGMS_home.html

- CGMS provides a forum for the exchange of technical information on geostationary and polar-orbiting meteorological satellite systems and research & development missions. It has been in existence since 1972.

- Activities include reporting on current meteorological satellite status and future plans, telecommunications matters, operations, intercalibration of sensors, processing algorithms, products and their validation, data transmission formats and future data transmission standards.

- Ad hoc Working Groups consider specific issues.
  - Telecommunications
  - Satellite products including satellite derived winds
  - Contingency planning
  - Integrated strategy for data dissemination from meteorological satellites
- GGMS/WMO Global Space-based Inter-Calibration System (GSICS)

- CGMS meets in plenary session annually.
  - Actions assigned.
  - Working papers submitted to address action items before next plenary.
  - Reports available on-line.

Advancing the Global Geostationary Fire Monitoring Network through international working groups and inter-agency efforts

- EUMETSAT hosted Joint GOFC/GOLD Fire and CEOS LPVWG workshop on *Geostationary Fire Monitoring Applications in March* 2004
  - 35 attendees from 11 countries
  - Is a global geostationary fire monitoring network feasible? Support? User Community?
  - Demonstration plan

- 2nd Workshop on Geostationary Fire Monitoring and Applications was hosted by the EUMETSAT in December 2006 .
  - 45 attendees from 18 countries
  - List of recommendations: R&D, data sharing, cal/val, future sensons, international coordination
  - Inform CGMS of global geostationary fire products in aerosol, air quality, and emissions modeling efforts including results of demonstration and evaluation studies
  - Made recommendation to CGMS

  http://gofcfire.umd.edu/products/pdfs/Events/2nd_GOFC_Geo_Workshop_Report%20final.pdf)

- Report back to GEO and CEOS regularly. Participated in SBA-Disasters

- Presented case to CEOS SIT on improved access to global geostationary data for fire monitoring and related issues.

CGMS – 36 NOAA Working Paper 21 Submitted to GSICS

- *Data access and pre-processing protocols*
- *Spatial resolution*
- *Pixel saturation and characterization of sensor behaviour at high temperatures*
- *Data navigation*
- *Band-to-band co-registration*
- *Impact of Point Spread Function on fire detection and characterization*
- *Calibration and Validation Activities*

Prins, E., I. Csiszar, W. Shroeder, C. Schmidt, L. Giglio, J. Hoffman, M. Wooster, J. Reid, E. Hyer, Y. Govaerts, 2008: Global Geostationary Fire Monitoring: Sensor and Data Issues and Recommendations. CGMS-36, NOAA-WP-21.

How does a user request new/modified operational satellite products from NESDIS?

NOAA/NESDIS Satellite Product and Services Review Board

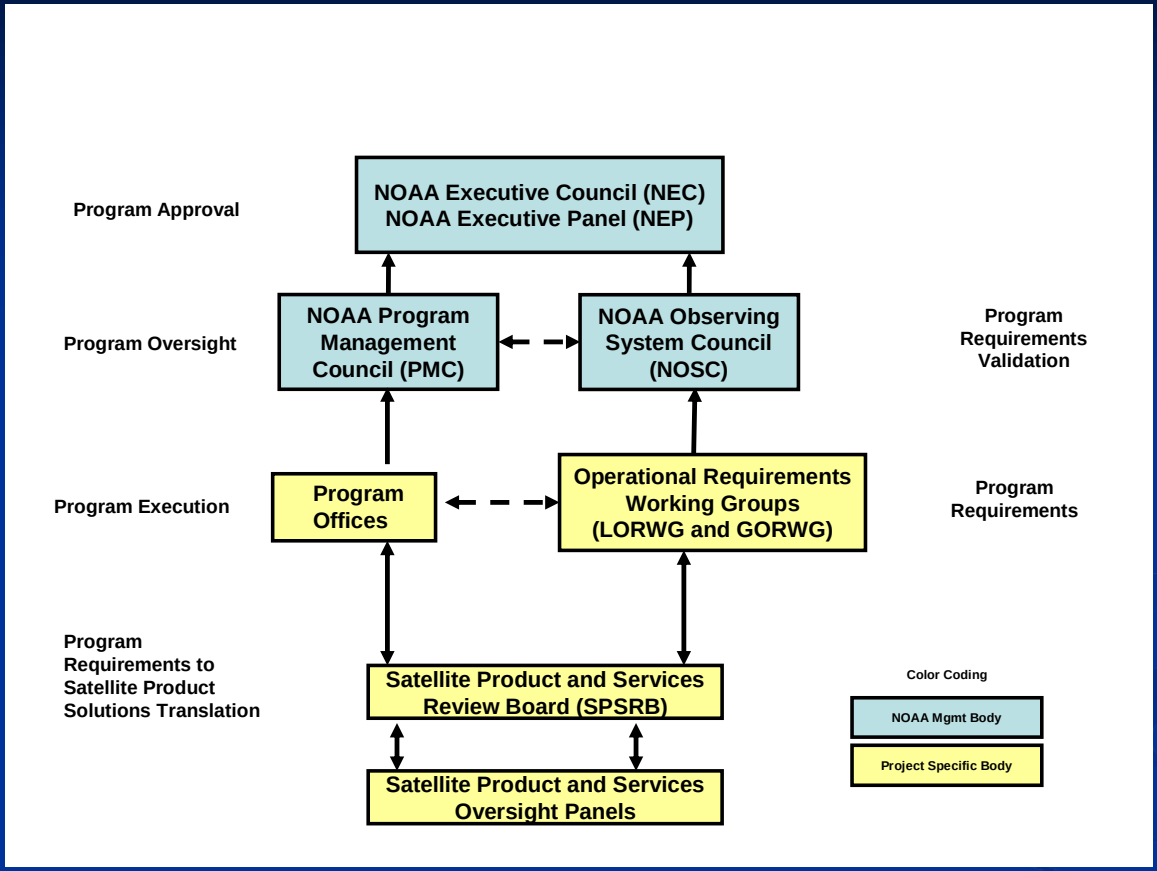
- SPSRB is responsible for the oversight of product life cycle process from product development, transition into operations, enhancements and retirement.

- The SPSRB helps bridge the gap between the requirements and program execution processes.

- Access the SPSRB Process Paper (Version 11.4, October 2008) at http://projects.osd.noaa.gov/spsrb/doc/SPSRB_Process_Paper_Ver11-4.doc.

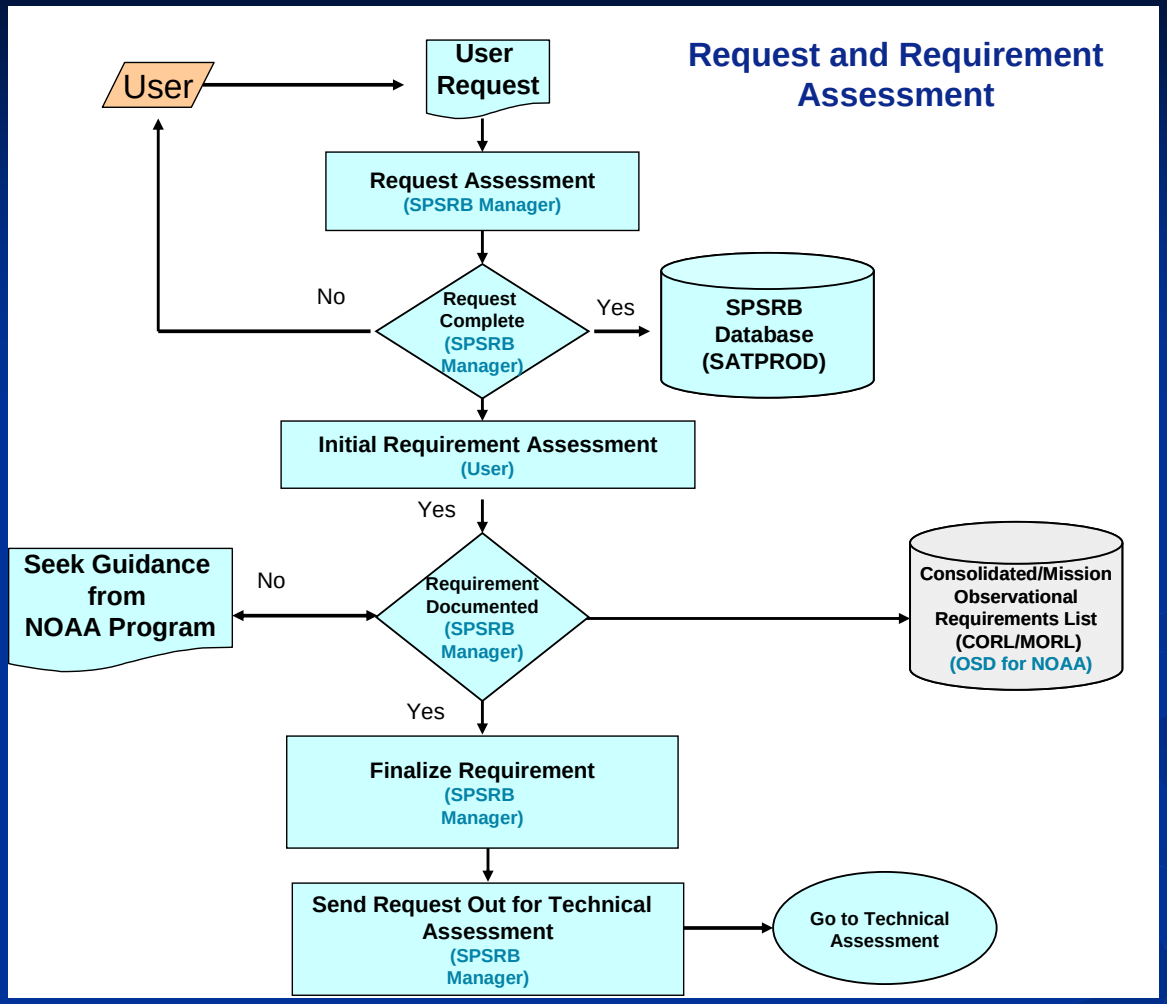
- The SPSRB is co-chaired by OSDPD and STAR Deputy Directors. Principal members include representatives from STAR, OSDPD, OSD, the NESDIS Data Centers and NWS.

- Initiate process by filling out a ***SPSRB Request Form.*** Need to be registered to enter the SPSRB Tracking System (SPSRB web site: http://projects.osd.noaa.gov/spsrb/) User request tracking web pages are restricted to .gov and .mil web domains. Other users can submit a request, but they have to work their requests through a NESDIS sponsor. Need a PAL?



NOAA Panel and Councils

Taken from Draft **Satellite Products and Services Review Board (SPSRB) Process Paper** (SPI WG: David Benner, Tom Schott, Hank Drahos, Eileen Maturi, Antonio Irving, John Paquette, Matthew Seybold), Version 11.4, October 10, 2008



Request and requirement assessment process led by the SPSRB Manager

Taken from Draft **Satellite Products and Services Review Board (SPSRB) Process Paper** (SPI WG: David Benner, Tom Schott, Hank Drahos, Eileen Maturi, Antonio Irving, John Paquette, Matthew Seybold), Version 11.4, October 10, 2008

- **How does a data product producer/user impact future operational sensor design?**

- **What is the requirement change request process?**

GOES –R MRD Fire Requirement as of December 2006

Observational Requirement	User & Priority (LO-#)**	LEVEL	Geographic Coverage (G,H,C,M) Note 2	Vertical Res.	Horizontal Res.	Mapping Accuracy	Msmnt. Range	Msmnt. Accuracy	Refresh Rate	Data Latency	Long-term Stability
Fire / Hot Spot Imagery: CONUS	GOES R	T	C	n/a	2 km	1.0 km	275 - 400 K	2.0 K	5 min	5 min	TBD
		O	C	n/a	0.25 km	0.2 km	275 - 700 K	0.1 K	1 min	1 min	TBD
Fire / Hot Spot Imagery: Hemispheric	GOES R	T	FD	n/a	2 km	1.0 km	275 - 400 K	2.0 K	15 min	5 min	TBS
		O	H	n/a	0.25 km	0.2 km	275 - 700 K	0.1 K	5 min	1 min	TBS

- **No requirements for sub-pixel fire characterization: instantaneous estimates of sub-pixel fire size, temperature and fire radiative power (FRP).**

- **Measurement range and accuracy refer to the input 3.9 micron band data not to the product**

- **MRD documents seem to indicate that NEdT is less than 0.5 K for temperatures greater than 330K, but there is no linearity required beyond 375 K. Measurement accuracy of 2.0 K refers to observed 3.9 micron data at the hot end.**

- **ABI sampling and re-gridding techniques and protocol for flagging saturated detectors are not entirely known and may impact fire detection and characterization, especially if there is no access to pre-gridded and/or level 1B flagged data in real time.**

Initial steps to change requirements for GOES-R fire and ongoing issues

- Issues with the MRD fire requirements discussed within NESDIS in 2005.

- Issues with the MRD requirements for fires were presented as “Actions” at the Algorithm Design Review (ADR) in December 2006.

- Expressed concerns at discussion at the 2007 GOES-R AWG annual meeting.

- Air quality user community sent a memo to the GOES-R Operational Requirements Working Group (GORWG) regarding the need for sub-pixel fire characterization for non-saturated, clear sky, active fire pixels. It did not contain specifics regarding measurement range, accuracy, and precision (Feb. 2008).

- Air quality user community sent a memo to the GOES-R Operational Requirements Working Group (GORWG) regarding the need for access to sub-pixel sample saturation information (or at minimum provide saturation flag) for the 3.9 and 10.35 micron bands prior to resampling/regridding (Feb. 2008).

Initial steps to change requirements for GOES-R fire and ongoing issues (continued)

- MRD version 3.1 (December 2007) and GS-F&PS (Functional and Performance Specifications, February 2008) did not address all of the issues.

- Issues/risks that remained open were presented to the Ground Segment Project Office (GSPO) at the Critical Design Review CDR in May 2008. This includes requirement for sub-pixel fire characterization, but the specifications for measurement range, accuracy, and precision have not been updated accordingly and do not make sense. The Cloud Cover Conditions Qualifier in the MRD is not correct. For fire characterization, it should indicate that fire characterization is only possible in clear sky. Fire detection is also a clear sky product and is compromised in the presence of any cloud.

- Since then, Chris Schmidt has been working with Laurie Rokke (GSPO) and Monica Coakley to reword the MRD and ultimately the F&PS.

MRD Version 3.7 (March 2009)

Fire/Hot Spot Characterization: Hemispheric	Threshold	Goal
Product Geographic Coverage/Conditions	Full Disk	Hemispheric
Product Vertical Resolution	N/A	N/A
Product Horizontal Resolution	2 km	0.25 km
Product Mapping Accuracy	1 km	0.2 km
Product Measurement Range	275 - 400 K	275 - 700 K
Product Measurement Accuracy	2.0 K within dynamic range	0.1 K
Product Refresh Rate/Coverage Time	15 min	5 min
Mission Product Data Latency	15 min	1 min
Product Measurement Precision	2.0 K (TBR)	TBD
Temporal Coverage Qualifier	Day and Night	Day and Night
Product Extent Qualifier	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA
Cloud Cover Conditions Qualifier	If feature is obscured by thick clouds, product will not meet threshold measurement accuracy	Any cloud cover short of completely obscured
Product Statistics Qualifier	Over specified geographic coverage	Over specified geographic coverage

3.3.4.1.2 Fire/Hot Spot Characterization: Hemispheric

The GOES-R System shall produce a Fire/Hot Spot Characterization Hemispheric product in accordance with the requirements and qualifiers provided in the product table. The fire/hot spot characterization product provides a fire mask indicating the location of active fires, saturated pixels, opaque cloud coverage, and processing block-out zones.

Sub-pixel fire characterization is provided for non-saturated, clear-sky, active fire pixels (where sub-pixels assessments are made with pixel values). Fire characterization will consist of instantaneous sub-pixel estimates of fire size and temperature and fire radiative power. Information about pixels with saturated detector samples are used for processing (same as CONUS product except this version provides larger coverage).

Conclusions

- Navigating meteorological remote sensing committees/working groups can be time consuming. Success not guaranteed.
- Clearly identify user community and relationship to agency mission goals.
- Involve user community in entire process
- Determine common goals and needs and present a united front.
- Choose your battles. Be reasonable in your requests.
- Communicate your case to the right group/committee clearly and succinctly.
- Become involved in new sensor design development/requirements process early in the game….i.e. 10 years before launch.

Examples of other worthwhile committees/ working groups?
Lessons learned?