Status of the GOES-R Space Weather Sensors and Products

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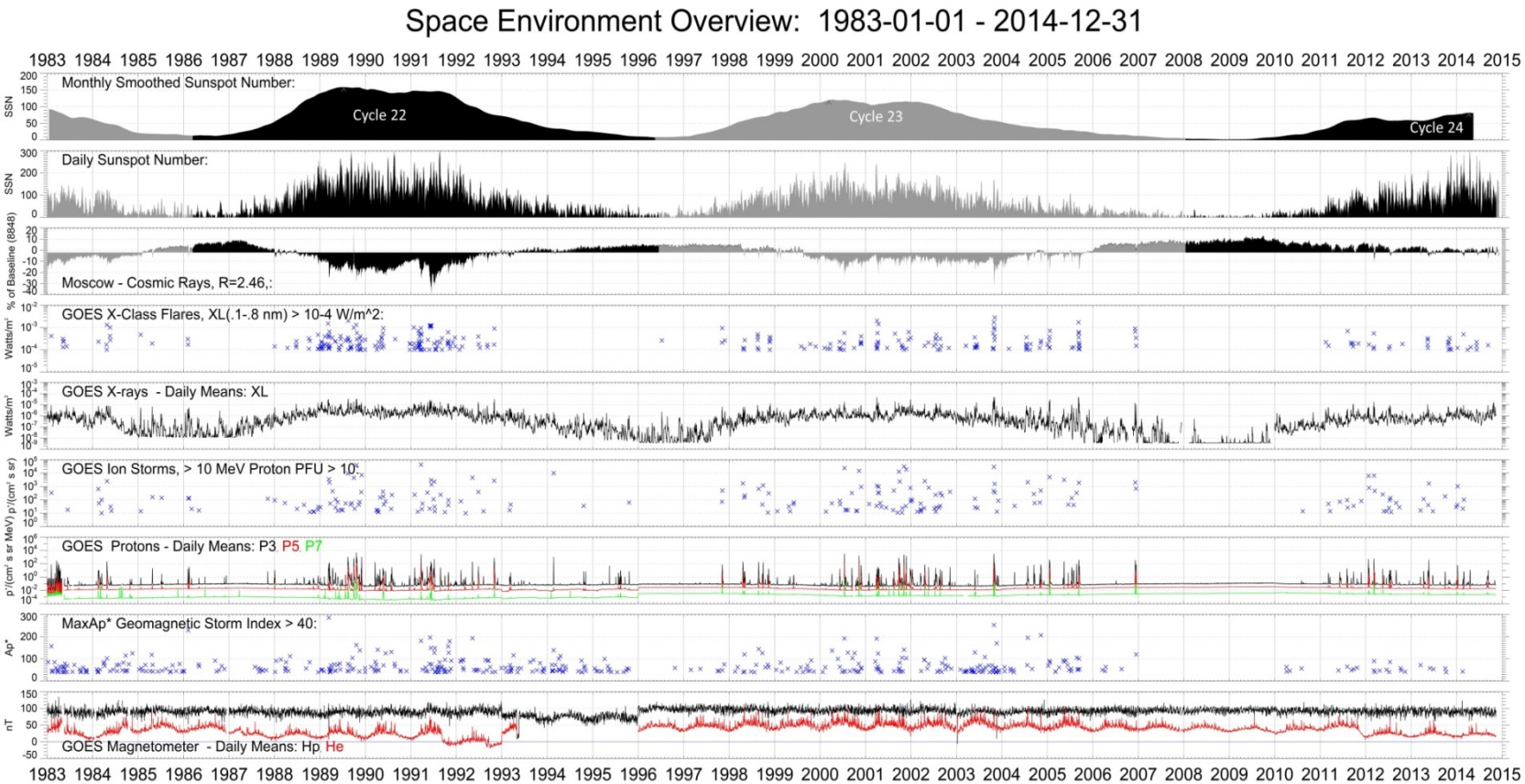
AMS Annual Meeting 2016

Paper 4.1

GOES-R – Continuing a 40+ Year History



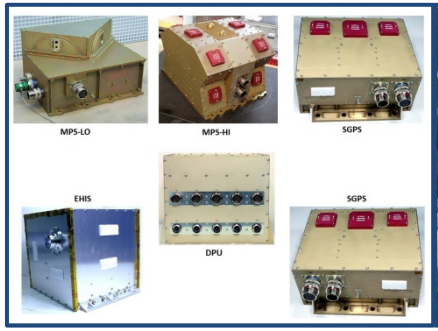
	Start Date	Max Date	End Date	C-Class Flares	M-Class Flares	X-Class Flares	Ion Storms	Mag Storms Ap* > 40
Solar Cycle 22	1986-03	1989-07	1996-06	12,447	2,021	151	73	191
Solar Cycle 23	1996-06	2000-03	2008-01	13,102	1,437	126	92	158
Solar Cycle 24 *	2008-01	2014-04	TBD	5,288	488	35	32	25

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

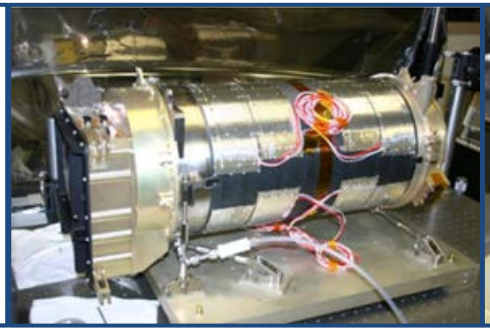
GOES-R Space Weather

GOES-R includes of a complement of in-situ particle/field and solar-viewing sensors providing a synoptic assessment of space weather.

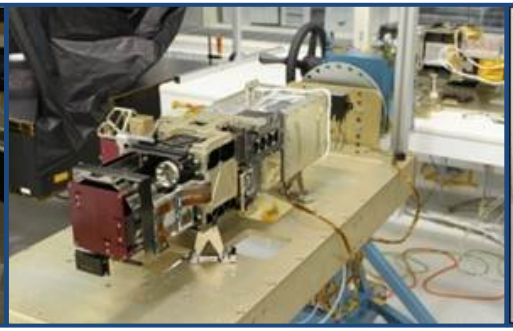
SENSOR	IMPROVEMENT	APPLICATION
Space Environmental In-Situ Suite (SEISS)	Improved energy range / contamination rejection	Spacecraft charge models for electrostatic discharge
Solar Ultra-Violet Imager (SUVI)	Multi-wavelength solar imagery	Surface features and thermal height profiles
EUV and X-ray Irradiance Sensors (EXIS)	Improved accuracy and dynamic range	Improved HF comm and climate model inputs
Magnetometer (MAG)	Gradiometer rejection of satellite generated fields	Geomagnetic field data with improved fidelity



SEISS



SUVI



EXIS

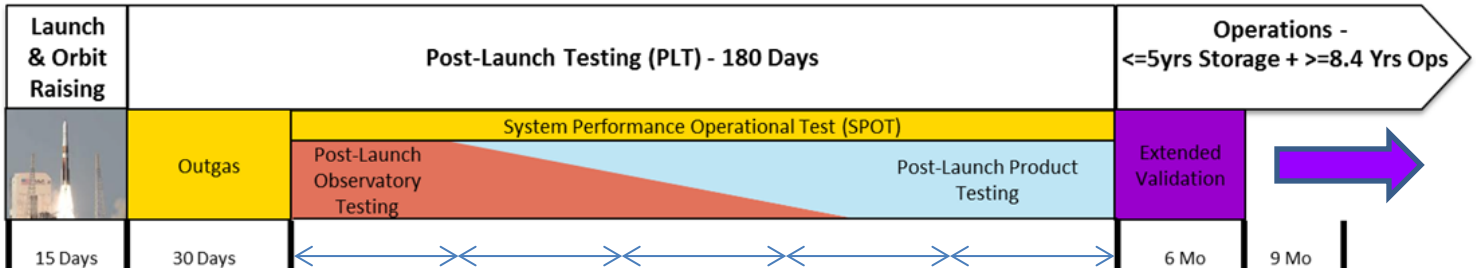
MAG

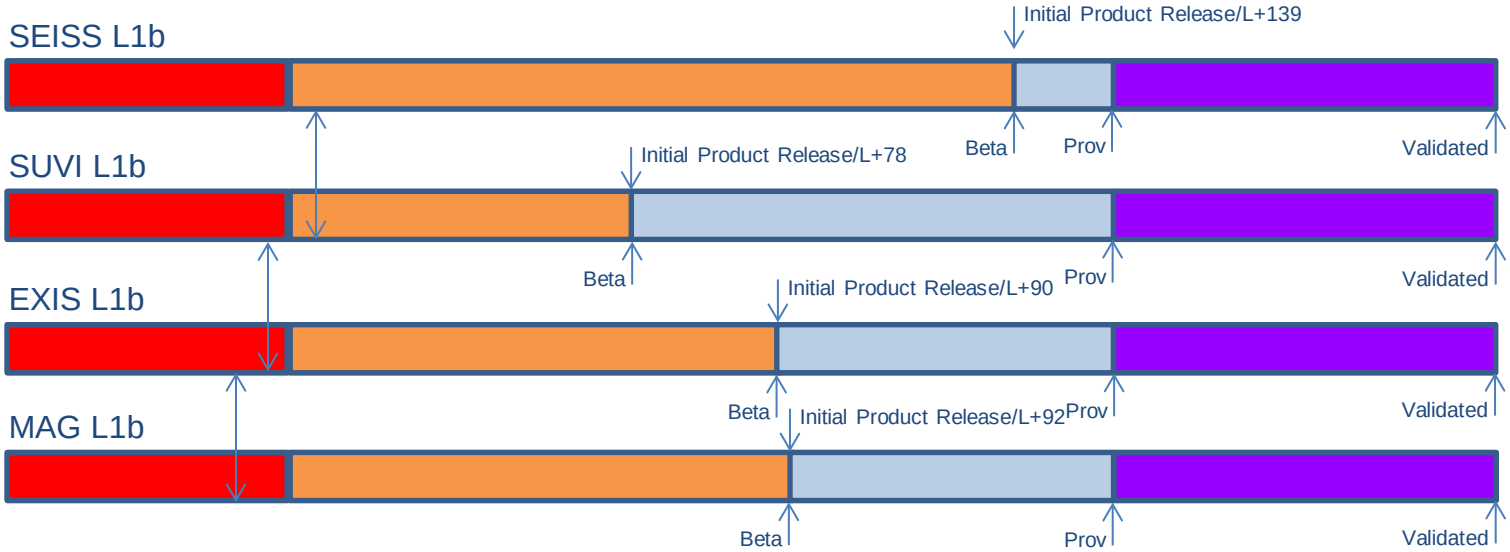
L1b Space Weather Products

Product Name	Sensor Resolution (sec)	PDA – Product Periodicity (sec)	PDA – Product Latency (sec)	GRB/IDB Periodicity (sec)	GRB - Product Latency (sec)
MAG-L1b-GEOF	.1	60	81.8	15	5.8 [*TBD*]
EXIS-L1b-SFXR	1	30	51.8	3	5.8 [*TBD*]
EXIS-L1b-SFEU	1 (max)	30	44	30	28
SEIS-L1b-MPSL	1	30	71	30	55
SEIS-L1b-MPSH	1	30	71	30	55
SEIS-L1b-SGPS	1	60	71	30	55
SEIS-L1b-EHIS	300	300	287	300	271
SUVI-L1b-Fe093	40	240	70	240	54
SUVI-L1b-Fe131	80	240	70	240	54
SUVI-L1b-Fe171	120	240	70	240	54
SUVI-L1b-Fe195	34.3	240	70	240	54
SUVI-L1b-Fe284	120	240	70	240	54
SUVI-L1b-He303	120	240	70	240	54

L1b – Calibration/Validation

Nominal L1b Product Validation Schedule





Post-Launch Product Tests

Details regarding the post-launch tests for the GOES-R space weather sensors and L1b products are included in the Readiness, Implementation and Management Plans (RIMPs)[1].

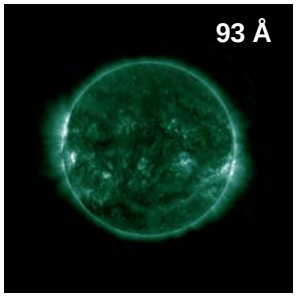
Boulder Space Weather Team

Sensor	Instrument Scientist	Advisory Support
SEISS	Brian Kress	Juan Rodriguez
EXIS	Janet Machol	Rodney Viereck
SUVI	Jon Darnel	Dan Seaton
MAG	Paul Loto'aniu	Rob Redmon
Data Manager	Meg Tilton	
Systems Engineer	William Rowland	

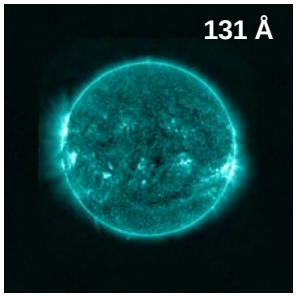
[1]Prepared by The Aerospace Corporation - RIMP responsibility now transferred to the cognizant instrument scientist.

SUVI Intercalibration

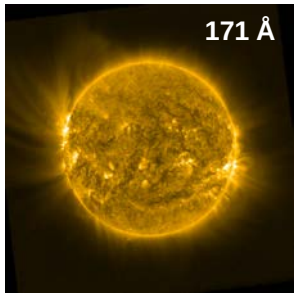
SUVI will be inter-compared to SDO/AIA (imager), and SDO/EVE, GOES-R EXIS, GOES 13-15 EUVS (spectral).



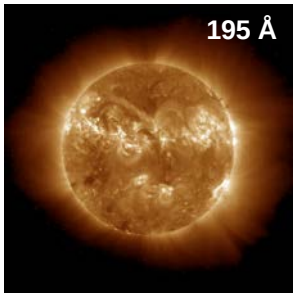
Flaring Regions (Fe XVIII)



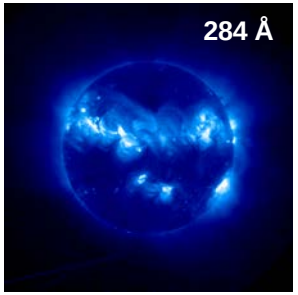
Flaring Regions (Fe VIII / XX / XXIII)



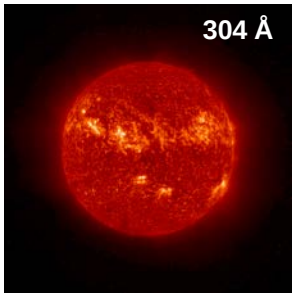
Transition Region (Fe IX)



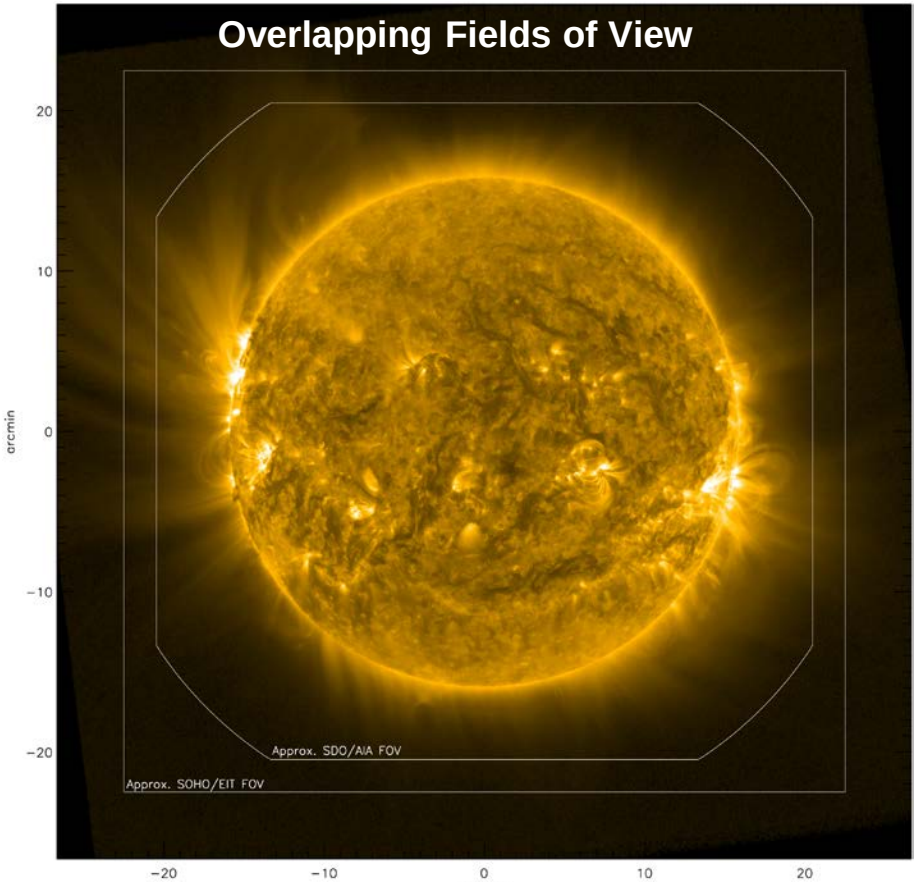
Corona (Fe XII / XXIV)



Flaring Regions (Fe XV)

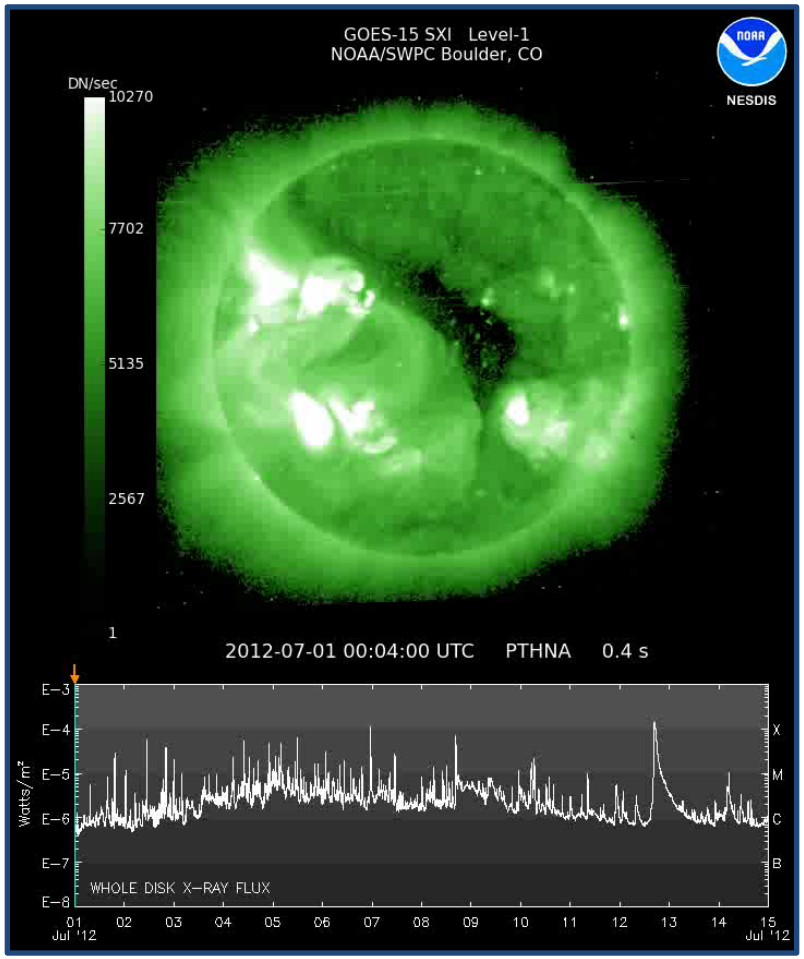


Chromosphere (He II)



Simulated SUVI image at 171 Angstroms (Fe IX)
Transition Region (chromosphere-corona)

EXIS Intercalibration

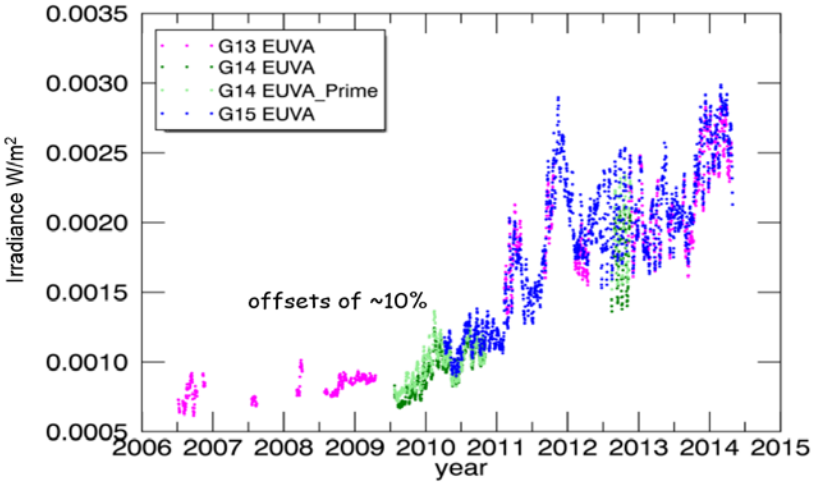


EXIS consists of 2 irradiance sensors

XRS – Heritage measurements of x-ray flux
EUVS – Measurements of EUV irradiance

Example: *Intercalibrating XRS with GOES SXI* *(Flare classification and location)*

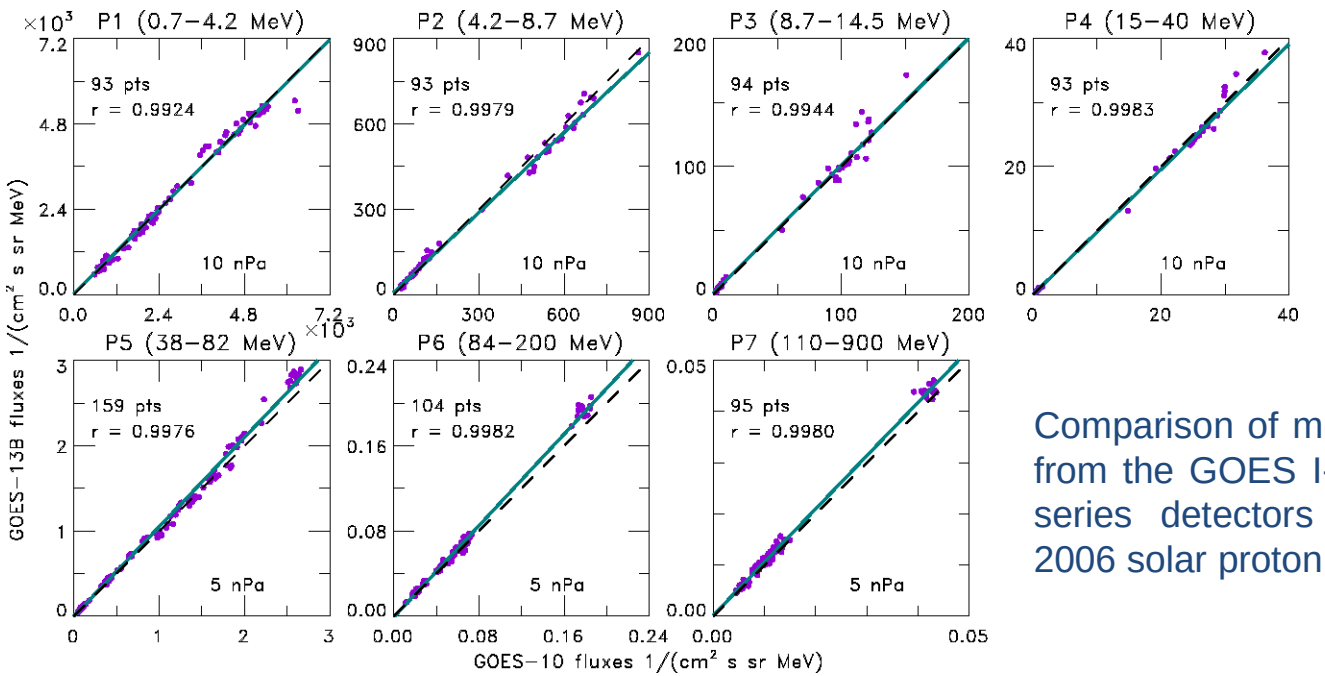
Example: *Intercalibrating EXIS/EUVS with GOES-NOP*



Intercalibration and Degradation Workshop Belgium Solar-Terrestrial Center of Excellence (10-13 June 2014).

SEISS Intercalibration

Example: ***Intercalibrating GOES particle sensors (GOES I-M and GOES NOP)***

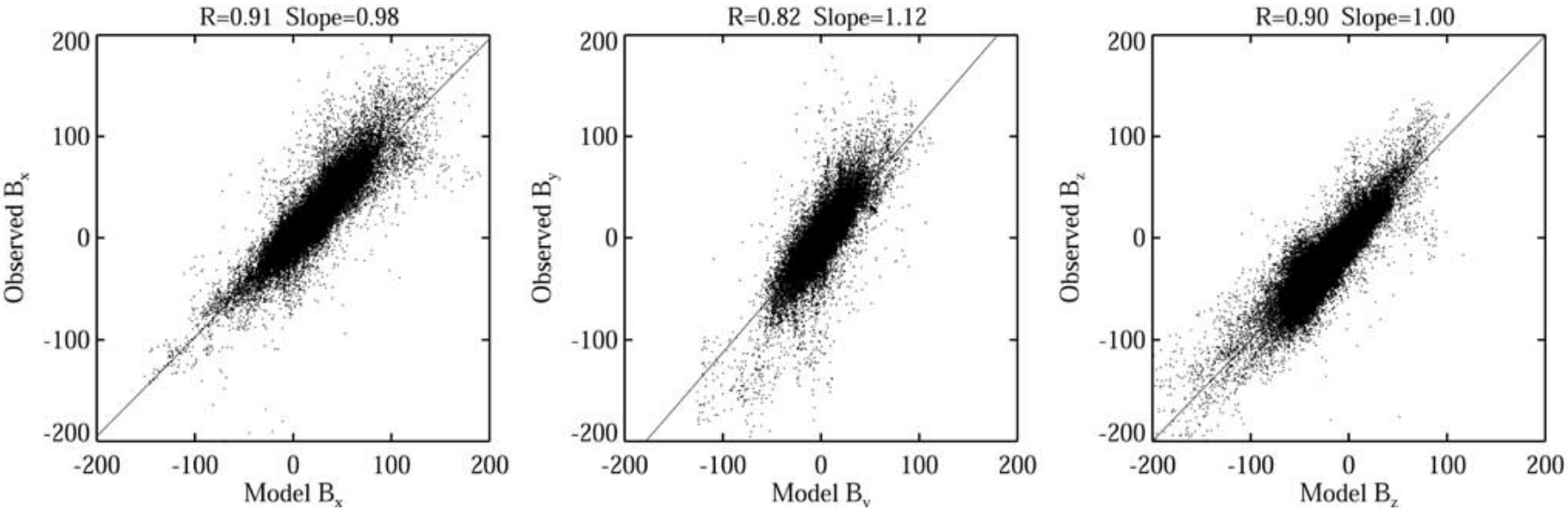


Comparison of measurements from the GOES I-M and NOP series detectors during Dec 2006 solar proton events.

Reference - Rodriguez, J. V., J. C. Krosschell, and J. C. Green (2014), Intercalibration of GOES 8–15 solar proton detectors, *Space Weather, 12*, 92–109, doi:10.1002/2013SW000996.

MAG Intercalibration

Example: ***Intercalibrating GOES MAG data with geomagnetic models***

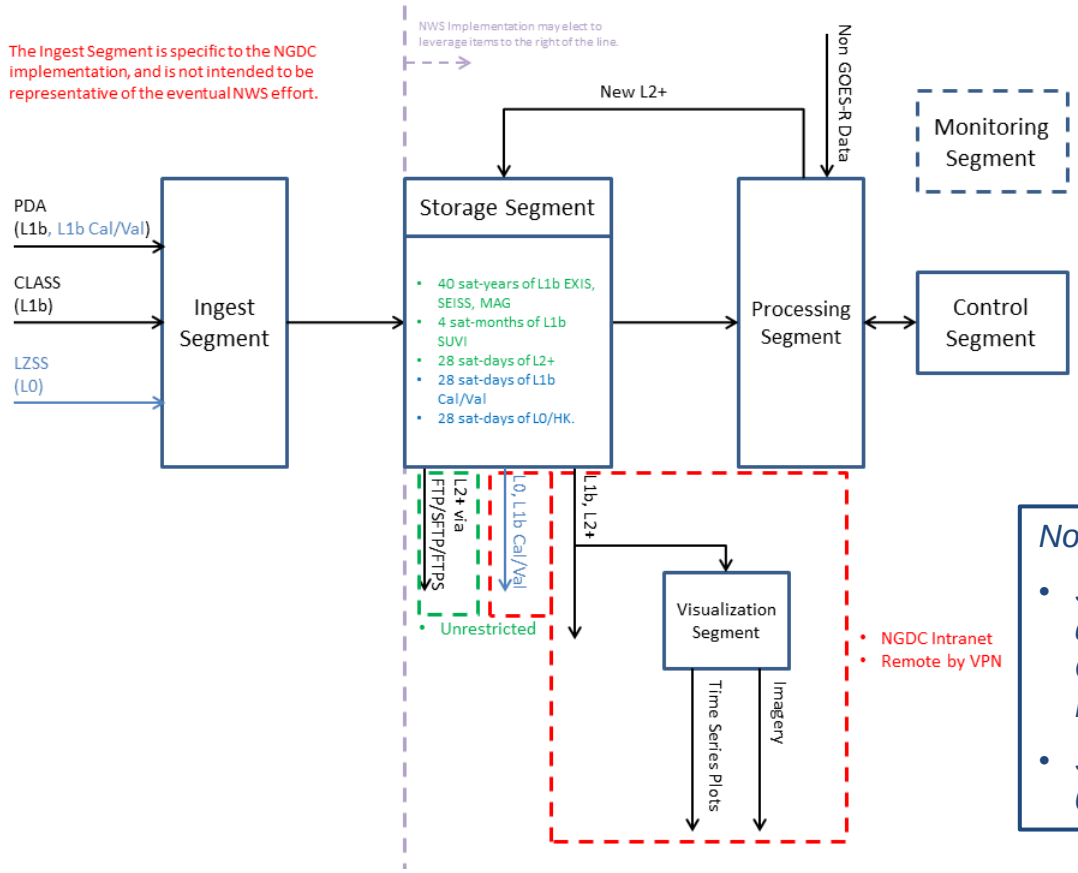


Scatter plots of the observed values of the external magnetic field components against those returned by the model.

Reference: Tsyganenko, N. A., H. J. Singer, and J. C. Kasper, Storm-time distortion of the inner magnetosphere: How severe can it get?, J. Geophys. Res., 108(A5), 1209, doi:10.1029/2002JA009808, 2003.

GOES-R Data Access

Satellite Product Analysis and Distribution Enterprise System (SPADES)



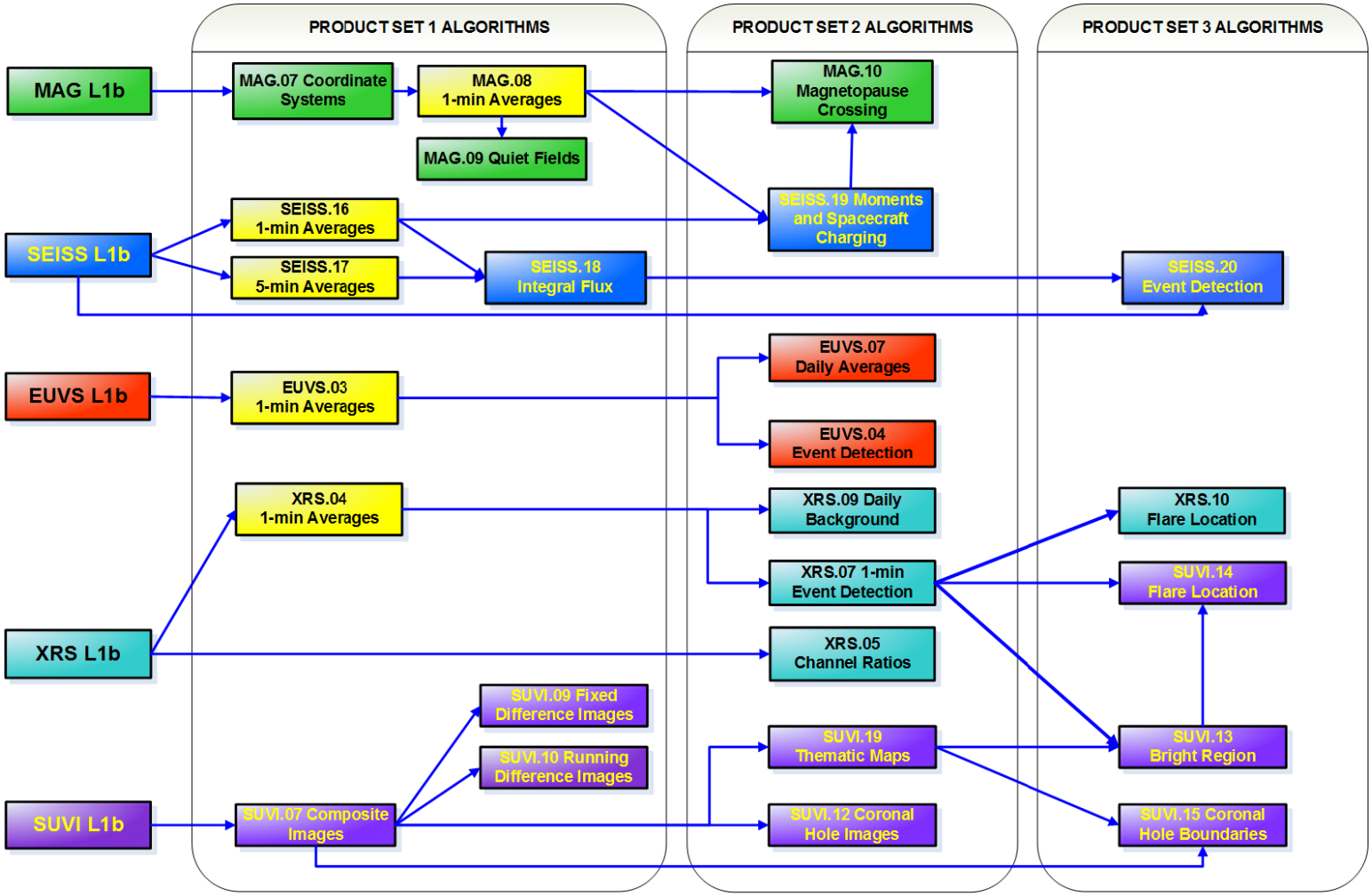
Satellite Product Analysis & Distribution Enterprise System (SPADES)

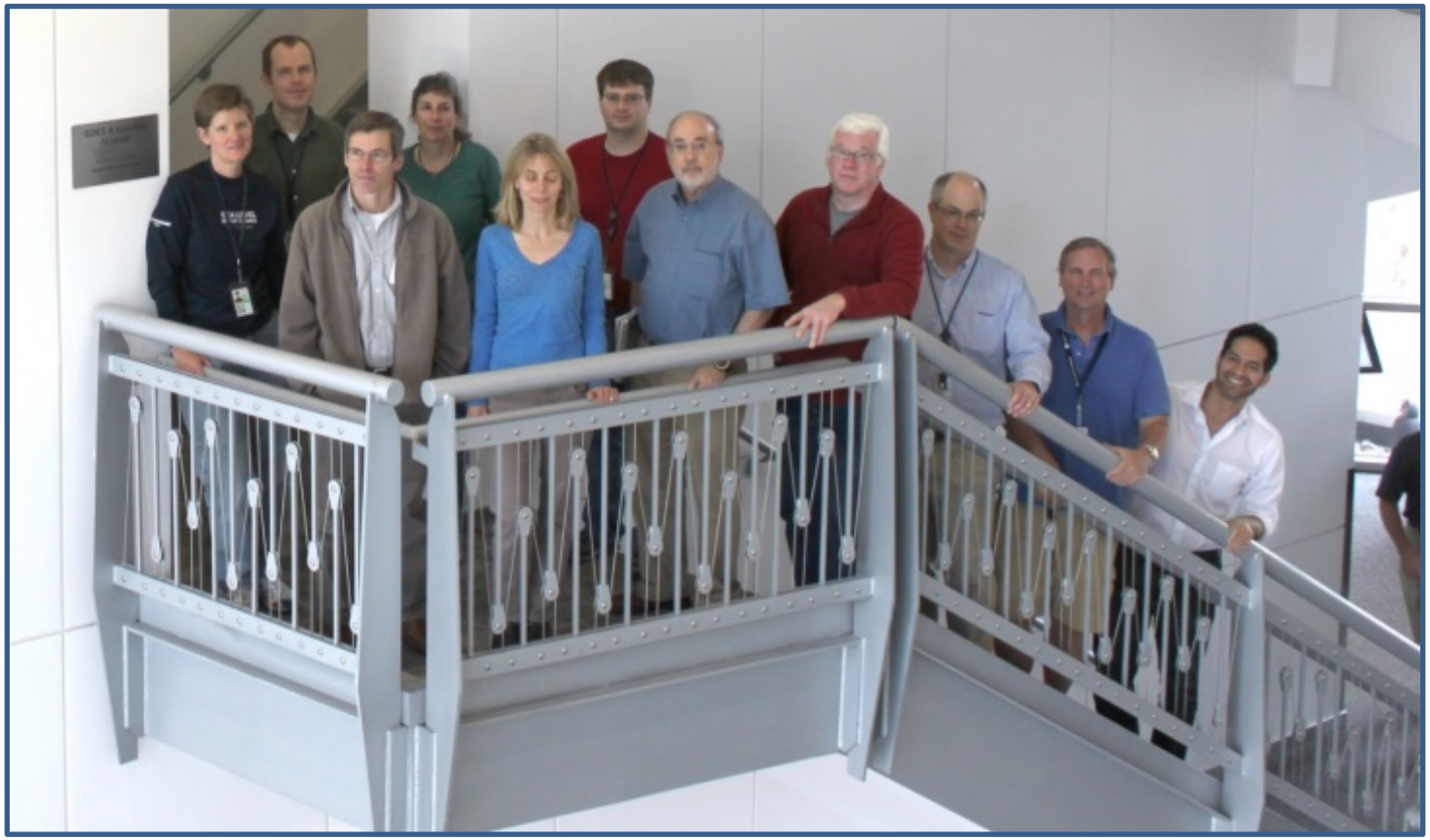
NOAA Space Weather

Notes:

- *SPADES functionality demonstrated during GOES-R Data Operation Experiment #2 (DOEs).*
- *SPADES IOCR occurred on 03 Dec 2015.*

L2 Space Weather Products



Summary

The Boulder Space Weather Team is responsible for the GOES-R space weather post-launch cal/val program.