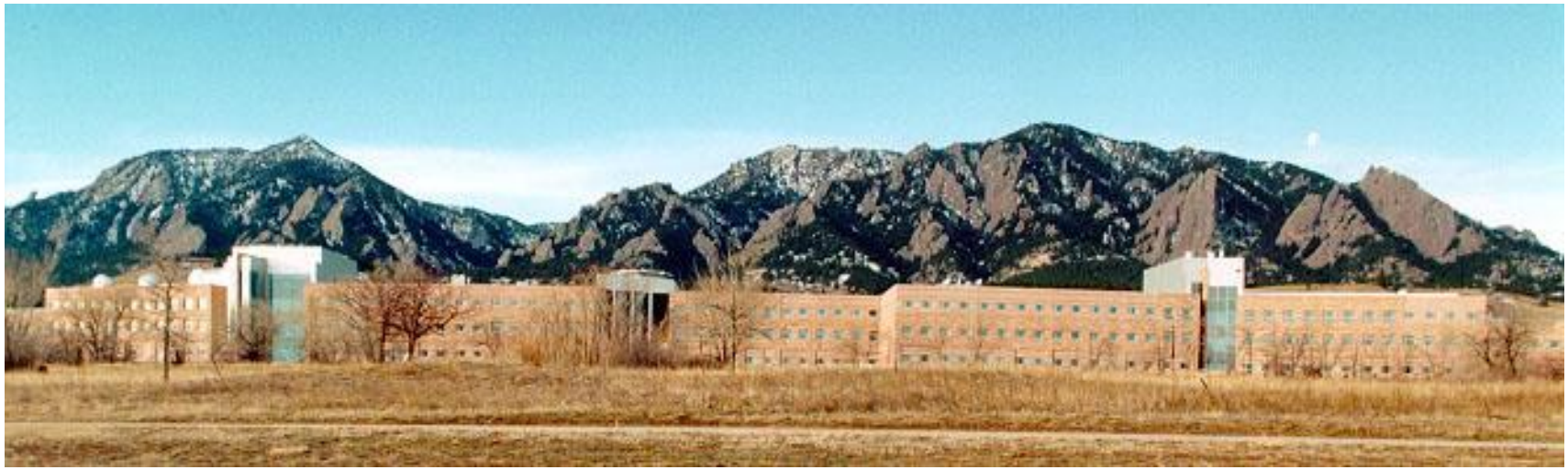


STP Quarterly Review

09 Apr 2012

2QFY12

William Denig

Solar & Terrestrial Physics Division

NOAA/NESDIS/NGDC

303 497-6323

William.Denig@noaa.gov

OUTLINE
Solar & Terrestrial Physics Division

- **STP Division Overview**
- **Milestones & Performance Measures**
- **Personnel Activities**
- **Accomplishments & Updates**
- **Action for the Director**
- **USAF Datasets At NGDC**
- **Issues & Summary**

STP Division Overview
Personnel

Solar & Terrestrial Physics Division
Bill Denig, Chief
Janet Brown

Key
F – Federal
C – CIRES/CIRA
S – Student
G – Guest Scientist

Earth Observations

Chris Elvidge/F
Kim Baugh/C
Sharolyn Anderson/C
Tilo Ghosh/C (remote)
Mikhail Zhizhin/C
Alexey Poyda/G

Space Weather

Dan Wilkinson/F
Rob Redmon/F
Janet Green/F
Peter Elespuru/C
Dominic Fuller-Rowell/S

CORS

Fran Coloma/C
Ernie Joynt (ISD)

Ionospheric Sounding

Terry Bullett/C
Jim Manley/C (80%)
Preeti Bhaneja/C
Ray Conkright/C

JPSS

Pat Purcell/C
Paul Meade/CPI

Indices & Solar Images

Justin Mabie/C
Karen Horan/F
Craig Clark/F

GOES-R

Anu Sundaravel/C
Mary Shouldis/C
Juan Rodriguez/C
Jonathan Darnel/C
Janet Machol/C
William Rowland/C

STP Division Overview
Personnel Changes

- Gains
  - William Rowland, GOES-R Magnetometer Physicist (Algorithms)
  - Mikhail (Misha) Zhizhin (CIRES) – DMSP/CLASS Data Manager
  - Alexey Poyda (Guest) – DMSP Nighttime Lights
- Losses
  - None
- Reassignments
  - None
- Inbound
  - Jenny Mills (Northwestern University) – Hollings (Redmon) – Aurora
  - Ranjeetha Bharath (MIT) – Hollings (Rodriguez) – SEP Events
  - Dmitry Medvedev (Guest) – DMSP Nighttime Lights [*23 Apr 12*]
  - Feng Chi Hsu (CIRES) – DMSP Nighttime Lights [*01 Jun 12*]
- Vacancies
  - Technology Manager (Fed) – STP IT Oversight / Agile Team
  - Space Weather Physicist (Fed) – Solar Program/SXI-SUVI
- Outbound
  - Pretti Bhaneja, Completed post-doc; Active job search
  - Anu Sundaravel, Vacation then Doctoral Program

STP Division Overview
Agreements – Status

Agreements

Scope	Team	Type	Partner	NOAA Legal	DOC Legal	NGDC Signed	Partner Signed	Start	End	Status	
CORS Support	CORS	AGR	NGS	n/a	n/a	X	X	10/01/2003	09/30/2013	G	In place - IC complete
SWx Climatology	SWX	MOU	AFCCC	X	X	X	X	05/27/2004	10/01/2014	G	In place - no FY12 activity
GPS Data (CORS)	SWX	MOA	Multi	n/a	n/a	X	X	09/20/2004	TBD	G	*Biannual Review - waiting on NGS*
DMSP Archive	NTL	MOA	DMSP	X	X	X	X	05/30/2007	09-30/2009	G	*In process - Blanket MOA*
Ionosonde Sites	SWX	IA	USGS	X	X	X	X	04/03/2009	04/03/2014	G	In place - FY12 site support
ViRBO	SWX	MOA	NASA	X	X	X	X	04/15/2009	n/a	G	In place - no FY12 activity
SEM-N - AFRL	SWX	MOA	AFRL	X	X	X	X	05/11/2009	05/11/2014	G	In place - DWSS cancelled
Nighttime Lights	SWX	MOU	DOE	X	X	X	X	08/12/2009	08/12/2013	G	In place - nothing to report
NASIC	NTL	MOU	NASIC	X	X	X	X	03/09/2011	01/30/2015	G	In place - nothing to report
Gas Flaring	NTL	SA	WBank					*TBD*	*TBD*	G	*New Agreement for FY12*
Global CO2	NTL	AGR	NASA	n/a	n/a	n/a	n/a	07/29/2011	09/30/2012	G	In place - Space Act (1958)
SEM-N Algorithms	SEG	MOU	SMC	X	X	X		08/01/2011	07/31/2013	G	In place - DWSS cancelled
Outage Detection	NTL	MOU	NPS	X	X	X	X	10/28/2011	07/30/2012	G	In place - nothing to report

4/5/2012

G	No Action Needed
Y	Watch Item
R	Action Required

STP Division Overview
Renewing AFWA-NGDC MOA

U.S. DEPARTMENT OF COMMERCE/ National Oceanic and Atmospheric Administration

OFCM

OFFICE OF THE FEDERAL COORDINATOR FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

U.S. AIR FORCE

Memorandum of Agreement
for
Data Acquisition, Processing, and Exchange (DAPE)

Signed by (PC/NOPC):
Mary E. Kicza, NESDIC
John L. Hayes, NWS
David W. Titley, NMOC (Navy)
Fred P. Lewis, AFW (USAF)

Prepared by:
The Joint Action Group
for Operational Data
Acquisition for Assimilation

September 24, 2008

The existing MOA-DAPE provides an appropriate vehicle for a renewed agreement between AFWA and NGDC for the AAA of USAF satellite and space weather datasets. W. Denig is working with Mr. Ron Dunic to better define AFWA's needs and NGDC's capabilities.

- Program Council/National Operational Processing Centers (PC/NOPC) — M. Kicza
- Committee for Operational Processing Centers (COPC) — K. Kelly
- Working Group for Cooperative Support and Backup (WG/CSAB) — K. Amburgey
  - JAG/ODAA
  - JAG/CCM

Engage

STP Division Overview
Renewing AFWA-NGDC MOA

Thursday, March 22, 2012 **DRAFT** 09:58:44

Space Weather Data Stewardship Annex
to the
Memorandum of Agreement
On Data Acquisition Processing and Exchange

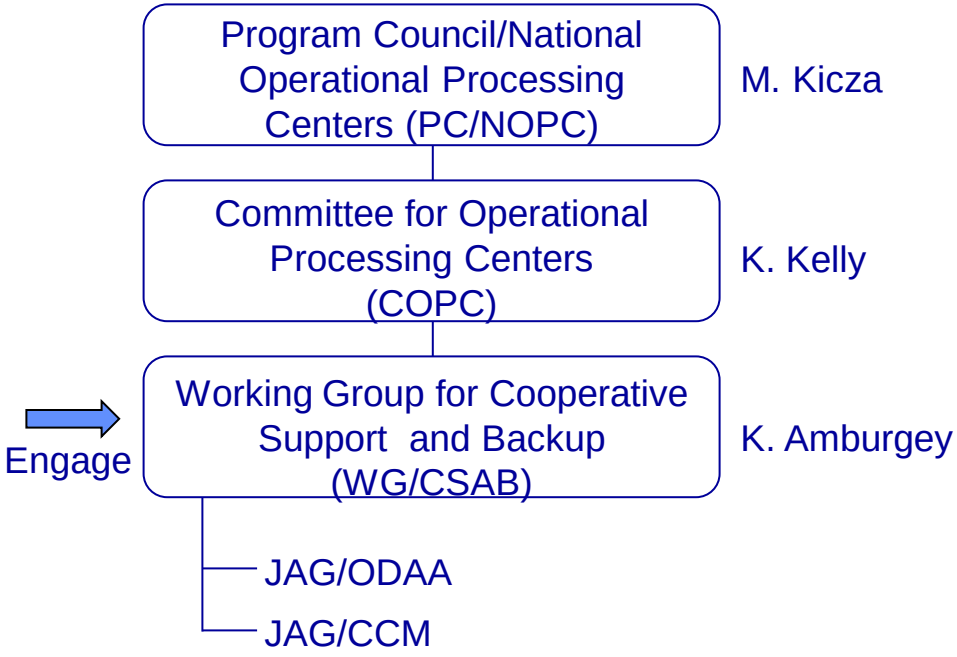
Participants

Dr. Christopher Fox Date
Director, National Geophysical Date Center

Louis Zuccarello, COL USAF Date
Commander, Air Force Weather Agency

2

The existing MOA-DAPE provides an appropriate vehicle for a renewed agreement between AFWA and NGDC for the AAA of USAF satellite and space weather datasets. W. Denig is working with Mr. Ron Dunic to better define AFWA's needs and NGDC's capabilities.



STP Division Overview
FY12 Funding [*YTD*]

STP Balance Sheet - FY12 (YTD)

	Income			Expenditures					
	FY11 Carryover	FY12 New	Sum	Salaries	Travel	Miscellaneous	OD overhead	Sum	Notes:
Base			**1,201,576**	**1,230,023**				**1,230,023**	
NGDC Base	0	1,201,576	1,201,576						Use FY11 base allotment for FY12 - see Connie Craig (24 Jun 11)
Space Weather			**110,000**	**132,537**			**2,500**	**135,037**	
POES Processing	85,000	25,000	110,000				2,500		$19,481 to ISD for K Tanaka (FY11)
Nighttime Lights			**568,000**	**339,270**	**30,000**		**52,300**	**421,570**	
NPS (DHS)		198,000	198,000				19,800		Received
NASIC		100,000	100,000				10,000		Received
NASA - ASU	25,000	25,000	50,000				2,500		Received
JPSS Cal Val		53,000	53,000				5,300		Pending
World Bank		45,000	45,000				4,500		Pending
Data Sales		30,000	30,000		30,000		3,000		Received
McMurdo	20,000	72,000	92,000				7,200		Received
Ionospheric Data Serv			**0**			**20,000**		**20,000**	
Northrop-Grumman		0	0			20,000			Terry Bullett - self-supporting
GOES-RRR			**833,792**	**659,640**		**10,250**	**83,379**	**753,269**	
GOES-R (PN76)		412,500	412,500			9,250	41,250		SWx Risk Reduction
GOES-R (PN77)		300,000	300,000			1,000	30,000		SWx Algorithm Readiness
GOES-R (Cal/Val)		121,292	121,292				12,129		GOES-R L1 Cal/Val
CORS			**198,000**	**174,292**	**10,000**		**15,840**	**200,132**	
CORS		198,000	198,000		10,000		15,840		OVHD is 8% of total; $78K for Ernie
SEM-N			**160,000**	**74,103**	**10,000**	**10,000**	**16,000**	**110,103**	
DWSD-NGDC MOA	160,000		160,000		10,000	10,000	16,000		Federal oversight - received in late FY11
			3,071,368	**2,609,866**				**2,870,135**	As of 23 Feb 12

STP Division Overview

GOES Spacecraft/Instrument Status

Spacecraft	Series	Operational Status	Status	Magnet1	Magnet2	Magnetometer 1	Magnetometer 2	MAG	XRS	XRS-EUV	EXIS	EPS	HEPAD	SEISS	XRP	SXI	SUVI
GOES 8	GOES I-M	Decommisioned	R	G	G				G			G	G		G		
GOES 9	GOES I-M	Decommisioned	R	G	G				G			G	G		G		
GOES 10	GOES I-M	Decommisioned	R	G	G				G			Y	G		G		
GOES 11	GOES I-M	Decommisioned	R	G	G				R			G	G		R		
GOES 12	GOES I-M	South America	G	G	G				R			Y	G		R	R	
GOES 13	GOES N-O-P	Operational East	G			G	G			Y		G	G			Y	
GOES 14	GOES N-O-P	On-orbit Storage	G			G	G			G		G	G			G	
GOES 15	GOES N-O-P	Operational West	G			G	G			G		G	G			G	
GOES R	GOES R	Acquisition						TBD			TBD			TBD			TBD
GOES S	GOES R	Acquisition						TBD			TBD			TBD			TBD

As of: 04 Apr 2012

Operational (or capable of)	G
Operational with limitations (or Standby)	Y
Operational with Degraded Performance	O
Not Operational	R
Status Unknown	TBD

Note: SWPC operations use GOES-15 SEM & SXI. GOES-13 SEM (no XRS) & SXI (since 28 Feb) are also used for SWPC operations. All available GOES and POES Space Weather data flowing into NGDC.

STP Division Overvies

STP Annual Data Ingest[1] – 2QFY12

	CY10 GB	CY11 GB	CY12 YTD
GOES SEM	71	71	18
GOES SXI	870	1,731	475
POES SEM	30	29	7
DMSP OLS	5,000	5,760	1,440[2]
CORS GPS	20,198	24,456	4,326
Ionosonde	1,400	900	324

[1]Uncompressed data volumes
[2]Estimate

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Personnel Activities

Accomplishments & Updates

Action for the Director

USAF Datasets At NGDC

Issues & Summary

Milestones & Performance Measures

FY12 AOP Milestones

Primary NGSP Goal: Objective	Performance Measures / Milestones (NOTE: Do not report Measure or Milestone Targets in the same row)					Measure or Milestone Targets (NOTE: Do not report Measure or Milestone Targets in the same row)												Milestone Progress		
	Measures/Milestone	Select any																		
		GPRA	NOAA BSC	LO/SO BSC	HPPG	10	11	12 Q1	12 Q2	12 Q3	12 Q4	13	14	15	16	17	18	Planned/ Actual Completion	Status	POC
Weather:Environmental Information	Complete the historical data rescue of daily H-alpha solar images from the NOAA Boulder Observatory (1967-1994)							X										31-Dec-11	C	K. Horan
Weather:Environmental Information	Archive interplanetary data simulation runs for the Enlil operational space weather model per NWS request								X									31-Mar-11	C	W. Denig
Coastal:Marine Transportation	Achieve Initial Operating capability (IOC) for disseminating in real-time satellite data received via McMurdo Station in compliance with the Antarctic Treaty									X								30-Jun-12	C	S. Anderson
Weather:Environmental Information	Develop in-house capability to process NOAA POES Space Enviroment Monitor (SEM) data for satellite operations										X							30-Sep-12	G	J. Green
Weather:Environmental Information	Complete Phase 3 Preliminary Design Reviews for GOES-R Level 2+ space weather algorithms										X							30-Sep-12	G	M. Shouldis
Weather:Environmental Information	Maintain > 95% of availability of Space Environment Monitor (SEM) satellite data archived on an annual basis					>95	100%	95	95	95	95	95	95	95	95	95	95	1QFY12 2QFY12 3QFY12 4QFY12	100% ' ' '	D. Wilkinson
Coastal:Marine Transportation	Acquire, process, and disseminate >95% of available real-time nighttime lights imagery within 3 hours of receipt					>95	100%	95	95	95	95	95	95	95	95	95	95	1QFY12 2QFY12 3QFY12 4QFY12	100% ' ' '	C. Elvidge
Weather:Environmental Information	Provide a > 95% availability for Continuously Operating Reference Station (CORS) near real-time data to to the NWS Space Weather Prediction Center					>95	100%	95	95	95	95	95	95	95	95	95	95	1QFY12 2QFY12 3QFY12 4QFY12	100% ' ' '	F. Coloma

Milestones & Performance Measures

FY12 AOP Milestones

Primary NGSP Goal: Objective	Performance Measures / Milestones (NOTE: Do not report Measure or Milestone Targets in the same row)	Select any				Measure or Milestone Targets (NOTE: Do not report Measure or Milestone Targets in the same row)												Milestone Progress		
	Measures/Milestone	GPRA	NOAA BSC	LO/SO BSC	HPPG	10	11	12 Q1	12 Q2	12 Q3	12 Q4	13	14	15	16	17	18	Planned/ Actual Completion	Status	POC
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Wea																				en
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Weather:Environmental Information	Provide a >95% availability for Continuously Operating Reference Station (CORS) near real-time data to to the NWS Space Weather Prediction Center					>95	100%	95	95	95	95	95	95	95	95	95	95	1QFY12 2QFY12 3QFY12 4QFY12	100% ' ' '	F. Coloma

2QFY12 Milestone: Archive interplanetary data simulation runs for the Enlil operational space weather model per NWS request

Milestones & Performance Measures

Enlil Archive

DOC. NUMBER: NGDC/STP-12/026	U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS)	RELEASE DATE: *06 April 2012*	
VERSION: 1.0		REV: A	PAGES: 9

Enlil Modeling System

SUBMISSION AGREEMENT BETWEEN

NOAA Space Weather Prediction Center

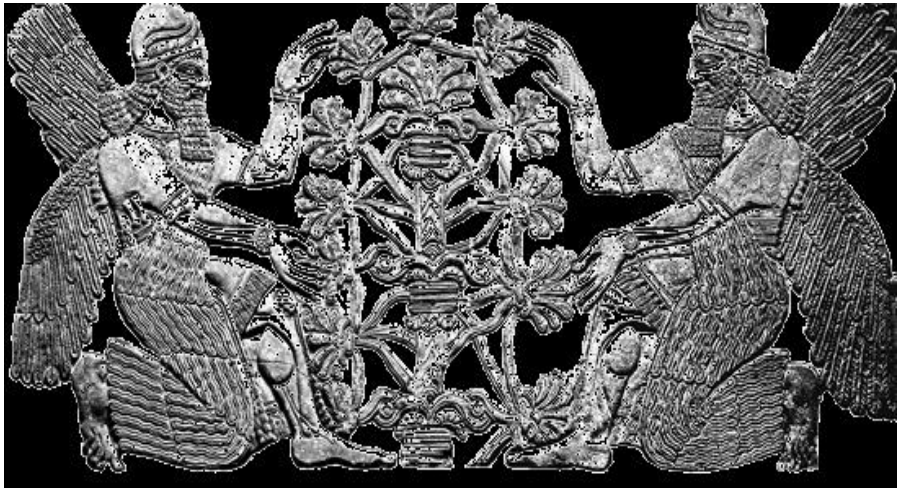
AND

National Geophysical Data Center

Milestone: Archive interplanetary data simulation runs for the Enlil operational space weather model per NWS request

- **Planned Completion:** 2QFY12 (31 Mar 12)
- **Actual Completion:** 2QFY12 (31 Mar 12)

Status: All elements of the archive process are in place and have been tested. Sample Enlil run is now in the archive. Enlil Submission Agreement in coordination. Awaiting SWPC transition to operations



Milestones & Performance Measures

FY12 AOP Milestones

Primary NGSP Goal: Objective	Performance Measures / Milestones (NOTE: Do not report Measure or Milestone Targets in the same row)	Select any				Measure or Milestone Targets (NOTE: Do not report Measure or Milestone Targets in the same row)												Milestone Progress		
	Measures/Milestone	GPRA	NOAA BSC	LO/SO BSC	HPPG	10	11	12 Q1	12 Q2	12 Q3	12 Q4	13	14	15	16	17	18	Planned/ Actual Completion	Status	POC
Weather:Environmental Information	Complete the historical data rescue of daily H-alpha solar images from the NOAA Boulder Observatory (1967-1994)							X										31-Dec-11	C	K. Horan
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Coastal:Marine Transportation	Achieve Initial Operating Capability (IOC) for disseminating in real-time satellite data received via McMurdo Station in compliance with the Antarctic Treaty									X								30-Jun-12	C	S. Anderson
Weather:Environmental Information	Develop in-house capability to process NOAA POES Space Enviroment Monitor (SEM) data for satellite operations										X							30-Sep-12	G	J. Green
Wea																				ldis
Wea Information	(SEM) satellite data archived on an annual basis																	3QFY12 4QFY12		son
Coastal:Marine Transportation	Acquire, process, and disseminate >95% of available real-time nighttime lights imagery within 3 hours of receipt					>95	100%	95	95	95	95	95	95	95	95	95	95	1QFY12 2QFY12 3QFY12 4QFY12	100%	C. Elvidge
Weather:Environmental Information	Provide a > 95% availability for Continuously Operating Reference Station (CORS) near real-time data to to the NWS Space Weather Prediction Center					>95	100%	95	95	95	95	95	95	95	95	95	95	1QFY12 2QFY12 3QFY12 4QFY12	100%	F. Coloma

3QFY12 Milestone: Achieve Initial Operating Capability (IOC) for disseminating in real-time satellite data received via McMurdo Station in compliance with the Antarctic Treaty

Milestones & Performance Measures

FY12 Performance Measures

STP Annual Performance Measures

Space Weather Metric

LO	Goal	Objective	Performance Measure	POC	1QFY12	2QFY12	3QFY12	4QFY12
NWS	Weather-Ready Nation (NWS)	A More Productive and Eficient Economy Through Environmental Information Relevant to Key Sectors of the U.S. Economy	Greater than 95% (2 sigma) of available Space Environment Monitor satellite data are archived on an annual basis	Wilkinson	100%	100%		

Nightime Lights Metric

LO	Goal	Objective	Performance Measure	POC	1QFY11	2QFY11	3QFY11	4QFY11
CS	Climate Adaptation and Mitigation (CS)	Improved Scientific Understanding of the Changing Climate System and Its Impacts	Acquire, process and disseminate >2 sigma (95%) of available real-time nighttime lights imagery within 3 hours of receipt	Elvidge	100%	100%		

CORS

LO	Goal	Objective	Performance Measure	POC	1QFY11	2QFY11	3QFY11	4QFY11
NOS	Resilient Coastal Communities and Economics (NOS)	Resilient Coastal Communities That Can Adapt To The Impacts Of Hazards And Climate Change	Provide a >2 sigma (95%) availability for Continuously Operating Reference Station (CORS) near-real-time data to the NWS Space Weather Prediction Center as per the '4-way' Memorandum of Agreement and subject to normal business-hour response times.	Coloma	100%	100%		

As of 02 Apr 12

- Greater than 99% (3-sigma) Cumulative Distribution
- Greater than 97% (2-sigma) Cumulative Distribution
- Greater than 84% (1-sigma) Cumulative Distribution
- Below 84.1% (1-sigma) Cumulative Distribution

Note: Change metric wording in FY13 for a cumulative distribution.

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Personnel Activities

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USAF Datasets At NGDC

Issues & Summary

Personnel Activities
Hail and Farewell

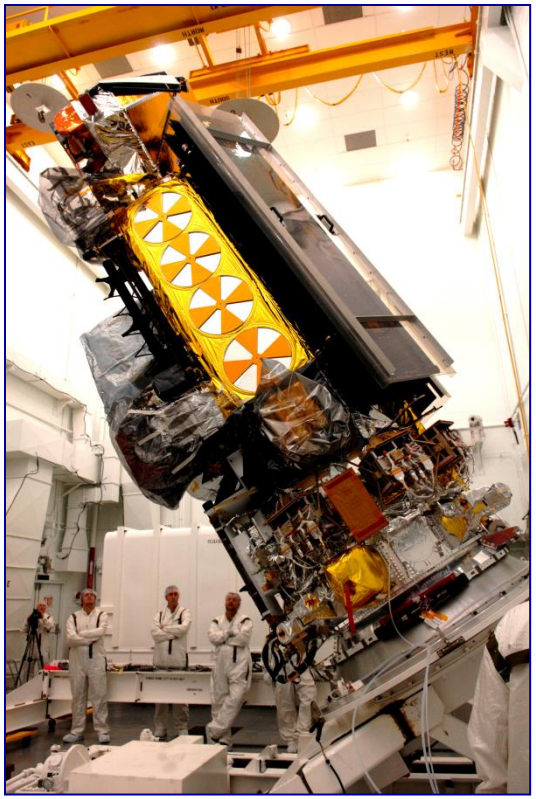
Welcome William Rowland
GOES-R Magnetometer

Welcome Misha & Alexey
DMSP Nightime Lights

Personnel Activities

NOAA Employee of the Month – Mar '12

Janet Green has excelled in safeguarding the nation's commercial and government satellite assets, enhancing NOAA space weather data products and services, and effectively interacting with the space physics community



Personnel Activities
Introducing Dr. Rob Redmon

Rob Redmon has successfully defended his PhD thesis, "Oxygen Ion Flows in the High Latitudes During Quiet Times"

Congratulations Dr. Rob!

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

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USAF Datasets At NGDC

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Accomplishments & Updates
SEAESRT

Space Environmental Anomalies Expert System Real Time (SEAESRT)

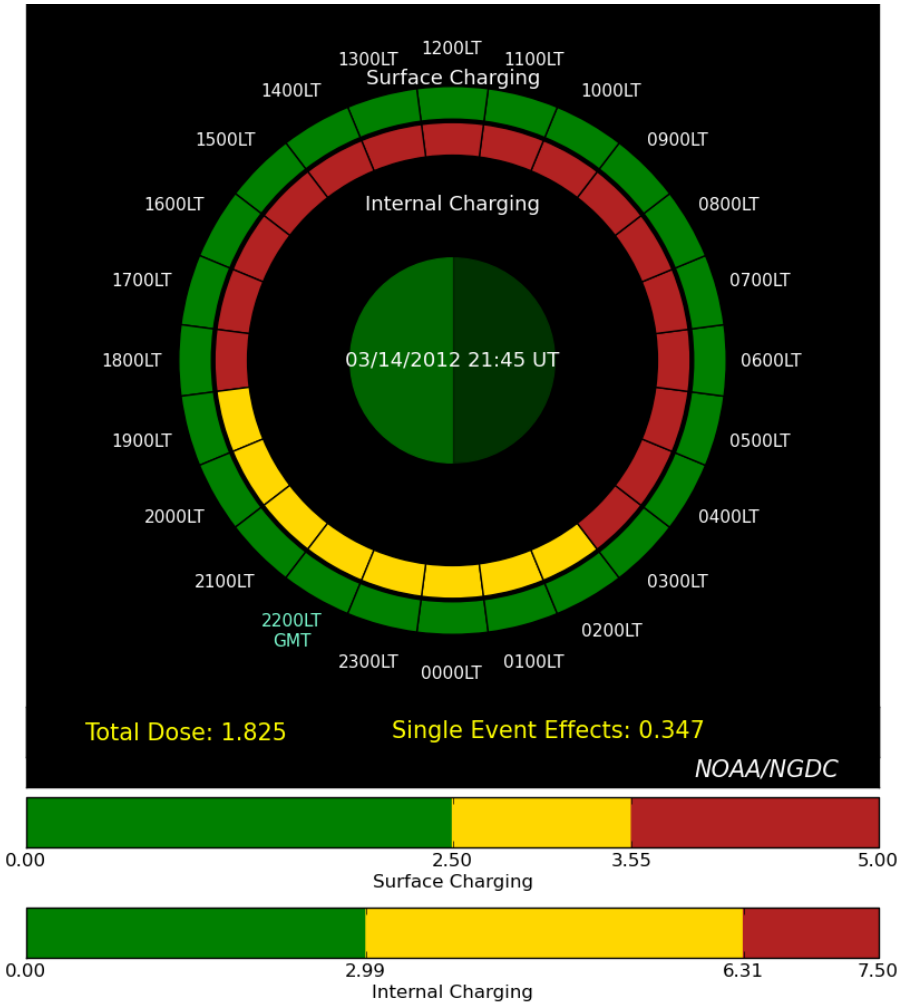
Product developed by The Aerospace Corporation [*O'Brien*, 2009] and implemented at NGDC by Jon Darnel to run in near real-time to calculate hazard quotients for geostationary satellites. Data sources: GOES particle data and the K_p geomagnetic index.

Satellite charging hazards:

Surface charging – Surface discharging – induced currents; low energy particles

Internal charging – Electro-static discharge within sensitive electronics; medium energy particles

Single Event Upsets – Particle energy deposition in microelectronics; very energetic particles



O'Brien, T. P. (2009), SEAES-GEO: A spacecraft environmental anomalies expert system for geosynchronous orbit, *Space Weather, 7*, S09003, doi:10.1029/2009SW000473.

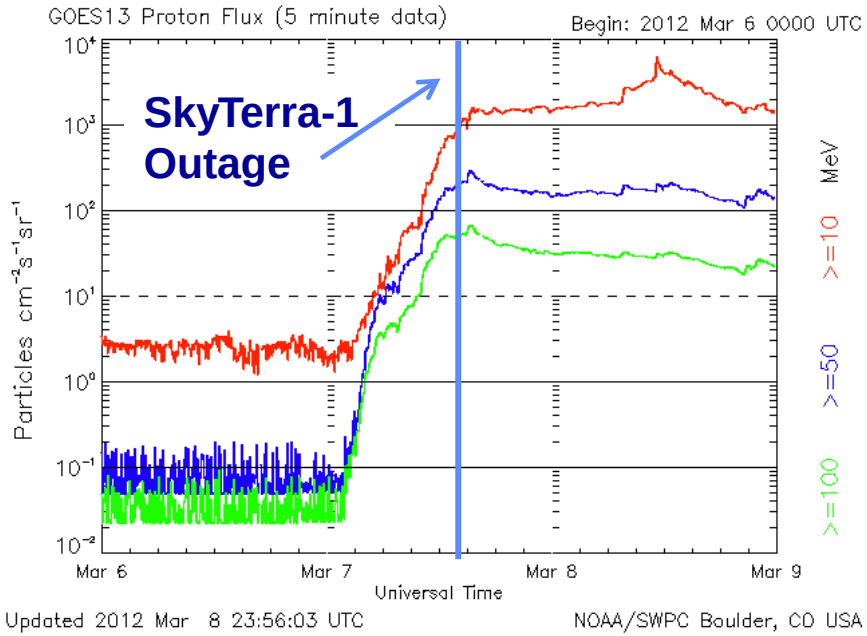
Accomplishments & Updates

SkyTerra-1 Outage – 07 Mar 12

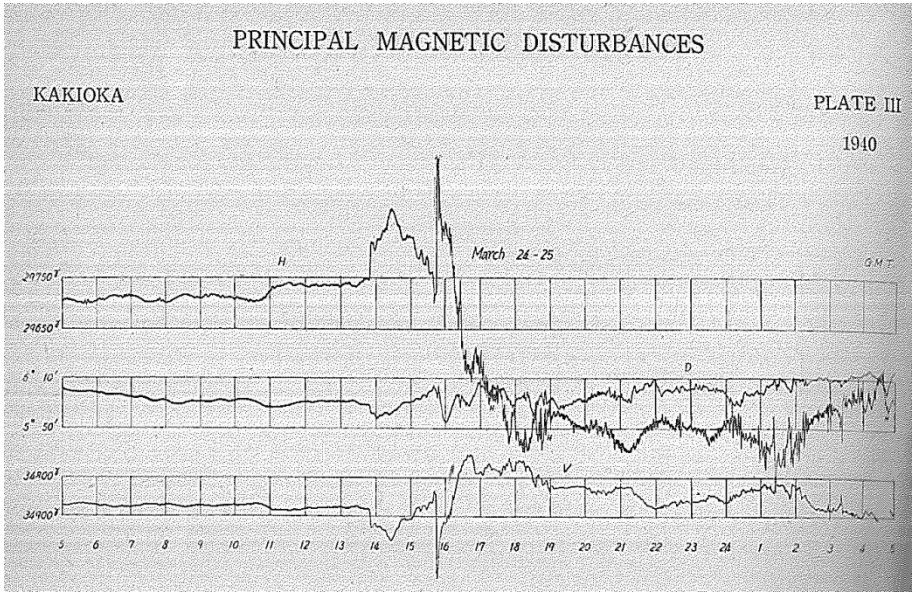
At the time of the SkyTerra-1 outage the environmental risk factors for Single Event Upset (SEU) were high based on GOES proton measurements and SEAESRT hazard estimates.

- GOES 13 data: SkyTerra-1 outage began on March 07 @ 14:43 UT just after the flux of energetic protons increased dramatically
- SEAESRT: Hazard estimate due to energetic protons indicates that a single event upset was 106 times more likely at the time of the outage

Analysis by Janet Green and Juan Rodriguez



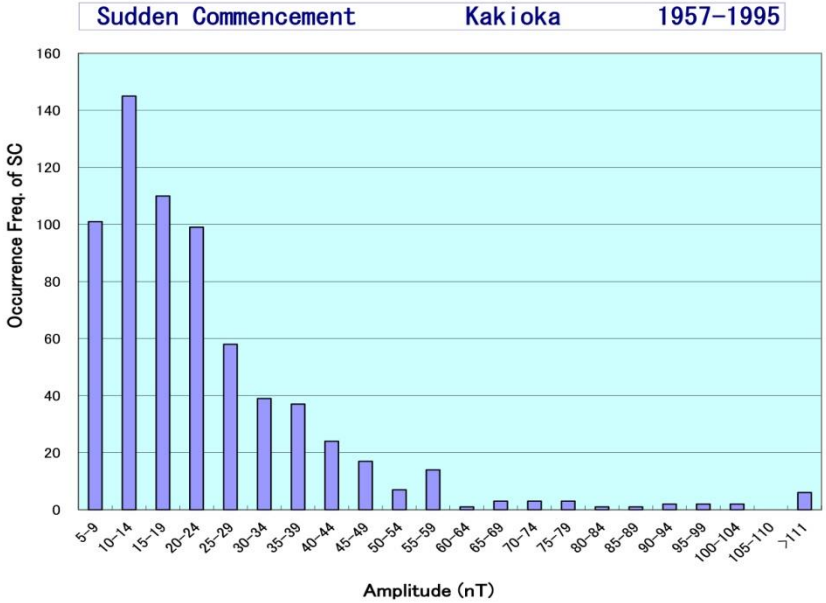
Accomplishments & Updates
Historical Data for Professor Tohru Araki



The strongest Sudden Commencement recorded by a magnetometer occurred on 24 March 1940

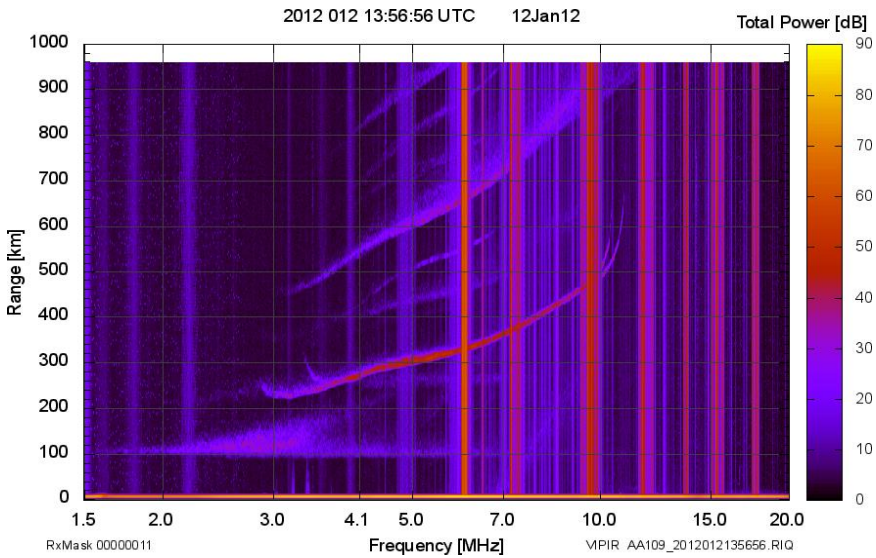
- SC of 273 nT (initial positive responsive)
- Total horizontal intensity variation of 661 nT
- Next largest storm occurred on the same day in 1991 (3/24/1991)
- The 1991 event produced a “new” radiation belt that persisted for up to a year (CRRES)

- Professor Araki of Kyoto University (Japan) is investigating extreme sudden commencement events
- Because of limited data access, records of these events are obtained through the NGDC climate controlled library
- Stations from North America and Europe will supplement data from Kakioka and Alibag observatories.



Accomplishments & Updates

First Ethiopian Ionosonde



Terry Bullett directed the installation and operation of the first ionosonde ever placed in Ethiopia

- Numerous logistical obstacles needed to be overcome during the construction phase:
  - Tree clearing
  - Shelter Construction
  - Antenna installation
  - Electrical power
  - Communications
- "First Light" occurred on 12 Jan 12 @ 13:57UT
- Magnetic equator data will be incorporated into NGDC's scintillation forecast product

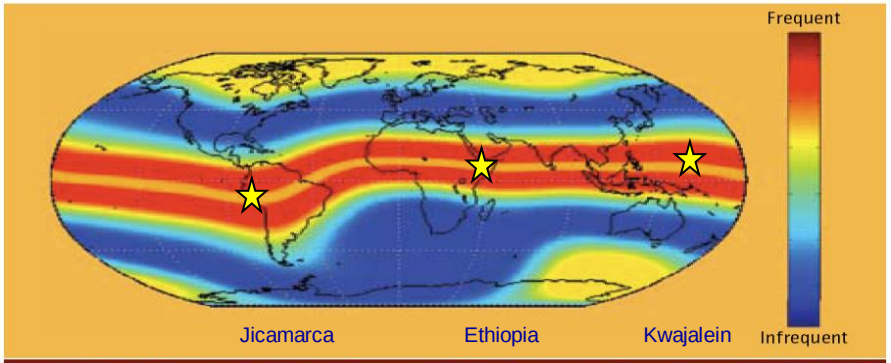


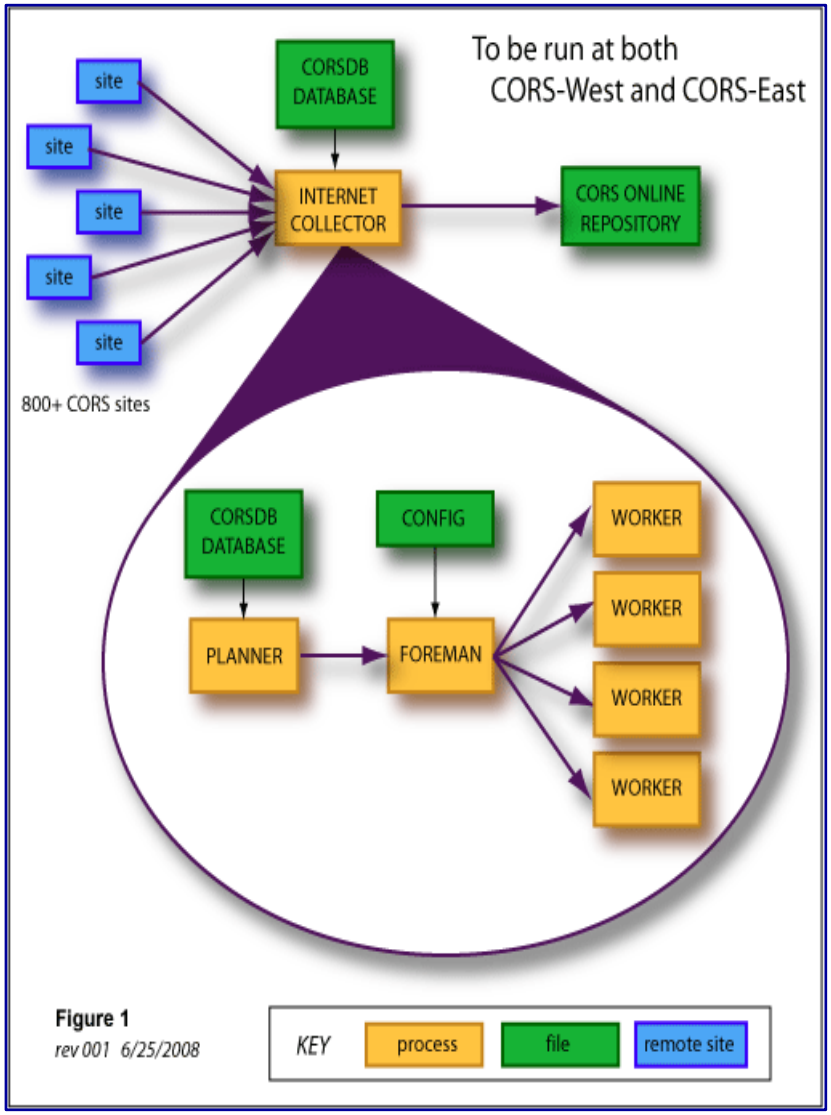
FIGURE 1 Scintillation map showing the frequency of disturbances at solar maximum. Scintillation is most intense and most frequent in two bands surrounding the magnetic equator, up to 100 days per year. At poleward latitudes, it is less frequent and it is least frequent at mid-latitude, a few to ten days per year.

Accomplishments & Updates
Satellite Anomaly Services

- STP has assumed responsibility for providing satellite anomaly services within NOAA
- Team has already conducted environmental assessments for the Galaxy 15 and SkyTerra-1 satellite anomalies
- NGDC/SWPC will hold a meeting with stakeholders to identify key issues and customer needs
- STP will produce a white paper and plan for providing satellite anomaly services based on the findings of the meeting
- The initiative needs support to implement a web portal and long-term maintenance and development – agile development?
- Assistance is requested identifying resources to maintain this capability which is currently supported "out of hide"

Accomplishments & Updates

CORS Internet Collector



An "alpha" version of the CORS Internet Collector (IC) is now complete and will be delivered to NGS in the form of a final demonstration on 11-Apr. Throughout the CORS IC development, Rob Prentice has been the consistent developer dealing with numerous personnel changes on the NGS side. Following this final delivery any requests for technical advice and support will need to be coordinated through STP and the front office.

Accomplishments & Updates
CORS COOP on 22-27 March 2012

On 22 March (Thursday), CORS-Boulder initiated COOP procedures after SSMC3 (Silver Spring, MD) experienced a fire-related emergency shutdown. Handover back to shared responsibilities with CORS-NGS occurred on the following Tuesday. Fran Coloma and NGS personnel worked during the weekend to safeguard the continuity and integrity of the CORS GPS data.

NOAA HOME WEATHER OCEANS FISHERIES CHARTING SATELLITES CLIMATE RESEARCH COASTS CAREERS

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

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- » Continuity of Operations
- » Incident Coordination Center
- » Pandemic Influenza Planning in NOAA
- » NOAA's Role in Homeland Security
- » CIO Organization
- » DOC OCIO
- » NOAA Order of Succession
- » NOAA Organization Chart

HSPO Related Links

- FEMA (Emergency Preparedness Guidance)
- Ready.gov - Prepare, Plan & Stay Informed
- Federal Government Operating Status
- NOAA Evacuation Guides and Plans (NOAA Employees Only)
- NOAA Security

Homeland Security Program Office

NOAA SSMC3 Campus Update

SSMC3 Occupancy For Friday March 23, 2012 (updated at 3pm)

This is to advise you that repairs to the electrical system in SSMC 3 have been completed, and IT systems continue to come on line. As a result, SSMC 3 will be open for employee access beginning at 3 PM on March 23rd.

Please note that this should not be construed as a requirement to report to work, but rather informational in the event you need to access the building to retrieve personal or work related items.

Staff is requested not to work in the building, as we are still working on cooling the computer rooms, and do not want our progress impacted by additional heat load.

Employees are to report to work on Monday March, 26 as scheduled. Thank you.

For further duty status information

- NOAA Workforce Management Emergency Procedures Memo for SSMC3 (23 March 2012)
- NOAA Workforce Management Emergency Procedures Memo for SSMC3 (22 March 2012)

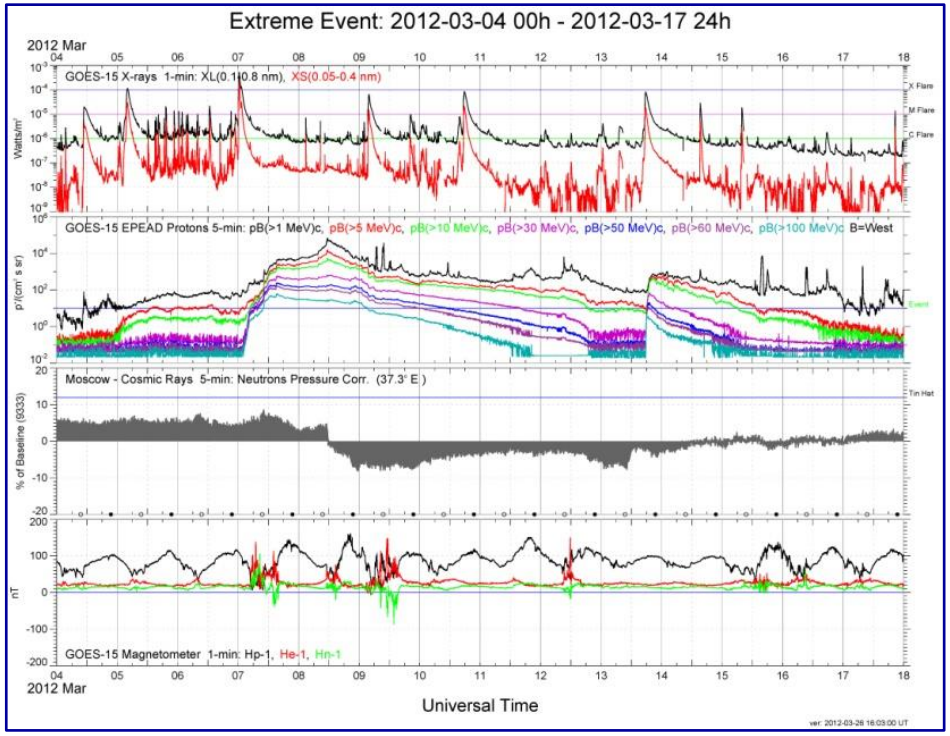
Accomplishments & Updates

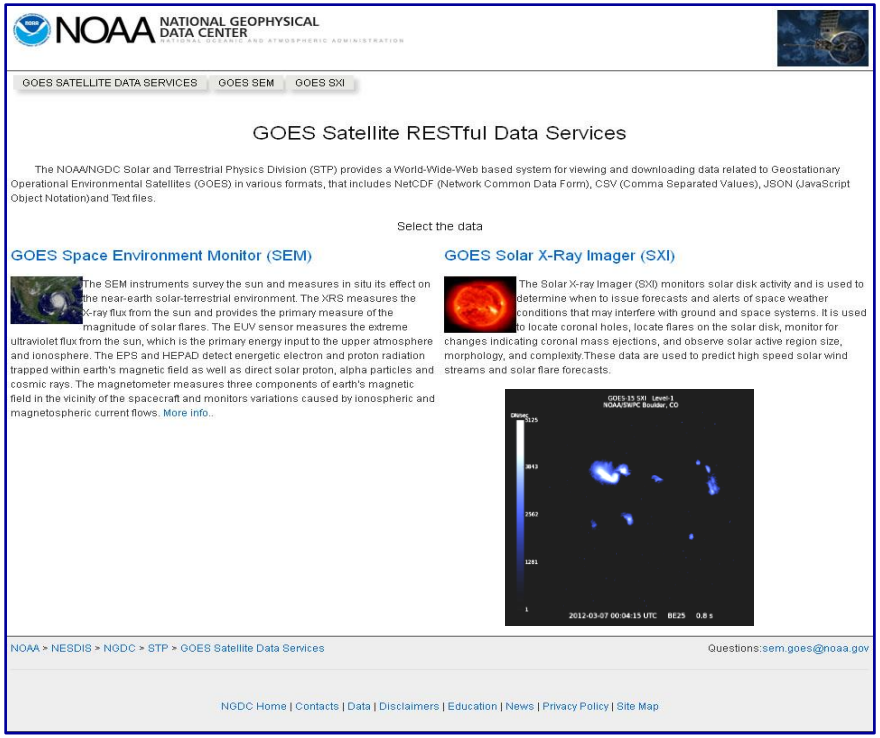
Restful Services – Satellite Data

Interested parties submit custom data queries via a new web service that accesses MySQL tables and generate data products on-the-fly. Primary development was performed by Anu Sundaravel under a GOES-R funded effort. Oversight provided by Dan Wilkinson.

Example:

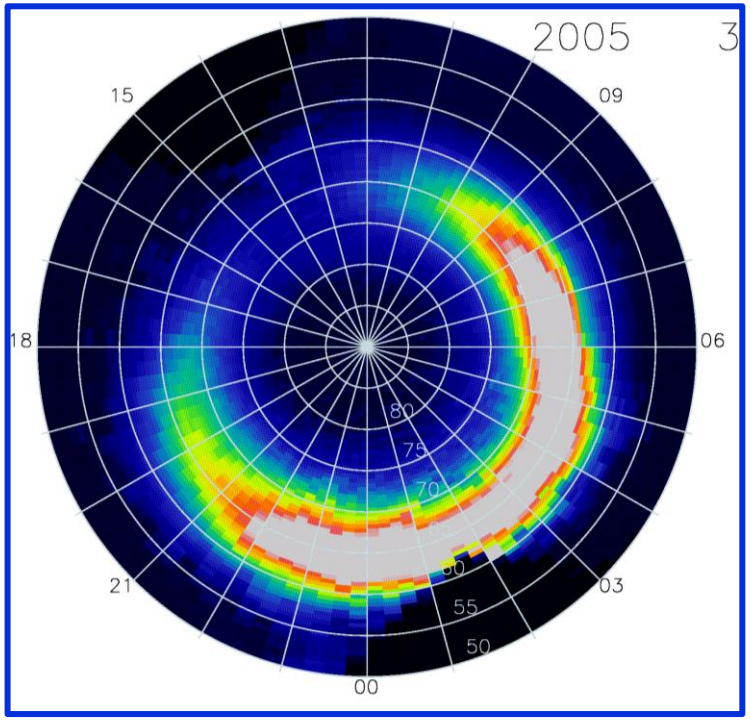
http://wwwtest.ngdc.noaa.gov/goes/sem/getData/goes15/xrs_1m.csv?fromDate=20120304&toDate=20120318

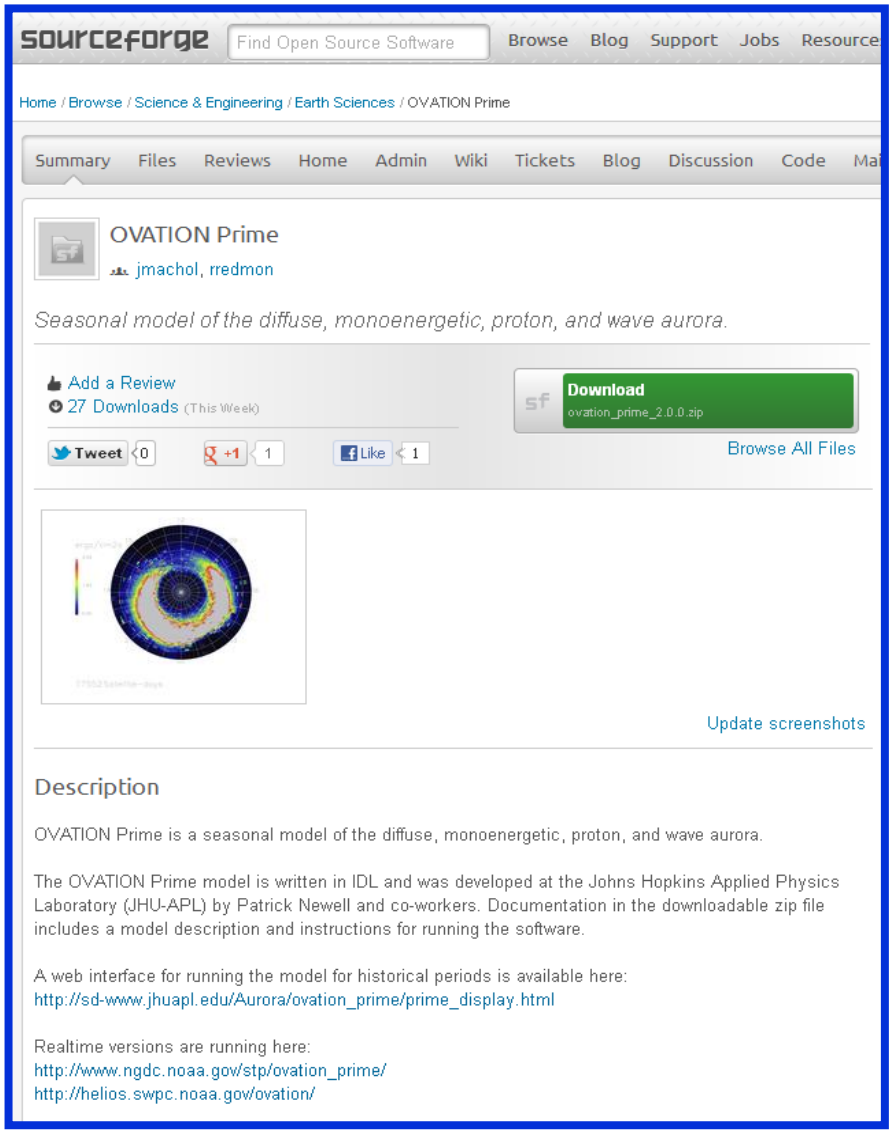




Accomplishments & Updates

Ovation *Prime* – SourceForge





Recent Code Enhancements (NGDC/STP)

- Now in real-time; faster & user-configurable
- Science Validated[1]

Public Access via SourceForge

- Managed by STP (Machol / Redmon)
- User community: APL / SWPC / Dartmouth

Research to Operations @ SWPC

- STP assisting SWPC in RT model improvements

[1]**Machol, J.L.**, **J.C. Green**, **R.J. Redmon**, R.A. Viereck, and P.T. Newell (2012), Evaluation of OVATION Prime as a Forecast Model for Visible Aurorae, *Space Weather, 10*, S03005, doi:10.1029/2011SW000746.

Accomplishments & Updates

DMSP Data via McMurdo

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFSPC)
LOS ANGELES AIR FORCE BASE, CALIFORNIA

28 March 2012

MEMORANDUM FOR: AFWA/CC

FROM: DWSD/CC
483 N. Aviation Blvd
El Segundo CA 90245-2808

SUBJECT: DMSP at McMurdo Initial Operational Capability (IOC) and Transfer to Operations

1. I certify that Initial Operational Capability (IOC) for the Defense Meteorological Satellite Program (DMSP) at McMurdo Project has been reached and that the Project meets or exceeds all threshold requirements for mission support.

2. In accordance with paragraph 6.1 of Annex O to the Concept of Operations for DMSP Operations, currently in final coordination, and paragraphs 1.1.2 and 3.2.1 of the DMSP McMurdo Ground Project Operational Assessment Plan, dated 30 November 2011, I hereby transfer the operational capabilities for the DMSP at McMurdo system to the Air Force Weather Agency.

Scott Larrimore
SCOTT C. LARRIMORE, Colonel, USAF
Director
Defense Weather Systems Directorate

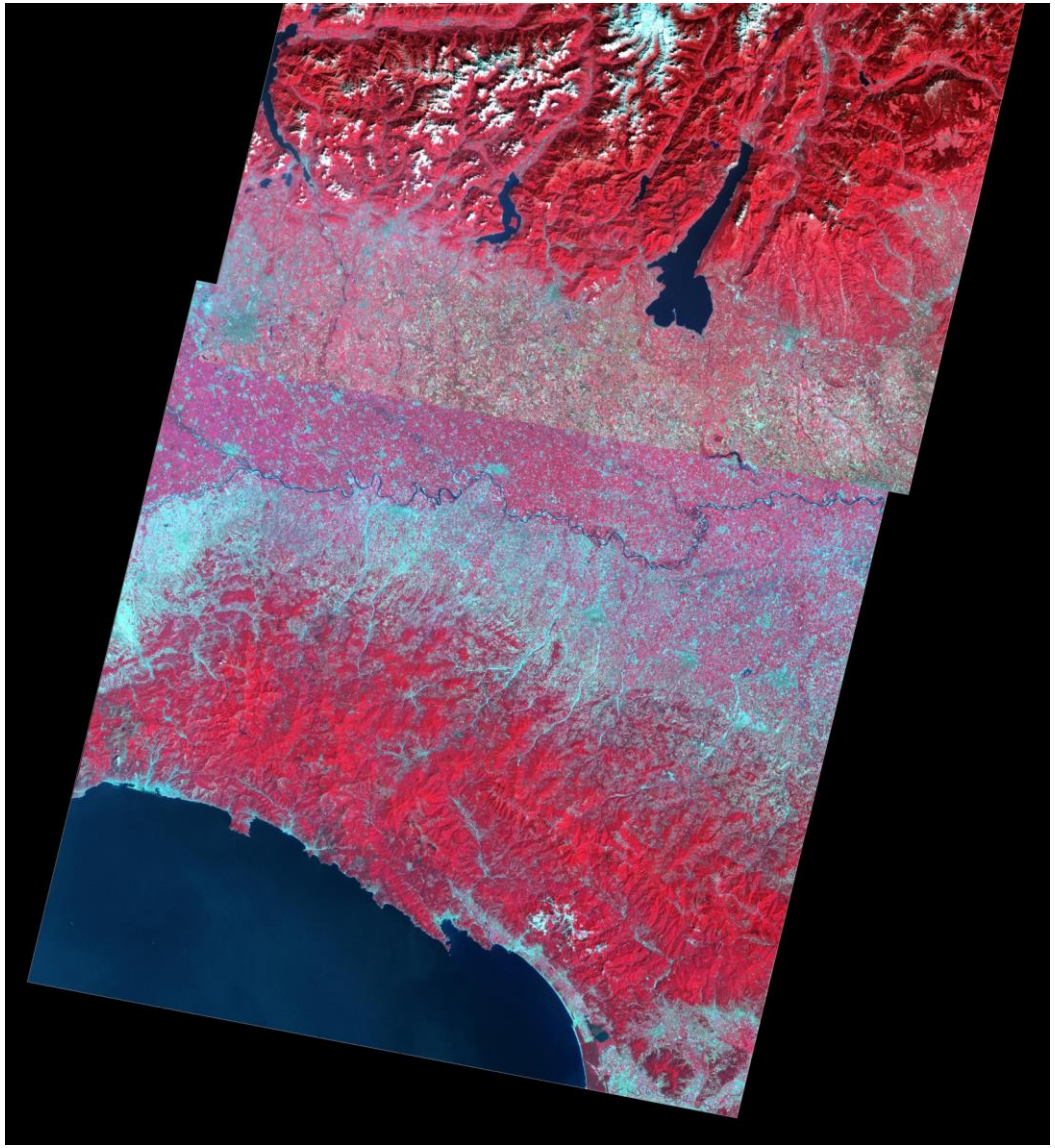
cc:
50th OG/DET 1
AF/A3Z-SO
AFSPC/A3FW
DOS/OES/OPA
FNMOC
JPSS Program/NASA/GSFC Code 470
NOAA JPSS Program Office
NOAA/NGDC
NOAA/SOCC
NSF/OPP/AIL

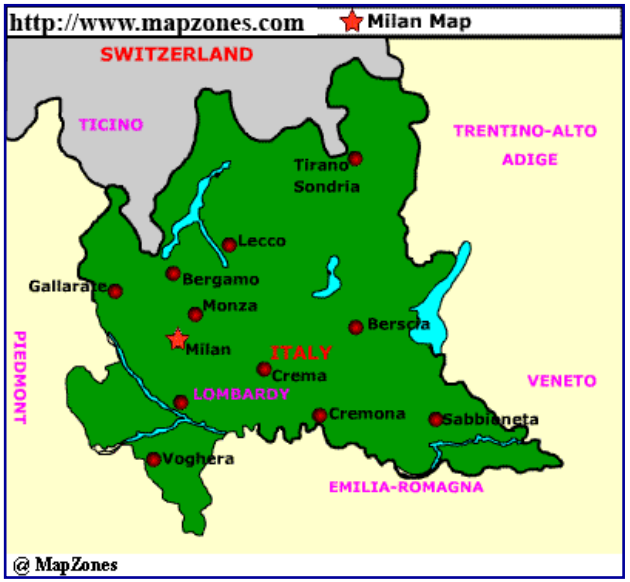
INTEGRITY, SERVICE, EXCELLENCE

On 24 March 2012 the AF/SMC transferred to operations receipt of DMSP data via McMurdo Station. NGDC was instrumental in assisting the USAF achieve Initial Operational Capability (IOC) in compliance with the 1959 Antarctic Treaty. With the DMSP Service Life Extension Program (SLEP) it is likely that NGDC will continue to serve the USAF/DMSP through 2022.

Accomplishments & Updates

Milan, Italy





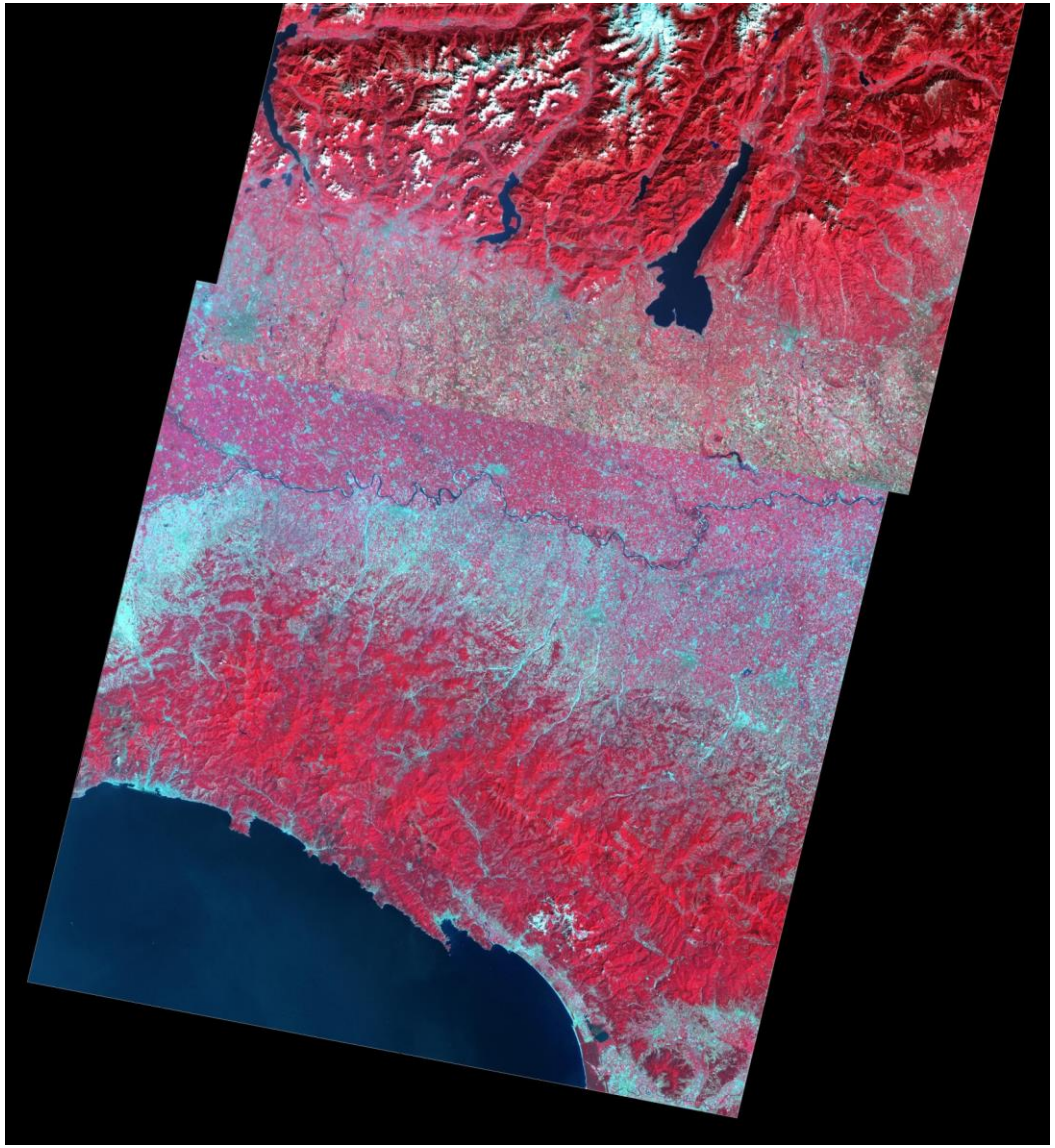
Landsat Mosaic

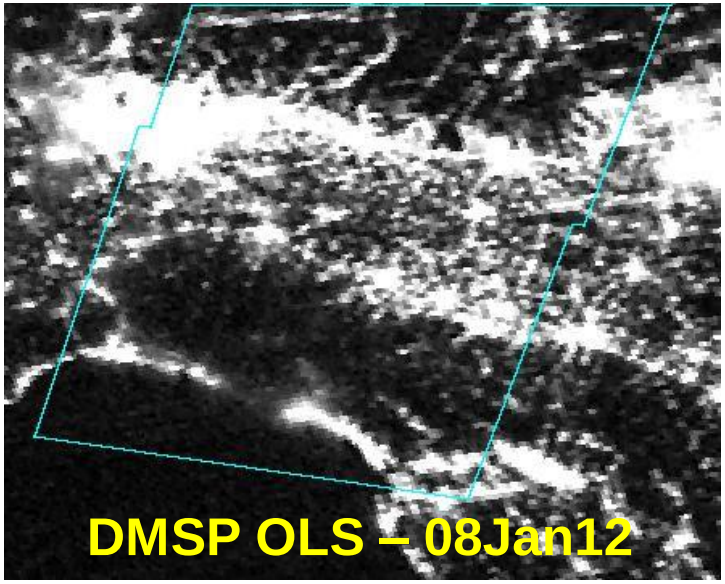
Where are the population centers?

Note the difficulty in identifying cities and towns due to spectral confusion with vegetation and soils.

Accomplishments & Updates

Milan, Italy





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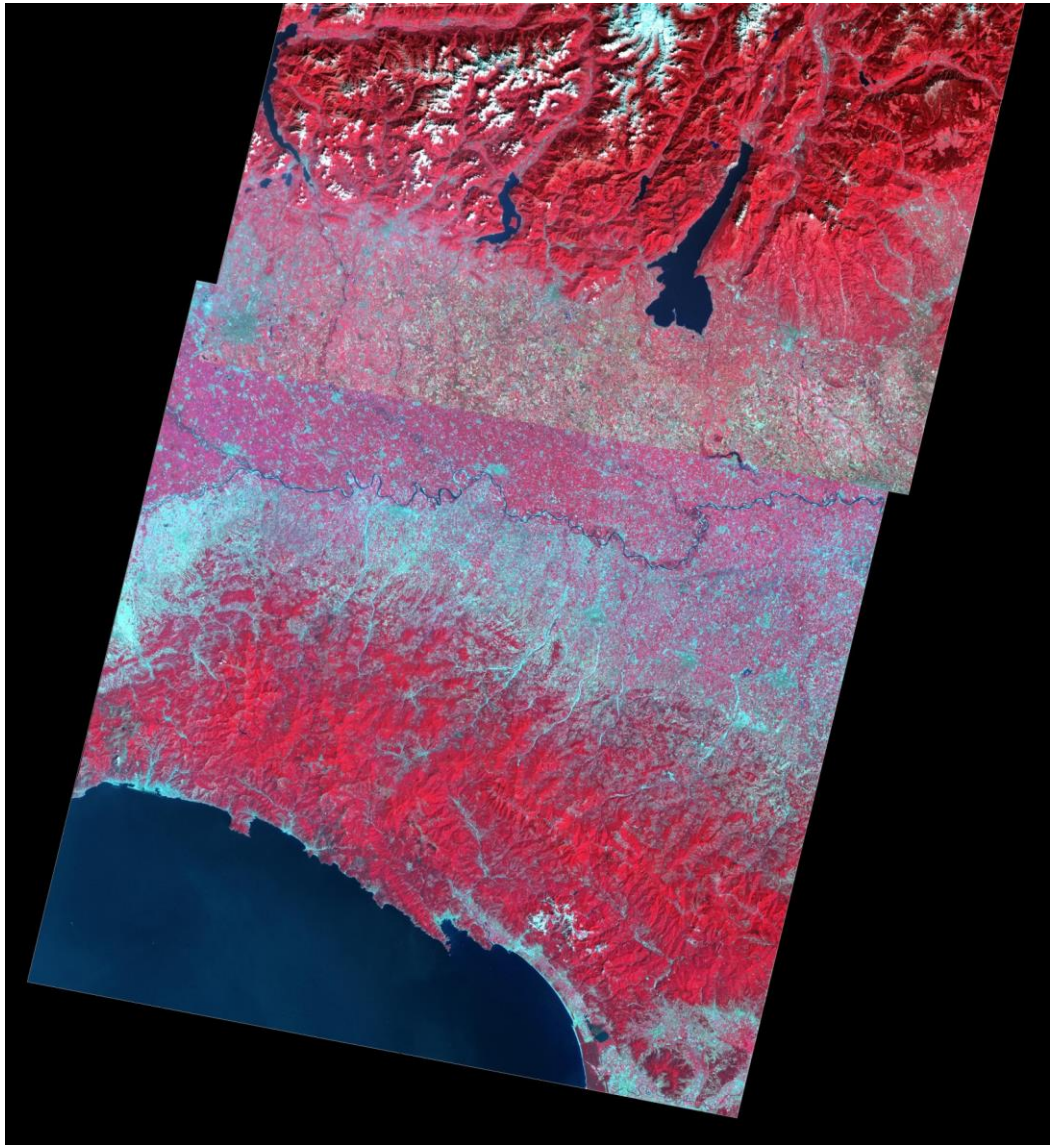
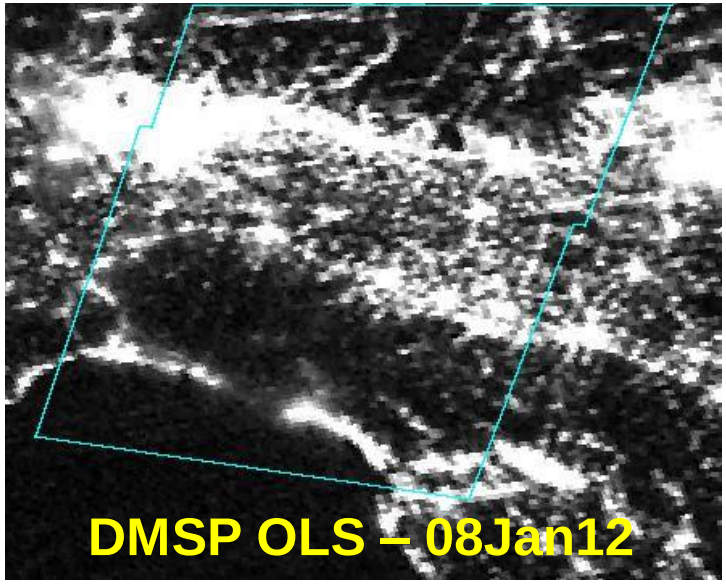
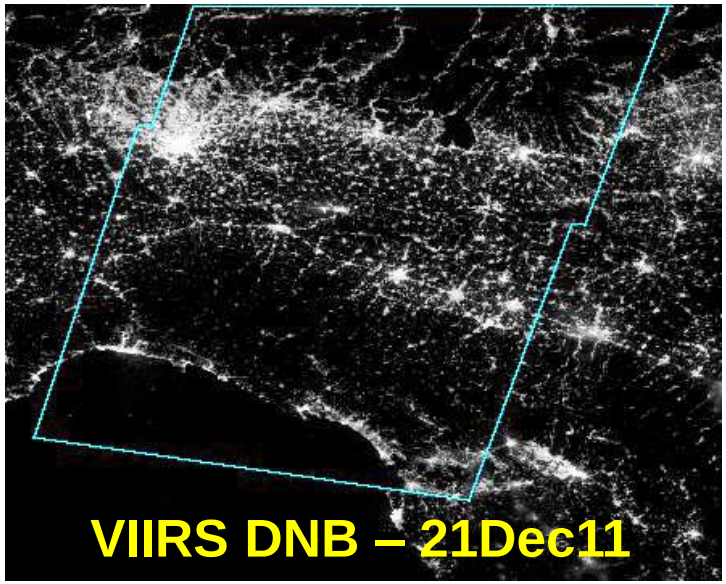
Accomplishments & Updates

Milan, Italy

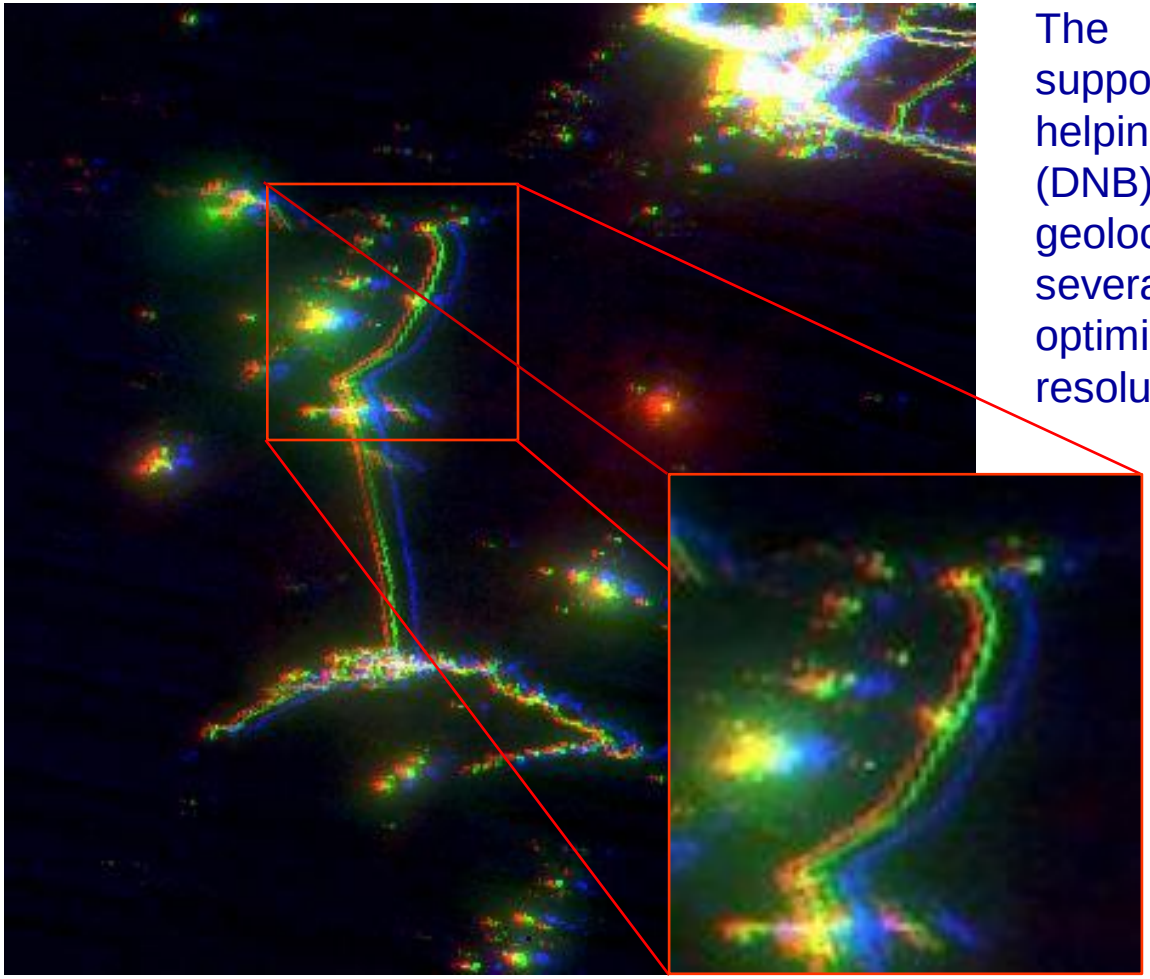






Accomplishments & Updates

VIIRS/DNB Geolocation Adjustments

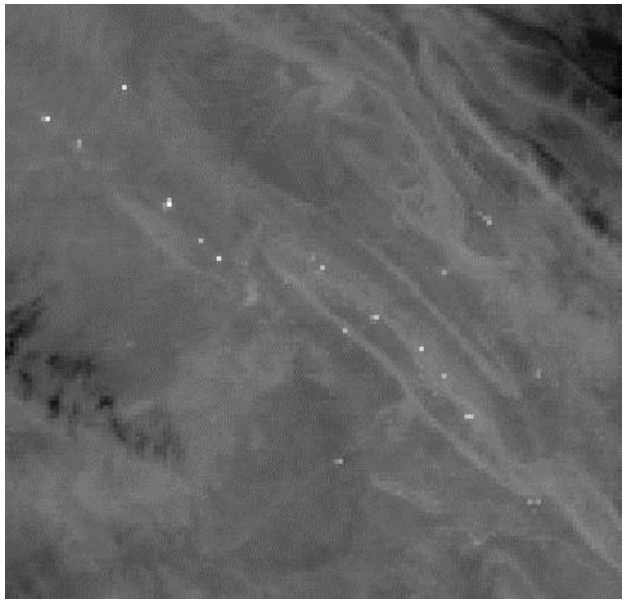


The Earth Observations Group is supporting the Suomi NPP mission by helping to geolocate the Day/Night Band (DNB). Errors in the previous inter-band geolocation were initially on the order of several km and work is continuing to optimize this geolocation. The maximum resolution of the VIIRS DNB is 0.74 km.

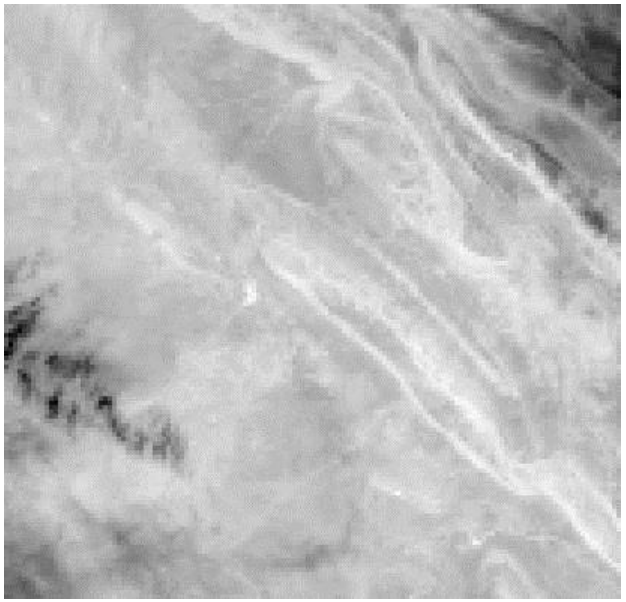
Accomplishments & Updates

Gas Flares in VIIRS Spectral Data

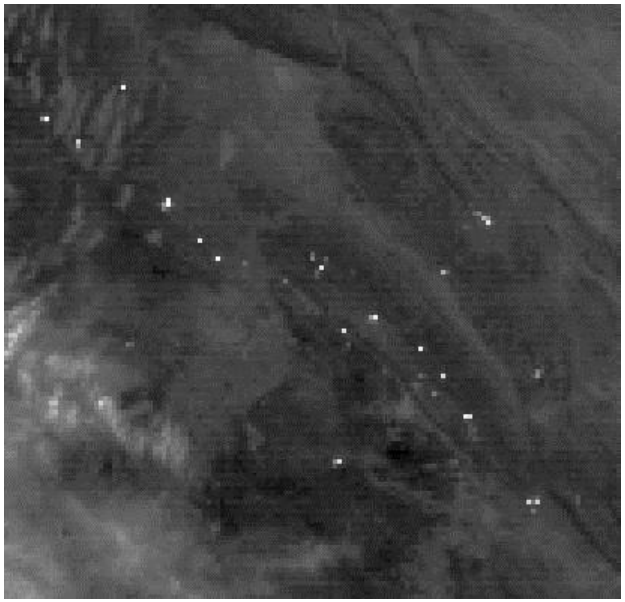
Gas flares show up well in VIIRS M13 (4.05 um) and are generally absent in M15 (10.8 um). The brightness temperature difference between these two bands is the core data used in the VIIRS operational hot spot product. Chris Elvidge finds that other VIIRS band may be more suited to gas flare detection, including determination of the blackbody temperature – proposal submitted to JPSS Proving Ground program.



M13
(4.05 microns)



M15
(10.763 microns)

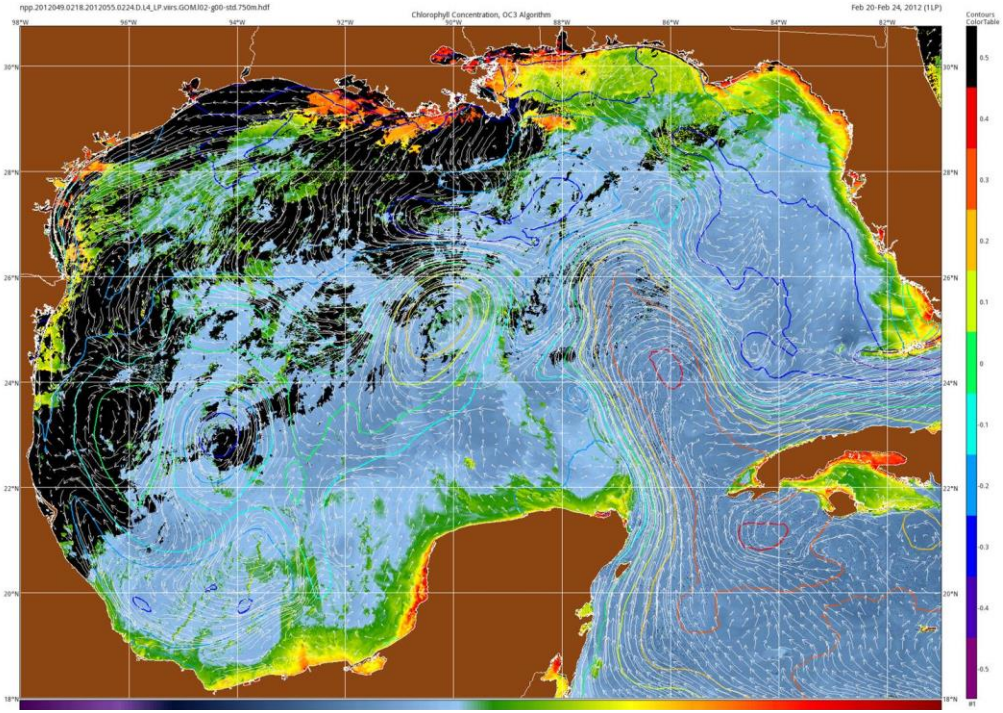


M13-M15 difference

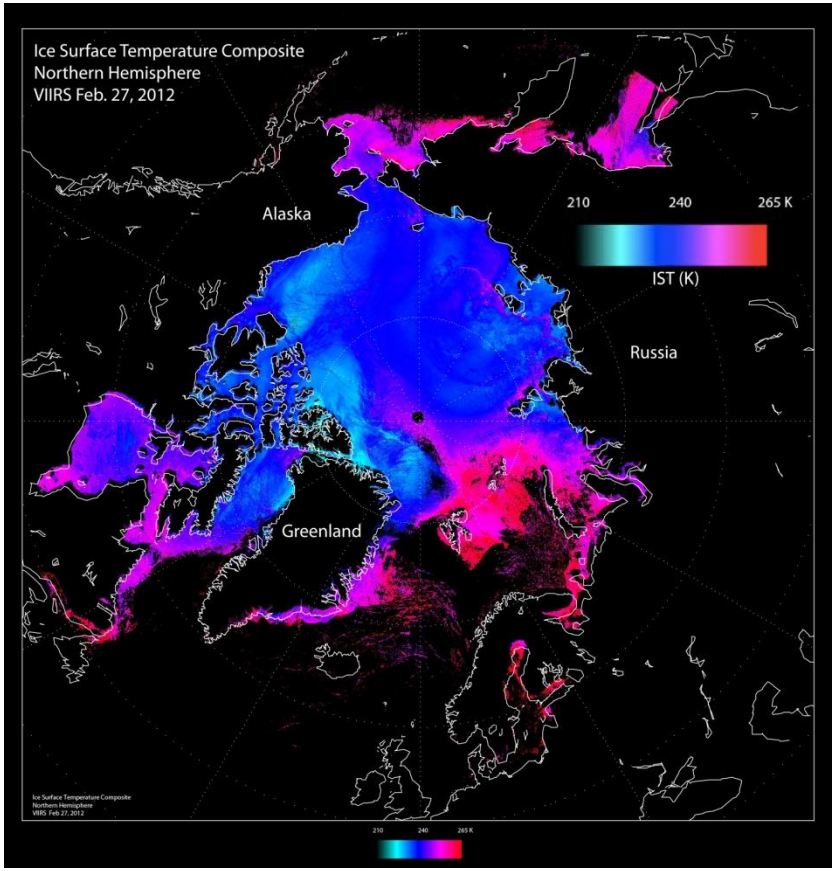
Location: Iran

Accomplishments & Updates
JPSS Logistical Operational Guidance

Paul Meade and Pat Purcell are providing Logistical Operational Guidance as JPSS Algorithm Managers (logJAMs) for, respectively, the Cryosphere (right image) and Ocean Color/Chlorophyll (left image) Cal-Val teams. Both Paul and Pat are aligned with the JPSS Data Products Engineering (DPE) Algorithm Integration Team (AIT).



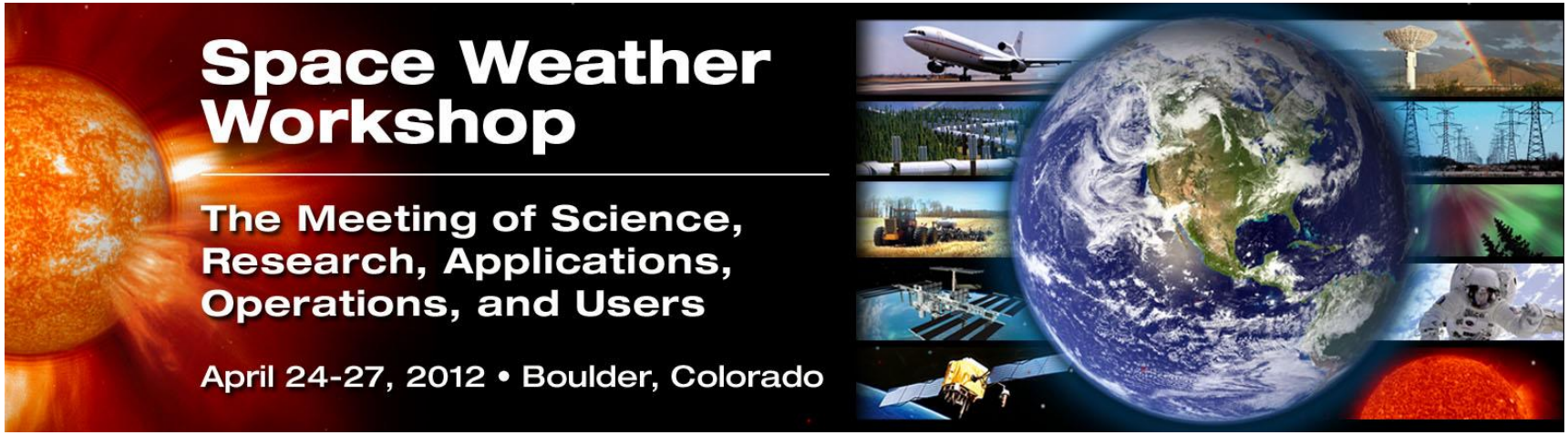
Chlorophyll Concentration



Ice Surface Temperature

Accomplishments & Updates

Space Weather Workshop



Space Weather Workshop is an annual conference that brings industry, academia, and government agencies together in a lively dialog about space weather. SWW the Nation's leading conference on all issues relating to space weather. Janet Green will be presenting an invited talk on spacecraft charging.

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Personnel Activities

Accomplishments & Updates

→ **Action for the Director**

USAF Datasets At NGDC

Issues & Summary

Action for the Director
Cal/Val Support to GOES-R: ~1 FTE

NGDC Cal/Val Support Funded Via STAR:

GOES-R PSE:
- GOES-R Cal/Val Plan Vol. 1 revision (all SWx instruments)
  - Mag section is completely new
- Created and/or revised lists of necessary SWx Cal/Val data (all SWx instruments)
  - Multiple iterations

GOES-R Ground:
- CLASS ICD review & telecon
- GOES-R Product User's Guide review
  - 2 iterations
- GOES-R Metadata Model review
- GOES-R Metadata Model telecons
  - 2 telecons to date

GOES-R Mag:
- TIM with GOES-R Flight and vendor
- Reviews of scientific papers
- Review of Mag GPA
- Attended Mag CDR
- Review of Mag CDRLs
- Created Mag Metadata List

GOES-R SEISS:
- Attended PERs for MPS-HI and SGPS
- Attended weekly telecons
- Attended SEISS GPA tag-ups
- Two white papers on SEISS L0->L1b GPA
- Review of CDRLs
- EHIS Science software review

GOES-R EXIS:
- Attended reviews at vendor site

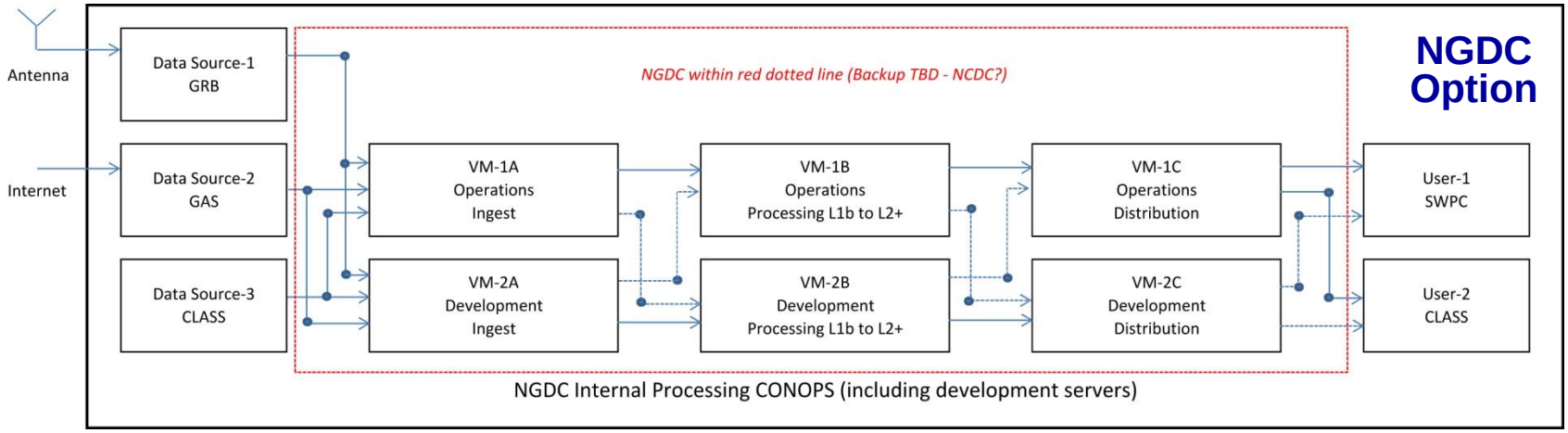
GOES-R SUVI:
- Review of CDRLs
  - Cal Plan, GPA, Trend Analysis
- TIM with vendor at SWPC
- Provided response to proposed PORD changes
- Review of SUVI Filter SEA
- Telecon with MSFC to review proposed underflights

***Recommendation[1]:* Have NGDC provide direct support to the GOES Program Office**

[1]Discussion topic with Greg Mangt

Action for the Director

Where to Process GOES-R L2+ Products?



The question of where and who is responsible for the processing of the GOES-R L2+ products is a continuing area of concern. With the first launch of GOES planned for late 2015 there is very little time to have the tools in place to properly support GOES-R Post-Launch Test (PLT), including phases for Operational Checkout (OC) & Environmental Calibration Initialization (ECI).

Something Else for Greg

OUTLINE
Solar & Terrestrial Physics Division

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→ **USAF Datasets At NGDC**

Issues & Summary

STP Division Overview

SWx Data Stewardship Annex (SWxDSA)

Thursday, March 22, 2012 **DRAFT** 09:58:44

Space Weather Data Stewardship Annex
to the
Memorandum of Agreement
On Data Acquisition Processing and Exchange

Participants

Dr. Christopher Fox Date
Director, National Geophysical Date Center

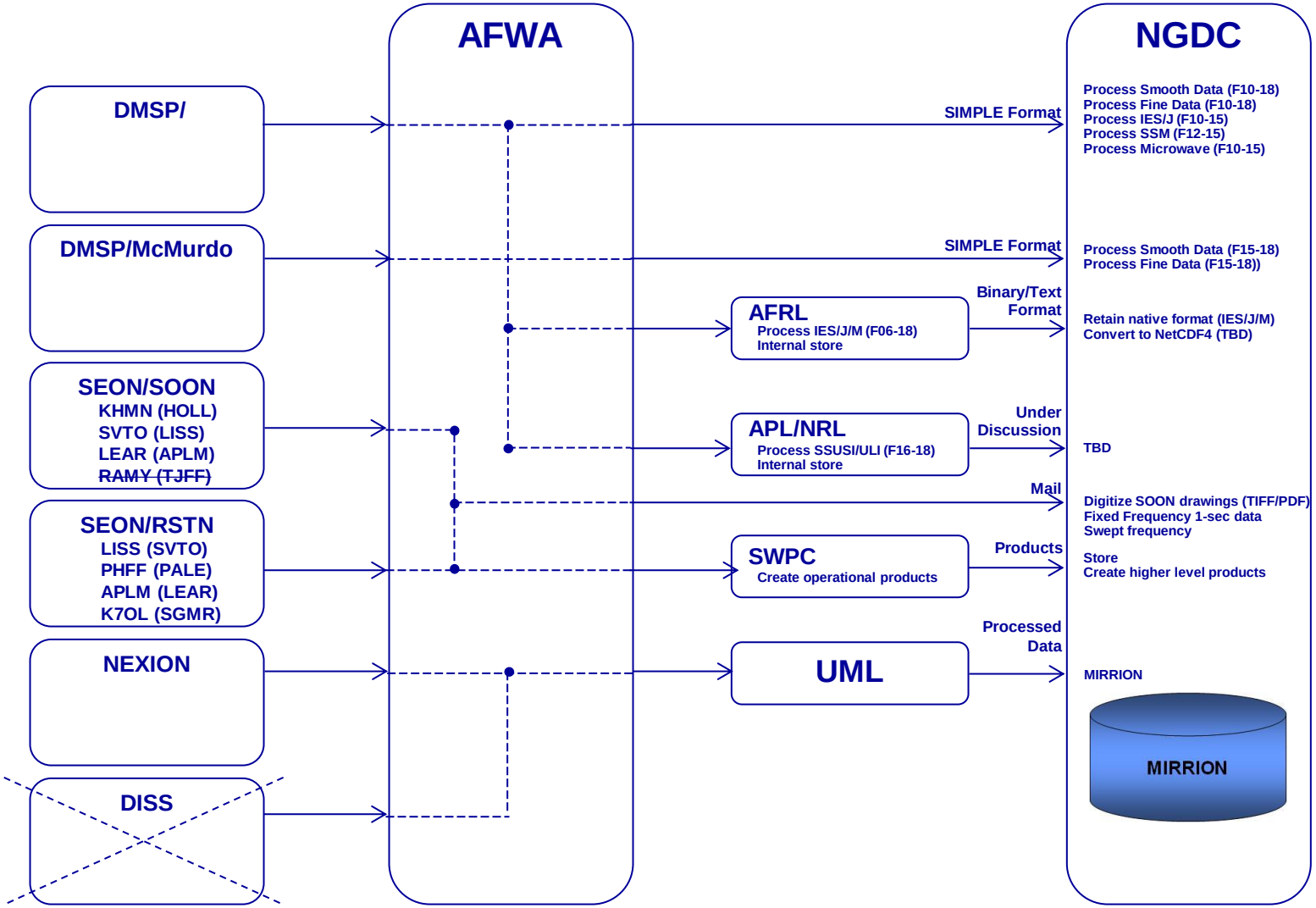
Louis Zuccarello, COL USAF Date
Commander, Air Force Weather Agency

2

The existing MOA-DAPE provides an appropriate vehicle for a renewed agreement between AFWA and NGDC for the AAA of USAF satellite and space weather datasets. W. Denig is working with Mr. Ron Dunic to better define AFWA's needs and NGDC's capabilities.

- Program Council/National Operational Processing Centers (PC/NOPC) — M. Kicza
  - Committee for Operational Processing Centers (COPC) — K. Kelly
    - Engage → Working Group for Cooperative Support and Backup (WG/CSAB) — K. Amburgey
      - JAG/ODAA
      - JAG/CCM

USAF Datasets
Data Flows - Overview



USAF Datasets
USAF Data Contributors

AFWA direct

- DMSP – full data stream (SIMPLE format) from Thule and McMurdo; smooth/fine
- NEXION – *tbd* – under discussion
- ISOON – *tbd* – future? (Interim GONG – *tbd*)

SEON (SOON & RSTN) Sites via Mail (monthly)

- SOON Sunspot Drawings – paper originals – *images to CU but status is unknown?*
- RSTN datafiles – CD – includes:
  - ✓Metrics – Station metrics (up/down time, etc)
  - ✓RIMS – Fixed frequency data – 1 sec, up to 8 frequencies
  - ✓SRS – Swept frequency data
  - ✓WNDS – Semi-automatic massages generated by the WNDS (operator input)

AFRL (APL & NRL – *tbd*) – Daily ftp

- Processed DMSP SWx sensor data (SSJ/SSIES/SSM; SSUSI/SSULI – *tbd*)

University of Masachusetts, Lowell

- Ionosonde – DIDBase – ionograms in SAO/XML format

Space Weather Prediction Center – next slide

USAF Datasets
Received via SWPC

External Space Weather Data Store (E-SWDS)[1]

- BURSTData – RSTN – Solar radio bursts (start, stop, frequency, type)
- DALASData – SOON – Disk & limb reports - filaments (locations)
- FLAREData – SOON – H-alpha flares (start, stop, peak, location)
- FLUXData – *TBD*
- SPOTData – SOON – Sunspots/groups
- STATSData – SOON – Times of sun viewing for each day
- SWEEPData – RSTN observations – Solar radio type
- *X-RAYData – GOES observations - X-Ray flares*

Derived SWPC Daily Products[2] – Relies on SOON/RSTN data plus other sources

- Solar Event Reports (edited events) – H-alpha, solar radio, and H-alpha flares
- Solar Region Summaries – Region numbers, sunspots/groups and plague
- Summary of Space Weather Observations – Region numbers, sunspots and characteristics
- Space Weather Indices – sunspot numbers, background x-ray flux and solar radio flux
- Reports of Solar Geophysical Activity – Geophysical analyses and forecasts
- Solar Geophysical Event Summaries – Flares and burst events and daily particle fluences
- Space Weather Event Reports – Energetic solar events; flares and bursts, locations
- *Geoalerts – International Ursigram & World Data Service (IUWDS) listings*

[1]Currently being acquired – not available online
[2]Daily files available online

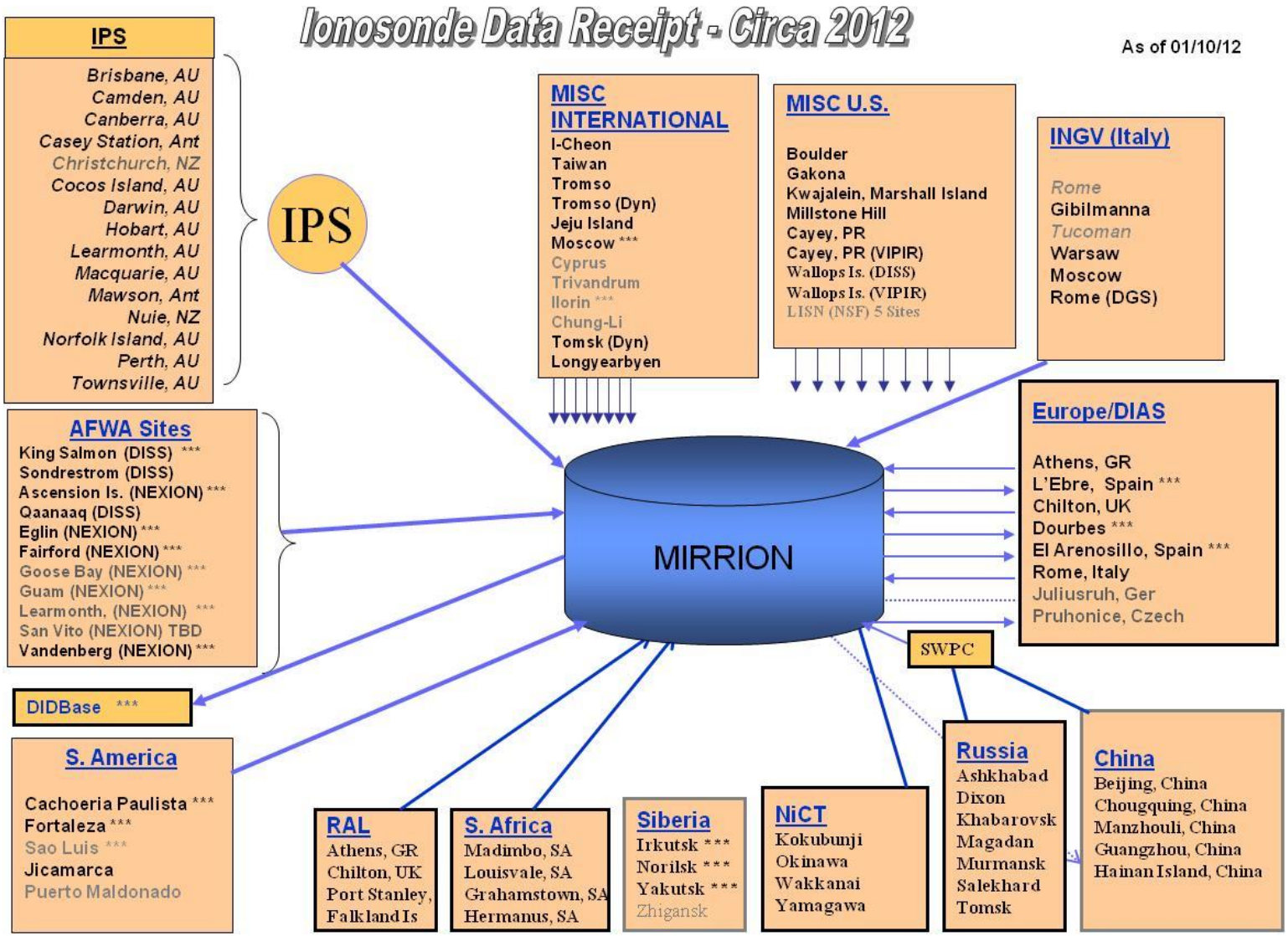
USAF Datasets
DMSP Data Holdings

			OLS	SSM/I	SSM/T1	SSM/T2	SSMIS	SSJ	SSIES	SSM	
Data Vol/Day/Sat (Mb)			2218	205	2.3	0		44.5	32.7	18.3	
	BLOCK	DATE	OLS	SSM/I	SSM/T1	SSM/T2	SSMIS	SSJ	SSIES	SSM	Daily Data Rates (Mb)
F10		92-95	X	X	X			X	X		906 (Inactive)
F11		92-95	X	X	X			X	X		924 (Inactive)
F12		94-02	X	F*	X	X		X	X	X	735 (Inactive)
F13	5D-2	95-09	X	X	X			X	X	X	923 (Inactive)
F14	5D-2	97-08	X	X	X	X		X	X	X	941 (Inactive)
F15	5D-2	00-	X	X	X	X		X	X	X	2400 (Active)
F16	5D-3	03-	X								1200 (Active)
F17	5D-3	06-	X								1975 (Active)
F18	5D-3	09-	X								1800 (Active)
Total (GB)			17460	2590	209			796	815	252	
F19	5D-3		X				X	X	X	X	
F20	5D-3		X				X	X	X	X	*Failure

DMSP Raw Data Volume: 58 TB / DMSP Processed Data: 34 TB / **Total: 92 TB** (w/McMurdo est.)

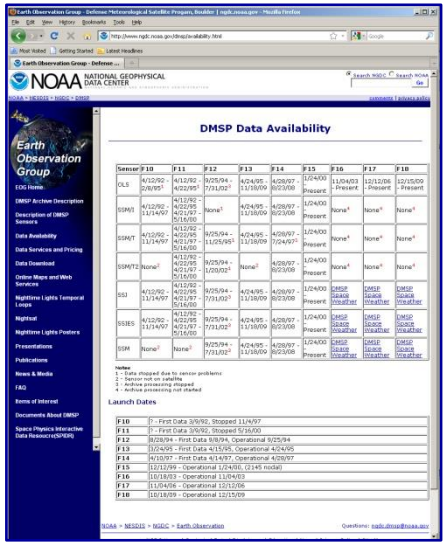
USAF Datasets

MIRRION Data – Used by AFWA

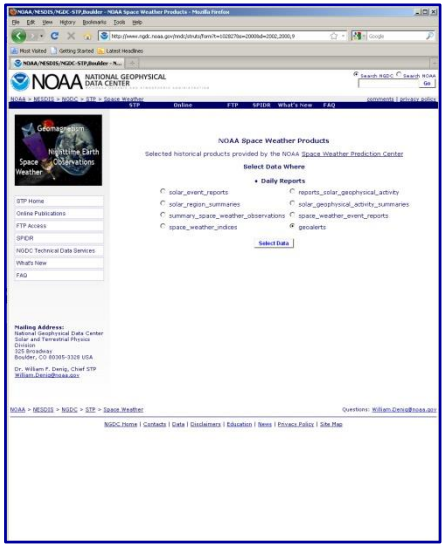


USAF Datasets

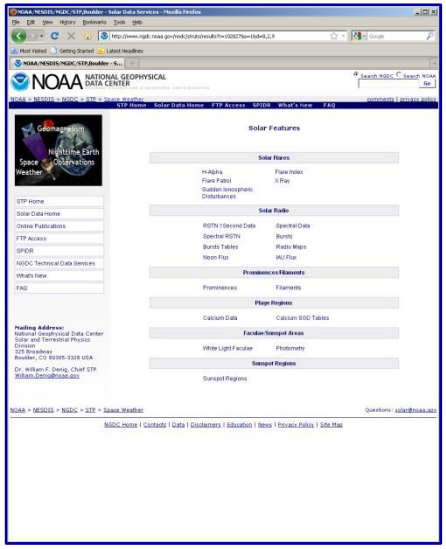
Data Availability – *Online*



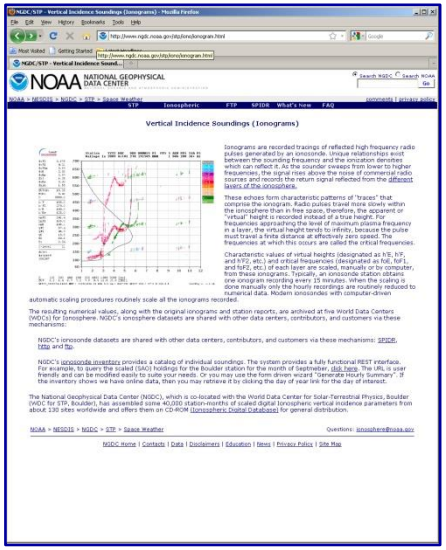
DMSP Data



SWPC Products



Solar Feature Products



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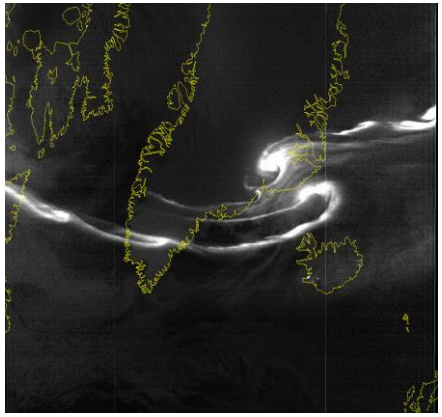

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:Product: 20020501SRS.txt
:Issued: 2002 May 01 0030 UTC
# Prepared jointly by the U.S. Dept. of Commerce, NOAA,
# Space Environment Center and the U.S. Air Force.
#
Joint USAF/NOAA Solar Region Summary
SRS Number 121 Issued at 0030Z on 01 May 2002
Report compiled from data received at SWO on 30 Apr
I.  Regions with Sunspots.  Locations Valid at 30/2400Z
Nmbr Location  Lo  Area  Z   LL   NN Mag Type
9914 N05W80   018  0110 Cso  09   03 Beta
9915 N12W69   007  0150 Dso  10   06 Beta
9919 N14W28   326  0070 Cso  05   06 Beta
9922 N22W38   336  0010 Bxo  07   02 Beta
9926 N14W15   313  0060 Cao  03   05 Beta
9927 S29E55   243  0070 Cso  07   04 Beta
9928 N18E61   237  0070 Cso  03   04 Beta
9929 N22E16   282  0010 Bxo  03   03 Beta
IA. H-alpha Plages without Spots.  Locations Valid at 30/2400Z Apr
Nmbr  Location  Lo
9916  S15W43   341
9921  N14W54   352
II. Regions Due to Return 01 May to 03 May
Nmbr Lat    Lo
9896 S09    196
9899 N19    181
9901 N21    206
9905 S14    204
9908 N05    206
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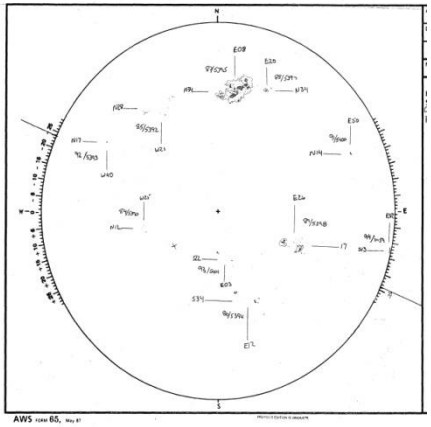
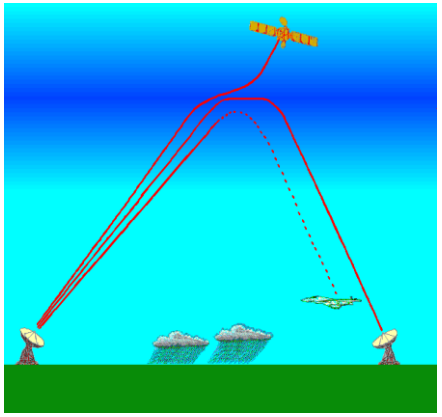
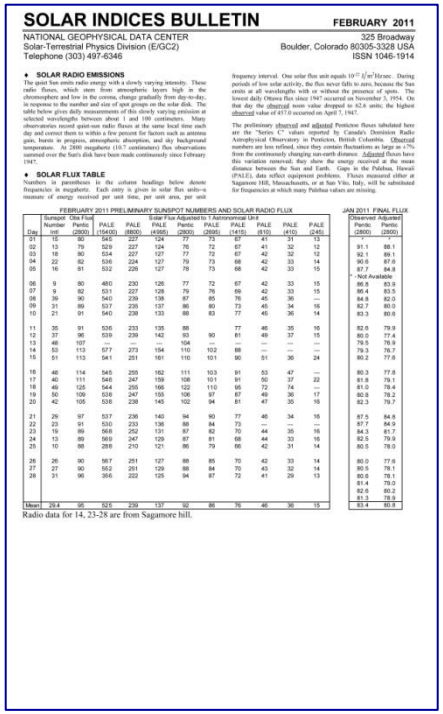




USAF Datasets
NGDC Solar Feature Products

Solar Indices Bulletin


SOLAR INDICES BULLETIN — FEBRUARY 2011

NATIONAL GEOPHYSICAL DATA CENTER
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ISSN 1046-1914

♦ SOLAR RADIO EMISSIONS

The quiet Sun emits radio energy with a slowly varying intensity. These radio fluxes, which stem from atmospheric layers high in the chromosphere and low in the corona, change gradually from day-to-day, in response to the number and size of spot groups on the solar disk. The table below gives daily measurements of this slowly varying emission at selected wavelengths between about 1 and 100 centimeters. Many observatories record quiet-sun radio fluxes at the same local time each day and correct them to within a few percent for factors such as antenna gain, beam in progress, atmospheric absorption, and sky background temperature. At 2800 megahertz (10.7 centimeters) flux observations summed over the Sun's disk have been made continuously since February 1947.

♦ SOLAR FLUX TABLE

Numbers in parentheses in the column headings below denote frequencies in megahertz. Each entry is given in solar flux units--a measure of energy received per unit time, per unit area, per unit frequency interval. One solar flux unit equals 10^{-22} J/m^2/Hz/sec. During periods of low solar activity, the flux never falls to zero, because the Sun emits at all wavelengths with or without the presence of spots. The lowest daily Ottawa flux since 1947 occurred on November 3, 1954. On that day the observed noon value dropped to 62.6 units; the highest observed value of 4710 occurred on April 7, 1947.

The preliminary observed and adjusted Penticton fluxes tabulated here are the "Series C" values reported by Canada's Dominion Radio Astrophysical Observatory in Penticton, British Columbia. Observed numbers are less refined, since they contain fluctuations as large as ±7% from the continuously changing sun-earth distance. Adjusted fluxes have this variation removed; they show the energy received at the mean distance between the Sun and Earth. Gaps in the Palehua, Hawaii (PALE), data reflect equipment problems. Fluxes measured either at Sagamore Hill, Massachusetts, or at San Vito, Italy, will be substituted for frequencies at which many Palehua values are missing.

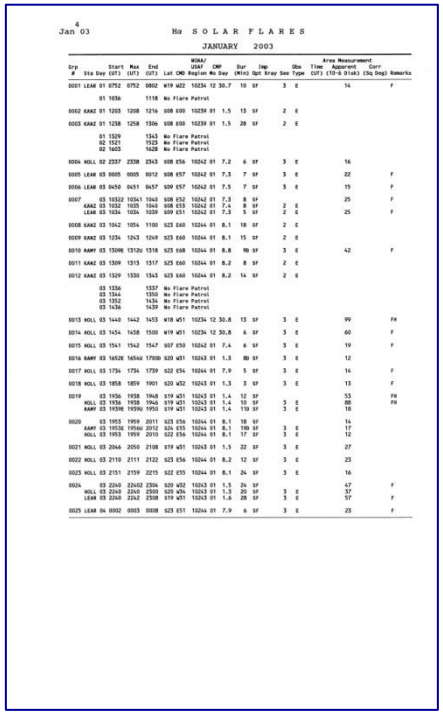
FEBRUARY 2011 PRELIMINARY SUNSPOT NUMBERS AND SOLAR RADIO FLUX

Day	Sunspot Number Int	Obs Flux PALE (2800)	PALE (15400)	PALE (8800)	Solar Flux Adjusted to 1 Astronomical Unit PALE (4995)	PALE (2800)	PALE (2695)	PALE (1415)	PALE (610)	PALE (410)	PALE (245)	JAN 2011 FINAL FLUX Observed Penticton (2800)	Adjusted Penticton (2800)
01	16	80	545	227	124	77	75	67	41	31	13	—	—
02	13	79	529	227	124	76	72	67	41	32	12	—	—
03	16	80	534	227	127	77	72	67	42	32	12	91.1	88.1
04	22	82	536	224	127	79	73	68	42	33	14	92.1	88.1
05	16	81	532	226	127	78	73	68	42	33	15	90.8	87.6
06	9	80	480	230	126	77	72	67	42	33	15	87.7	84.9
07	9	82	531	227	128	79	76	69	42	33	15	86.8	83.9
08	39	90	540	239	138	87	85	76	45	36	—	86.4	83.5
09	31	89	537	235	137	86	80	73	45	34	16	84.8	82.0
10	21	91	540	238	133	88	83	77	45	36	14	82.7	80.0
11	35	91	536	233	135	88	—	77	46	35	16	83.3	80.6
12	37	96	539	239	142	93	90	81	49	37	15	82.6	79.9
13	48	107	—	—	—	104	—	—	—	—	—	80.0	77.4
14	53	113	577	273	154	110	102	88	—	—	—	79.5	76.9
15	51	113	541	251	161	110	101	90	51	36	24	79.3	76.7
16	48	114	545	255	162	111	103	91	53	47	—	80.2	77.6
17	40	111	546	247	159	108	101	91	50	37	22	80.3	77.8
18	46	125	544	255	166	122	110	95	72	74	—	81.8	79.1
19	50	109	538	247	155	106	97	87	49	36	17	81.0	78.4
20	42	105	538	238	145	102	94	81	47	35	16	80.8	78.2
21	29	97	537	236	140	94	90	77	46	34	16	82.3	79.7
22	23	91	530	233	136	88	84	73	—	—	—	87.5	84.8
23	19	89	568	252	131	87	82	70	44	35	16	87.7	84.9
24	13	89	569	247	129	87	81	68	44	33	16	84.3	81.7
25	10	88	288	210	121	86	79	66	42	31	14	82.5	79.9
26	26	90	567	251	127	88	85	70	42	33	14	80.5	78.0
27	27	90	552	251	129	88	84	70	43	32	14	80.0	77.6
28	31	96	356	222	125	94	87	72	41	29	13	80.5	78.1
												81.4	79.0
												82.6	80.2
												81.3	78.9
Mean	29.4	95	525	239	137	92	86	76	46	36	15	83.4	80.9

Radio data for 14, 23-28 are from Sagamore hill.

Finalizing Development
Filling Gap

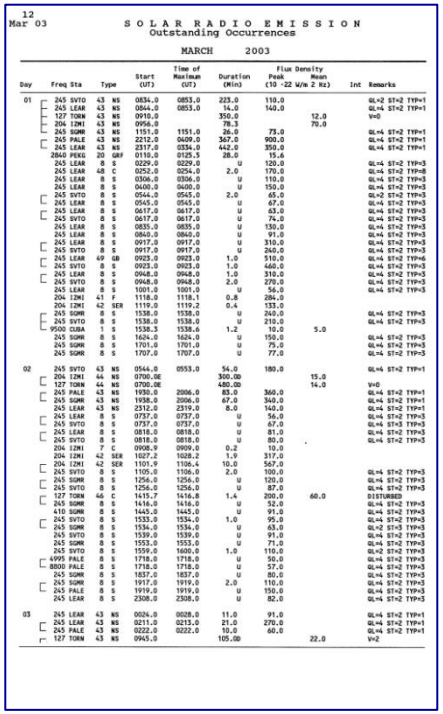
H-alpha Flare Listings


4
Jan 03 — Hα SOLAR FLARES — JANUARY 2003

Grp #	Start Sta	Day	Max (UT)	End (UT)	Loc	CMD	Region	No	Day	Obs Type	Qual	Area Measurement Apparent (UT)	(10-6 Sr1sk)	Corr (Sq Deg)	Remarks
0001	LEAR 01	0752	0752	0802	N19	W22	1023A	12	30.7	10	SF	3	E	14	F
	01	1036		1118	No Flare Patrol										
0002	KAKZ 01	1203	1208	1216	S08	E00	1023B	01	1.5	13	SF	2	E		
0003	KAKZ 01	1238	1258	1306	S08	E00	1023B	01	1.5	28	SF	2	E		
	01	1329		1343	No Flare Patrol										
	02	1521		1523	No Flare Patrol										
	02	1603		1628	No Flare Patrol										
0004	HOLL 02	2337	2338	2343	S08	E56	1024I	01	7.2	6	SF	3	E	16	
0005	LEAR 03	0005	0005	0012	S08	E57	1024I	01	7.3	7	SF	3	E	22	F
0006	LEAR 03	0450	0451	0457	S09	E57	1024I	01	7.5	7	SF	3	E	15	F
0007	03	1052	1054	1060	S08	E52	1024J	01	7.3	8	SF			25	F
	KAKZ 03	1052	1035	1040	S08	E53	1024J	01	7.4	8	SF	2	E		
	KAKZ 03	1034	1034	1039	S09	E51	1024J	01	7.3	5	SF	2	E	25	F
0008	KAKZ 03	1042	1054	1100	S23	E60	1024L	01	8.1	18	SF	2	E		
0009	KAKZ 03	1234	1243	1249	S23	E60	1024L	01	8.1	15	SF	2	E		
0010	RAMY 03	1309E	1312U	1318	S25	E68	1024L	01	8.8	90	SF	3	E	42	F
0011	KAKZ 03	1309	1313	1317	S25	E60	1024L	01	8.2	8	SF	2	E		
0012	KAKZ 03	1329	1330	1343	S25	E60	1024L	01	8.2	14	SF	2	E		
	03	1336		1337	No Flare Patrol										
	03	1344		1350	No Flare Patrol										
	03	1352		1434	No Flare Patrol										
	03	1436		1439	No Flare Patrol										
0013	HOLL 03	1440	1442	1453	N18	W51	1023A	12	30.8	13	SF	3	E	99	FN
0014	HOLL 03	1454	1458	1500	N19	W51	1023A	12	30.8	6	SF	3	E	60	F
0015	HOLL 03	1541	1542	1547	S07	E50	1024J	01	7.4	6	SF	3	E	19	F
0016	RAMY 03	1652E	1654U	1700D	S20	W31	1024J	01	1.3	80	SF	3	E	12	
0017	HOLL 03	1734	1734	1739	S22	E54	1024M	01	7.9	5	SF	3	E	14	F
0018	HOLL 03	1858	1859	1901	S20	W32	1024J	01	1.3	3	SF	3	E	13	F
0019	03	1936	1938	1948	S19	W51	1024J	01	1.4	12	SF			53	FN
	HOLL 03	1936	1938	1948	S19	W51	1024J	01	1.4	10	SF	3	E	88	FN
	RAMY 03	1939E	1939U	1950	S19	W51	1024J	01	1.4	119	SF	3	E	16	
0020	03	1953	1959	2011	S23	E56	1024M	01	8.1	18	SF			14	
	RAMY 03	1953E	1956U	2012	S24	E55	1024M	01	8.1	190	SF	3	E	17	
	HOLL 03	1953	1959	2013	S22	E56	1024M	01	8.1	17	SF	3	E	12	
0021	HOLL 03	2046	2050	2108	S19	W31	1024J	01	1.5	22	SF	3	E	27	
0022	HOLL 03	2110	2111	2122	S23	E56	1024M	01	8.2	12	SF	3	E	23	
0023	HOLL 03	2151	2159	2215	S22	E55	1024M	01	8.1	24	SF	3	E	16	
0024	03	2240	2240D	2304	S20	W52	1024J	01	1.5	24	SF			47	F
	HOLL 03	2240	2242	2308	S19	W54	1024J	01	1.5	20	SF	3	E	37	
	LEAR 03	2240	2242	2308	S19	W51	1024J	01	1.6	28	SF	3	E	57	F
0025	LEAR 04	0002	0003	0008	S23	E51	1024M	01	7.9	6	SF	3	E	23	F

Under Consideration
Auto Generation

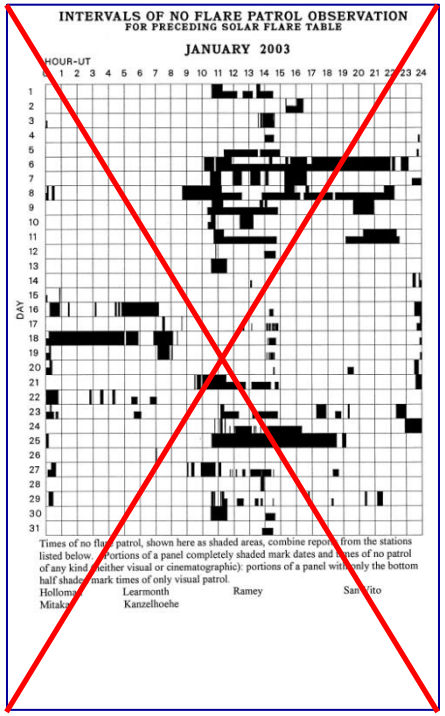
Solar Radio Bursts


12
Mar 03 — SOLAR RADIO EMISSION — Outstanding Occurrences — MARCH 2003

Day	Freq	Sta	Type	Start (UT)	Time of Maximum (UT)	Duration (Min)	Flux Density Peak (10 -22 W/m 2 Hz)	Mean	Int	Remarks
01	245	SVTO	43 NS	0834.0	0853.0	223.0	110.0			QL=2 ST=2 TYP=1
	245	KAKZ	43 NS	0844.0	0853.0	14.0	140.0			QL=4 ST=2 TYP=1
	127	TORN	43 NS	0910.0		350.0		12.0		V=0
	204	IZMI	43 NS	0956.0		78.3		70.0		
	245	SGMR	43 NS	1151.0	1151.0	26.0	73.0			QL=4 ST=2 TYP=1
	245	PALE	43 NS	2212.0	0400.0	367.0	900.0			QL=4 ST=2 TYP=1
	245	LEAR	43 NS	2317.0	0334.0	442.0	350.0			QL=4 ST=2 TYP=1
	2840	PEKG	20 GRF	0110.0	0125.5	28.0	15.6			
	245	LEAR	8 S	0229.0	0229.0	U	120.0			QL=4 ST=2 TYP=3
	245	LEAR	48 C	0252.0	0254.0	2.0	170.0			QL=4 ST=2 TYP=8
	245	LEAR	8 S	0306.0	0306.0	U	110.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0400.0	0400.0	U	150.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	0544.0	0545.0	2.0	65.0			QL=2 ST=2 TYP=3
	245	LEAR	8 S	0545.0	0545.0	U	67.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0617.0	0617.0	U	63.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	0617.0	0617.0	U	74.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0835.0	0835.0	U	130.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0840.0	0840.0	U	91.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0917.0	0917.0	U	310.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	0917.0	0917.0	U	260.0			QL=4 ST=2 TYP=3
	245	LEAR	49 GB	0923.0	0923.0	1.0	510.0			QL=4 ST=2 TYP=6
	245	SVTO	8 S	0923.0	0923.0	1.0	460.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0948.0	0948.0	1.0	310.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	0948.0	0948.0	2.0	270.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	1001.0	1001.0	U	56.0			QL=4 ST=2 TYP=3
	204	IZMI	41 F	1118.0	1118.1	0.8	286.0			
	204	IZMI	42 SER	1119.0	1119.2	0.4	133.0			
	245	SGMR	8 S	1538.0	1538.0	U	240.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	1538.0	1538.0	U	210.0			QL=4 ST=2 TYP=3
	9500	CUBA	1 S	1538.3	1538.6	1.2	10.0	5.0		
	245	SGMR	8 S	1624.0	1624.0	U	150.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1701.0	1701.0	U	75.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1707.0	1707.0	U	77.0			QL=4 ST=2 TYP=3
02	245	SVTO	43 NS	0544.0	0553.0	54.0	180.0			QL=4 ST=2 TYP=1
	204	IZMI	44 NS	0700.0E		300.0D		15.0		
	127	TORN	44 NS	0700.0E		480.0D		14.0		V=0
	245	PALE	43 NS	1930.0	2006.0	83.0	360.0			QL=4 ST=2 TYP=1
	245	SGMR	43 NS	1938.0	2006.0	67.0	340.0			QL=4 ST=2 TYP=1
	245	LEAR	43 NS	2312.0	2319.0	8.0	140.0			QL=4 ST=2 TYP=1
	245	LEAR	8 S	0737.0	0737.0	U	56.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	0737.0	0737.0	U	67.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	0818.0	0818.0	U	81.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	0818.0	0818.0	U	80.0			QL=4 ST=2 TYP=3
	204	IZMI	7 C	0908.9	0909.0	0.2	10.0			
	204	IZMI	42 SER	1027.2	1028.2	1.9	317.0			
	204	IZMI	42 SER	1101.9	1106.4	10.0	567.0			
	245	SVTO	8 S	1105.0	1106.0	2.0	100.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1256.0	1256.0	U	120.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	1256.0	1256.0	U	87.0			QL=4 ST=2 TYP=3
	127	TORN	46 C	1415.7	1416.8	1.4	200.0	60.0		DISTURBED
	245	SGMR	8 S	1416.0	1416.0	U	52.0			QL=4 ST=2 TYP=3
	410	SGMR	8 S	1445.0	1445.0	U	91.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	1533.0	1534.0	1.0	95.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1534.0	1534.0	U	63.0			QL=2 ST=2 TYP=3
	245	SVTO	8 S	1539.0	1539.0	U	91.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1553.0	1553.0	U	71.0			QL=4 ST=2 TYP=3
	245	SVTO	8 S	1559.0	1600.0	1.0	110.0			QL=2 ST=2 TYP=3
	4995	PALE	8 S	1718.0	1718.0	U	50.0			QL=4 ST=2 TYP=3
	8800	PALE	8 S	1718.0	1718.0	U	57.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1837.0	1837.0	U	80.0			QL=4 ST=2 TYP=3
	245	SGMR	8 S	1917.0	1919.0	2.0	110.0			QL=4 ST=2 TYP=3
	245	PALE	8 S	1919.0	1919.0	U	150.0			QL=4 ST=2 TYP=3
	245	LEAR	8 S	2308.0	2308.0	U	82.0			QL=4 ST=2 TYP=3
03	245	LEAR	43 NS	0024.0	0028.0	11.0	91.0			QL=4 ST=2 TYP=1
	245	LEAR	43 NS	0211.0	0213.0	21.0	270.0			QL=4 ST=2 TYP=1
	245	PALE	43 NS	0222.0	0222.0	10.0	60.0			QL=4 ST=2 TYP=1
	127	TORN	43 NS	0945.0		105.0D		22.0		V=2

Under Consideration
Auto Generation

H-alpha Observation Times



Discontinued

STP's general philosophy is to use SEON data from E-SWDS and SWPC products to generate these listings in an automatic fashion as is currently done for GOES x-ray listings. No external data sources are expected to be used.

OUTLINE
Solar & Terrestrial Physics Division

STP Division Overview

Milestones & Performance Measures

Personnel Activities

Accomplishments & Updates

Action for the Director

USAF Datasets At NGDC

Issues & Summary

Issues & Summary
STP FY12 Publications (YTD) – 10

Publications (YTD):

Alvarez, R., II, C. Senff, A. Langford, A. Weickmann, D. Law, **J. Machol**, D. Merritt, R. Marchbanks, S. Sandberg, W. Brewer, R. Hardesty, and R. Banta (2011), "Development and application of a compact, tunable, solid-state airborne ozone lidar system for boundary layer profiling", J. Oceanic Atmos. Tech., 28, 1258-1272, doi: 10.1175/JTECH-D-10-05044.1.

Araujo-Pradere, E.A., D. Buresova, **D.J. Fuller-Rowell**, and T.J. Fuller-Rowell (2012), Initial results of the evaluation of IRI hmF2 performance for minima 22-23 and 23-24, *Adv. Space Res., in press.*

Chaturvedi M., **T. Ghosh**, and L. Bhandari. (2011). Assessing income distribution at the district level for India using nighttime satellite imagery. *Proceedings of the 32nd Asia-Pacific Advanced Network Meeting*. New Delhi, India.

Elvidge, C.E., P.C. Sutton, **K.E. Baugh**, **S. Anderson**, **T. Ghosh** and **D. Ziskin** (2011) Satellite observation of urban metabolism in China, Proceedings of the Asian Conference on Remote Sensing, Taipei, Taiwan, October 3, 2011.

Elvidge, C.D., **K.E. Baugh**, **P.C. Sutton**, B. Bhaduri, B.T. Tuttle, **T. Ghosh**, **D. Ziskin and E.H. Erwin** (2011), "Who's In The Dark: Satellite Based Estimates Of Electrification Rates", *Urban Remote Sensing: Monitoring, Synthesis and Modeling in the Urban Environment*, Ed. X. Yang, Wiley-Blackwell, Chichester, UK, p. 211-224.

Kristina H.Y., **S.J. Anderson**, R.L. Powell, D.G. Sullivan and P.C. Sutton (2011), Identifying Similar Biophysical Characteristics among Nesting Beaches of Green Turtles of Turkey Using Remote Sensing Techniques, International Journal of Remote Sensing Applications (IJRSA), pp. 22-29, 31-Dec-2011.

Machol, J.L., **J.C. Green**, **R.J. Redmon**, R.A. Viereck, and P.T. Newell (2012), Evaluation of OVATION Prime as a Forecast Model for Visible Aurorae, *Space Weather, 10*, S03005, doi:10.1029/2011SW000746.

Redmon, R.J., W.K. Peterson, L. Andersson, and **W.F. Denig** (2012), A global comparison of O+ upward flows at 850 km and outflow rates at 6000 km during non-storm times, *J. Geophys. Res*., doi:10.1029/2011JA017390*, in press.*

Small, C., **C.D. Elvidge**, D. Balk and M. Montgomery (2011), "Spatial scaling of stable night lights", *Remote Sensing of Environment*, Elsevier, 115 (2011), 269-280.

Zhao, N., **T. Ghosh**, N. A. Currit, & **C. D. Elvidge** (2011). Relationships between satellite observed lit area and water footprints, *Water Resource Management*, *25*, 2241-2250.

ftp://ftp.ngdc.noaa.gov/STP/publications/stp_publications/stp_publications.pdf

Kudos
Dominic Fuller-Rowell (Student)

Subject: Fwd: Re: Thanks
From: wdenig <william.denig@noaa.gov>
Date: 3/12/2012 8:29 AM
To: Dominic Fuller-Rowell <Dominic.Fuller-Rowell@noaa.gov>
CC: Eric A Kihn <Eric.A.Kihn@noaa.gov>, Chris Fox <Christopher.G.Fox@noaa.gov>, Tim Fuller-Rowell <Tim.Fuller-Rowell@noaa.gov>

Way to go Dominic! - Thanks for being such a team player, Bill

-------- Original Message --------
Subject: Re: Thanks
Date: Mon, 12 Mar 2012 08:28:17 -0600
From:wdenig <william.denig@noaa.gov>
To: Brent Gordon <brent.gordon@noaa.gov>
CC: Steve Hill <Steven.Hill@noaa.gov>, Rodney Viereck <Rodney.Viereck@noaa.gov>, Eduardo Araujo <Eduardo.Araujo@noaa.gov>

Thanks Brent - I'll be sure to highlight this working relationship at my quarterly program review in April. - Bill

On 3/12/2012 8:05 AM, Brent Gordon wrote:
> Bill,
>
> I just wanted to pass along my personal thanks for the time Dominic
> Fuller-Rowell spent last month helping us port the USTEC model from
> RHEL4 to RHEL5. Without his help we certainly wouldn't have been able
> to meet our February 29 deadline to turn all RHEL4 systems off. I
> think this is a nice example of the partnership we are building and we
> should both keep it in our back pockets for future reference!
>
> Brent

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Initial results of the evaluation of IRI hmF2 performance for minima 22–23 and 23–24

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Abstract

The performance of the International Reference Ionosphere (IRI) in predicting the height of the maximum of electron density (hmF2) has been evaluated for similar geomagnetic latitudes stations in the northern hemisphere (NH) and southern hemisphere (SH), and for the last two minima. As truth-sites, the digisonde stations of Millstone Hill (42.6°N, 288.5°E), USA, and Grahamstown (33.3°S, 26.5°E), South Africa, were considered. A monthly averaged diurnal variation was obtained from all the observations and model output in the months studied, and the corresponding difference was also calculated. For this initial study data from summer and winter in the NH and SH were selected for the solstice comparison, and October data for both stations were used to represent equinox conditions. The choice of these periods depended on data availability and quality. The results show that for the earlier minimum in 1996, in general IRI hmF2 values are in reasonable agreement with the observations. The exceptions are October and December in the SH, where IRI hmF2 tends to high, particularly on the dayside, and also July for which the daytime measured values tend to be larger than the IRI ones. For the recent minimum in 2008, IRI tends to over-estimate the hmF2 in most of the observations. The results support the general assertion that thermospheric temperatures were cooler during the last solar minimum as a consequence of an unusually low, and extended, minimum in solar extreme-ultraviolet flux, and in response to continually increasing long-term trend in anthropogenic carbon dioxide. The cooler temperatures not only decrease density at a fixed height, but also make the corresponding contraction of the atmosphere lower the height of the F-region peak.
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Keywords: Solar minima; Ionosphere; hmF2; IRI

1. Introduction

The latest solar cycle 23–24 minimum showed several interesting characteristics. It was, essentially, a "long, low, and flat" minimum. Many papers have already been published describing it in detail (*e.g.* Tokumaru et al., 2009; Gibson et al., 2009) as well as some of its effects on the Earth system (*e.g.* Solomon et al., 2010; Araujo-Pradere et al., 2011; Liu et al., 2011). There are even some papers published discussing how this minimum affected the International reference Ionosphere (IRI) model performance (Lühr and Xiong, 2010; Araujo-Pradere and Fuller-Rowell, 2012).

Solar minimum 23–24 has been described as unusually deep and complex. There were 266 spotless days in 2008, and a magnetic field at the solar poles approximately 40% weaker than the previous cycle. A warped heliospheric current sheet (HCS) and fast-wind streams at low latitudes characterized the solar wind, while the fast-wind threads the ecliptic more commonly in 2008 than 1996 (Tokumaru

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Issues & Summary

STP FY12 Presentations (YTD) – 30 (1 of 3)

Presentations (YTD):

32nd Asian Conference on Remote Sensing (ACRS), 03-07 Oct 2011, Taipei, Taiwan

– Satellite observation of urban metabolism in China (Oral), **C.D. Elvidge**, P.C. Sutton, **K.E. Baugh**, **S. Anderson**, **T. Ghosh**, and **D. Ziskin**

US-UK Space Weather Workshop, 11-13 October 2011, Boulder, CO

– What are the requirements from satellite customers (Oral), **J.C. Green**

7th GOES Users' Conference, 15-21 October 2011, Birmingham, AL

– GOES Data and Products in the Space Weather Forecast Office (Oral), M. Shouldis, R. Viereck, S. Hill, J. Rigler, J.V. Rodriguez, and P. Lotoaniu

5th International Association for the Advancement of Space Safety, 17-19 October 2011, Paris, France

– Space Environmental Conditions at the Time of the Galaxy 15 Anomaly (Oral), J.M. Kunches, **W. Denig**, **J. Green**, **D. Wilkinson**, **J. Rodriguez**, H. Singer, P. Loto'aniu, W. Murtagh and D. Biesecker

Low-Latititde Ionospheric Sensor Network, 06 November 2011, Sao Jose Dos Campos, Brazil

– Advanced Ionospheric Sounding with Vertical Incidence Pulsed Ionospheric Radar (Invited Oral) - T.W. Bullett.

Hokkaido University, 08 November 2011, Hakodate, Japan

– Long term trends in satellite observed lit fishing boat activity, C.E. Elvidge

Ministry of Agriculture, Forestry and Fisheries (MAFF), 10 November 2011, Tsukuba, Japan

– Trends in fishing boat activity observed from space, C.E. Elvidge

National Institute for Advanced Industrial Science and Technology (AIST), 10 November 2011, Tsukuba, Japan

– Prospects for monitoring gas flares with ASTER data, C.E. Elvidge

Institute of Arctic and Alpine Research (INSTAAR) Noontime Seminar, 14 November 2011, Boulder, CO

– Aurora, Space Physics and Nighttime Lights of the World (Oral), **W.F. Denig**

2nd Low Latitude Ionospheric Sensor Network Workshop, 07-10 November 2011, São José dos Campos, Brazil

– Advanced Ionospheric Sounding with Vertical Incidence Pulsed Ionospheric Radar, **T. Bullett**

– Detection of Spread-F and foF2 values using Digisonde and VIPIR instruments, **P. Bhaneja** and **T. Bullett**

International School for Atmospheric Radars, 11-23 November 2011, Chung-Li, Taiwan

– High Frequency Radars and Ionospheric Sounding (Invited Lecture), T.W. Bullett

European Space Weather Week-8 (ESWW8), November 28 - December 02, 2011, Namur, Belgium

– Space Environmental Data and Information Available from U.S. Civilian Operational Space Weather Systems (Poster), **W.F. Denig** and **J.V. Rodriguez**

Issues & Summary

STP FY12 Presentations (YTD) – 30 (2 of 3)

Presentations (continued)

– New Measurements of Magnetospheric Particle Fluxes, Densities and Temperatures on GOES 13-15 (Poster), **J.V. Rodriguez**, **J.C. Green**, T. Onsager and H. Singer

American Geophysical Union (AGU) Fall Meeting, 05-09 December 2011, San Francisco, CA

– Equatorial electron flux pulsations correlated with ground-based pulsating aurora observations (Poster), SM13B-2038, Allison N. Jaynes, M. Lessard**, J.V. Rodriguez** and K.M. Rychert

– New Directions for the NOAA Solar and Terrestrial Physics Division (Poster), SM21A-1997, **W.F. Denig**

– Extreme Events in GOES Space Environment Monitor Data 1974 – 2011 (Poster), NG23A-1484, **D.C. Wilkinson** and **A.S. Sundaravel**

– Measured and Modeled O+ Upwelling at 800 km: Understanding the Dayside Asymmetry (Poster), SM31A-2093, **R.J. Red**mon, W.K. Peterson, L. Andersson and P.G. Richards

– Evaluation of Ovation Prime as a Forecast Model of Visible Aurora (Poster), SM31B-2101, **J.L. Machol**, **J.C. Green**, **R.J. Redmon**, R.A. Viereck and P.T. Newell

– Detailed Characterization of Substorm Dipolarization and Particle Injection from an Unprecedented Constellation of Geosynchronous Satellites (Poster), SM31B-2114, **J.C. Green**, H.J. Singer, T.G. Onsager**, J.V. Rodriguez**, **W.F. Denig**, **D.C. Wilkinson** and **J.L. Machol**

– National Trends in Satellite Observed Lighting: 1992–2009 (Oral, Invited), GC32C-03, **C.D. Elvidge**, P.C. Sutton, **K. Baugh**, **D.C. Ziskin**, **T. Ghosh** and **S. Anderson**

– The Unusual Response of the Magnetosphere to Solar Wind Conditions during the Galaxy 15 Substorm (Oral), SM32A-05, H.J. Singer, R.L. McPherron, **J.C. Green**, **J.V. Rodriguez** and **R.J. Redmon**

– Spatial Resolution and Detection Limit Considerations for Low Light Imaging of Urban Land Use Patterns (Poster), GC33B-1081, S. Anderson, **C. Elvidge** and P.C. Sutton

– Anatomy of a Radiation Belt Flux Dropout (Poster), SM41B-2026, J.F. Fennell, R.H. Friedel, **J.C. Green**, T.B. Guild and J.E. Mazur

– Modeling and Observations of the East-West Effect in Solar Energetic Particle Flux at Geosynchronous (Poster), SM31B-2103, Brian T. Kress and **J.V. Rodriguez**

– On the Relativistic Electron Injection Event in Early April 2010 (Poster), SM51B-2079, J.B. Blake, P. Obrien, **J.V. Rodriguez and J.C. Green**

– Comparison of Simulated and Observed Ring Current Magnetic Field and Ion Fluxes and ENA Intensity during the 5 April 2010 Storm (Oral), SM54A-08, M.W. Chen, C. Lemon, T.B. Guild, M. Schulz, A. Lui, A.M. Keesee, J. Goldstein and **J.V. Rodriguez**

American Meteorological Society, 22-26 January 2012, New Orleans, LA

– New Operational Algorithms for Charged Particle Data from Low-Altitude Polar-Orbiting Satellites (Poster), **J.L. Machol, J.C. Green**, **J.V. Rodriguez**, T.G. Onsager, **W.F. Denig** and **P.N. Purcell**

Issues & Summary

STP FY12 Presentations (YTD) – 30 (3 of 3)

Presentations (continued)

Geospatial Forum, Gurgaon, Haryana, India, 07-09 February 2012, Haryana, India

– Evaluating district-level income distribution for India using nighttime satellite imagery and other datasets (Oral), **T. Ghosh**, M. Chaturvedi, L. Bhandari, **C. D. Elvidge** and **K. E. Baugh**

LASP Friends of the Magnetosphere, 20 March 2012, Boulder, CO

– Upwelling to Outflowing Oxygen Ions at Auroral Latitudes during Quiet Times:Exploiting a New Satellite Database (Oral), **R.J. Redmon** and L.A. Peterson

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Issues & Summary

Solar & Terrestrial Physics Division

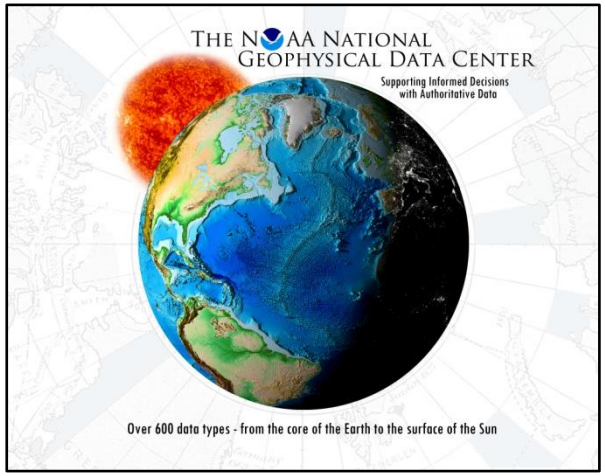
- ✓ **GOES-R L2+ SWx algorithms (3QFY11) – *active (on-going discussions)***
- ✓ Loss of key personnel has a severe mission impact (3QFY10) - *NLAI*
- • Satellite processing transition from SWPC (4QFY09) – *DOA/NLAI*
- ✓ Continuity of solar data services (1QFY09) – *NLAI*
- ✓ *Refocus of NWS/SWPC Objectives (2QFY08) – NLAI*
- • **NightSat Mission Concept (1QFY08) – *active (proposal under review)***
- ✓ *NGS Aerial Photography (1QFY08) – NLAI*

<u>Metrics (FY12 - YTD)</u>

Papers Published: 10

Presentations: 30

Bulletins: 3



QUESTIONS?