DoD Space Weather Activities
Partnerships and Program Update

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Overview

- The Challenge
- DoD Space Wx Services
- Space Weather Data Collection & Forecasting
- Way Ahead

- AFW-WEBS Demo
The Challenge for All of Us

- Space Weather is a “Total Team Sport”… From Research to Ops
- Expand collection capabilities:
  - Ground-Based: Optical, Radio, Magnetic, and Ionospheric
  - Space-Based: Ionospheric, Magnetosphere, Solar Wind, & Radiation Belt
- Solve the tough forecasting problems:
  - Physics-based model improvements
  - Move from now-casts to “true” forecasts … easier said than done!
- Deliver Ops Focused Exploitation Tools:
  - An operational imperative to rapidly respond to the “Solar Threat” of the day
  - Must be easily understood and operationally relevant
  - An absolute must if we are to move science into operations and protect our Nation’s valued assets and technologies

Team, Sense, Forecast, and Exploit…the Way Forward
DoD Space Weather Services
40+ Years Providing Support for Warfighters

Environmental Inputs (DoD, Civil, International)

Data Received/Models Run

Teamwork

AFWA's 2nd Weather Squadron Space Weather Flight (DoD's Space WX Providers)

All Levels of Support

Key Partnerships

Community Coordinated Modeling Center

Air Force Research Laboratory

Naval Research Laboratory

Space Weather Prediction Center

Department of Defense Users

I n t e g r i t y  -  S e r v i c e  -  E x c e l l e n c e
Exploit Current Capabilities
- DMSP, GOES, POES, SOHO, ACE
- STEREO, SDO, COSMIC & C/NOFS
- Non-traditional sources

Future
- DSCOVR (ACE Follow-on)
- COSMIC-II
- AMPERE
- Radiation Belt Storm Probe
- Non-traditional sources

Advocacy and Partnering
- Need partnerships to collect from the space domain!
- CSES MO … proposed national space-based sensing architecture
AF and other agencies collect space weather data from ground-based sensors

- Sensors include SOON, RSTN, DISS, NEXION, SCINDA
- Data from many government & non-government sources, USGS Magnetometer, TEC (JPL), GONG, NGDC and others … Data partnerships are crucial
Investing in a Global Observing Network

Improved Solar Optical Observing Network
- Upgrades/remoting finished by 2017

Global Oscillation Network Group
Radio Solar Telescope Network
- Remoting finished by 2015

Logging cities:
- BIG BEAR
- KAENA POINT
- MAUNA LOA
- SAGAMORE HILL
- KIRTLAND
- CERRO TOLOLO
- SAN VITO
- UDAIPUR
- LEARMOUTH

Symbols:
- ISOON / RADIO
- ISOON ONLY
- RSTN (RADIO) ONLY
- RESEARCH ISOON
- GONG
Next Generation Ionosonde
NEXION

- Replacement for Digital Ionospheric Sounding System (DISS)
  - Ionospheric data feeds AFWA's ionospheric model
  - Generates products critical to space situational awareness

- Advantages
  - Reduced footprint -- 5 acres for DISS/1 acre for NEXION
  - Characterizes ionosphere over 1000 km radius
  - Improved spatial resolution
  - Modernized network and remote sustainment functions

- NEXION network will consist of at least 30 sites
  - New acquisition contract in place; install 3 sites per year: worldwide fielding

Partners: UMass - Lowell, SMC

Users
Space Weather Analysis and Forecast System (SWAFS)

2011

- Upgraded GAIM
  - 4-wave ionospheric signature
  - F-17 SSUSI data
  - Assimilated additional NEXION data

Jan 12

- SUN to HP Blade architecture & Linux refresh
- Radiation Belt Environment flux & fluence plots
- Assimilate COSMIC RO TEC data into GAIM

FY12 (Planned)

- Proton warning/monitoring system
- Net-centric data display and dissemination
- Assimilation of F-18 SSULI/SSUSI data into GAIM
- Visualize GONG/SOON imagery w/ 30 day archive
- Integrate D-Region Absorption Prediction upgrade
- Full Physics-GAIM development

Partners: AFSPC / SMC / SWPC / AFRL / NRL / JHU-APL / Utah St & academia / CCMC / NGC / Aerospace
Space Weather
Analysis and Forecasting

AFW provides space environmental data, analyses, forecasts, model output, and critical strategic-level products to the warfighter!

- Global Assimilation of Ionospheric Measurements (GAIM) Model
  - Provides 24-hour forecast of ionospheric conditions
  - Follow-on “full physics” upgrade planned for FY14
  - Output used for HF communication and geolocation error analysis

Estimated GPS Error Maps
Ionospheric Impacts
HF Illumination Maps
Space weather products in a GIS/Google Earth format
Space Weather Mission Support
Way Ahead

- Must team for solar max ... and beyond
  - Plans in place to improve collection, forecasting, & exploitation
  - OFCM, NOAA, NASA, DoD, and other National Partners working together
    ... e.g. National Space Wx Program Council Integrated Action Plan
  - Collaborate with U.S. & Allied government/civilian agencies to increase
    sensing capability & reduce costs... NASA, NOAA, NSF, USGS, LANL, and others

- Invest in collection...
  - Modernize ground- and space-based sensing capabilities

- Support national space wx forecasting needs
  - Physics-based, “true” forecasting

- Ensure exploitation of space wx expertise for situational awareness in the future
  - Tailor products to specific missions and operational needs
  - Develop expertise/knowledge among operators and space weather professionals through training

Team, Sense, Forecast, and Exploit...the Way Forward

Integrity - Service - Excellence
AF Partnership with CCMC

- Teaming is essential
- Joint advocacy for new sensor capabilities
- Model transition from research to ops
- Collaborative research/V&V
- New visualization and training tools
Working with National Partners
to support National Space Wx needs

I n t e g r i t y  -  S e r v i c e  -  E x c e l l e n c e

Questions?

Rising Sun Over Pyramid (painting) – Paul Greco, 2009