

Space Weather Analysis and Forecast System (SWAFS)

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Space Weather Analysis and Forecast System (SWAFS)

- SWAFS is a software suite that exploits space environmental data to characterize and forecast impacts to operations, communication, and systems for defense and intelligence agencies, as well as, provides data and output compatible in a net-centric environment
- SWAFS v2.0 transitioned the program to Govcloud platform and tailored directly for operations
 - Ops-Accepted on all 3 security enclaves (UNCLAS - NIPRnet, SECRET - SIPRnet, TS//SCI - AFSCI/JWICS)
- The SWAFS system is called the Space Domain Awareness Environmental Toolkit for Defense (SET4D)
- United States Space Force, Space Systems Command (SSC/SYD 810/ETS) acquires the SWAFS 2.0 capability
- Prime contractor is Peraton Technology Services
- Agile software DevSecOps development and sustainment, and responds quickly to changing warfighter needs, priorities, and emerging threats

Use Cases

Attribution

Utilizing observations, models, and algorithms to characterize space environment hazards to assess the likely causes of an anomalous event at a specific point in time and place in space

Monitoring

Utilizing continuous/real-time observation and tracking of the space environment to inform the current operational picture

Forecasting

Utilizing algorithms, empirical or physics-based models to provide prediction of the future environment and events that inform the operational decision



SET4D Paradigm Shift from Legacy SWAFS

- SET4D focuses on space weather impacts to systems/services vs. environmental data only
- SET4D is direct to operators and interactive vs. static web pull
- SET4D tailors to specific operational systems, locations, frequencies, and geometry vs. generic global characterizations
- SET4D provides awareness and assessments on-demand vs. on a schedule
- SET4D provides data-driven impacts vs. model-driven environmental characterizations
- SET4D uses a comprehensive data/attribution archive vs. data stored for only 30 days
- SET4D impact products primarily available on SIPRnet/AFSCI-JWICS vs. legacy products which was mostly on NIPRnet with some SIPRnet (but had no TS//SCI processing)
- SET4D forecasts can be probabilistic vs. all deterministic with unknown or large errors
- SET4D delivers capabilities faster using agile Software Acquisition Pathway development vs. waterfall software development

SWAFS Program Approach



- How is the SWAFS Program addressing user needs?
- How is the SWAFS Program prioritizing those needs?
- How is the SWAFS Program collaborating with other groups?
- Where are the gaps or additional needs/coordination that should be supported?



SWAFS Program Future Capabilities List for SET4D

- **Ionospheric Models**
 - Integration of ionospheric data assimilative ionospheric model, including arctic models
 - Integration of scintillation specification and nowcast model
 - Integration of high frequency (HF) ray-tracing applications to support HF comm applications
- **Magnetospheric Models**
 - Integration of ECP data processing pipelines
 - Integration of magnetospheric plasma specification and forecast models
 - Integration of high energy electron specification and nowcast model
- **Forecasting**
 - 7-day tailored, probabilistic warnings for satellites operations & electro-magnetic spectrum ops
 - Improved Solar Energetic Particle (SEP) forecast
 - Integration of Solar Indices Forecast Tool (SIFT)
 - Integration of scintillation forecast model
 - Integration of solar event forecast models
- **Tailored Impact Warnings**
 - Tailored impact warnings for satellites operations & electro-magnetic spectrum operations
 - Tailored impact warnings for radiation exposure for pilots and aircrew
- **Dashboards and Visualization**
 - Users customize-able thresholds for attributions and warnings
 - Improved South Atlantic Anomaly (SAA) maps
 - Additional space weather situational awareness dashboards for solar wind, ionospheric model visualizations, and equatorial scintillation impacts
 - Constellation satellite hazard dashboard for low earth orbit (LEO)
- **Data Ingestion & Exploitation**
 - Ingest, display, and exploitation of NOAA's SOLAR-1 in situ solar wind observations
 - Ingest and display of WSF-M ECP observations
 - Ingest and exploitation of ionospheric electron density observations
 - Ingest and exploitation of equatorial scintillation observations
 - Ingest and display of imagery from next-gen Global Oscillation Network Group (ng-GONG)



How to contact the SWAFS Program?

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