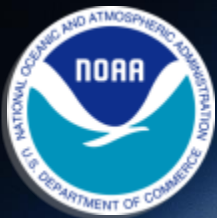


NOAA Progress on SWAP Activities



Bill Lapenta

National Weather Service's National Centers for
Environmental Prediction

Space Weather Workshop
Westminster, CO
17 April 2018

DOC/DOD will enable and sustain acquisition and delivery of satellite-based Global Navigation Satellite System radio occultation (Action 5.3.7)

DOC will also ensure that such data are assimilated into operational models of Earth's thermosphere and ionosphere (Action 5.3.7)

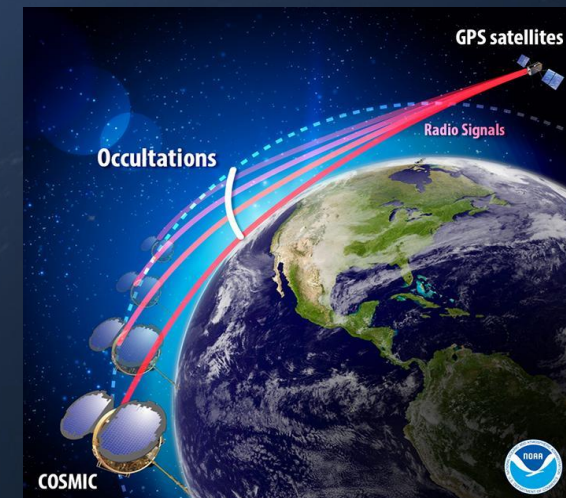


COSMIC-2A - six satellites into low-inclination orbits – launch in 2018

NOAA Commercial Weather Data Pilot - NOAA exploring demonstration projects to validate the viability of commercial environmental data for NOAA's models

- NOAA selected GNSS radio occultation
- NOAA will evaluate commercial data to demonstrate quality and impact to models
- NOAA anticipates releasing an RFP third quarter of FY 2018

(Updates from Spire Global, GeoOptics and PlanetIQ tomorrow)



RO data will be key input to WAM + IPE

Model Development in the Thermosphere-Ionosphere

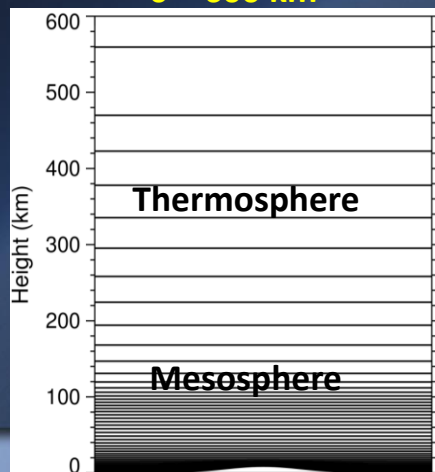
Whole Atmosphere Model (WAM = Extended GFS)
+ Ionosphere Plasmasphere Electrodynamics (IPE)

Inputs:

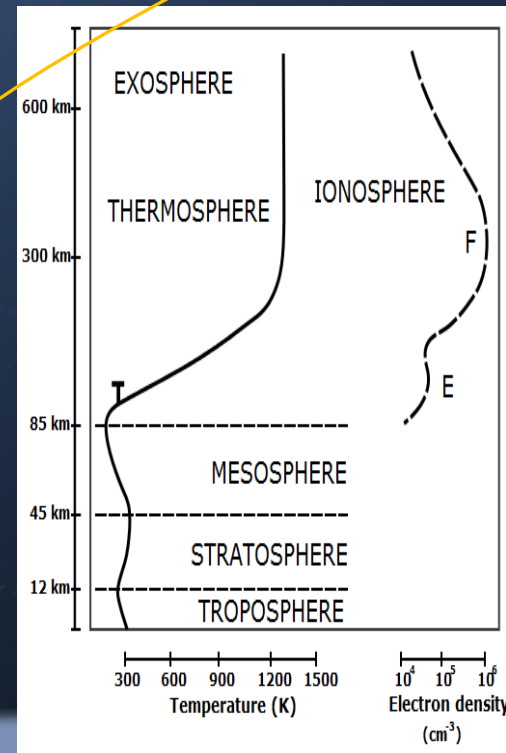
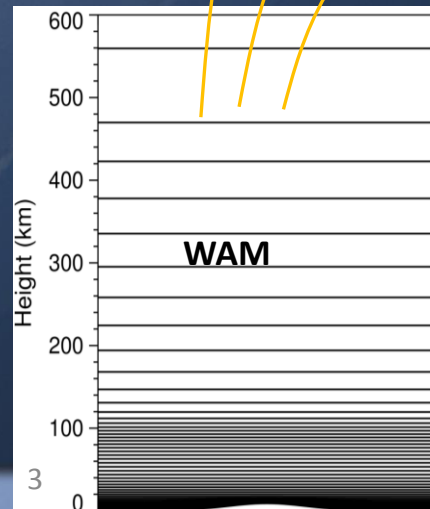
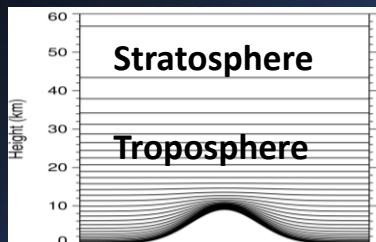
1. GFS Tropospheric weather model inputs
2. GOES Solar Extreme Ultraviolet flux
3. COSMIC-2 RO electron density
4. Geomagnetic storm data from Geospace Model

Ionosphere Model

WAM Neutral Atmosphere 0 – 600 km



GFS 0 – 60 km



NOAA Space Weather Forward Observatory



Complete an analysis of alternatives to achieve operational status in time to ensure continuity of coronagraph and solar wind data

Action 5.3.2

- Complete the Compact CORonagraph (CCOR) with Naval Research Laboratory (NRL) as NOAA partner project.
- Host CCOR on the GOES-U spacecraft planned for launch in early 2024
- Establish NOAA/NASA partnership for rideshare to L1 with NASA's Interstellar Mapping and Acceleration Probe (IMAP) launch late 2024; NOAA spacecraft will have SWIS, CCOR and instruments of opportunity
- NOAA Satellite Observing System Architecture (NSOSA) calls for sustained Space Weather in-situ and CME imaging capability

Operations to Research – Research to Operations

R2O - Key focus in both the National Strategy and EO 13744:

“The Secretaries of DOD and DOC, the Administrator of NASA, and the Director of NSF, shall identify mechanisms for sustaining and transitioning capabilities from research to operations and operations to research, collaborating with industry and academia to the extent possible”

- Administration’s goal is to strengthen the pipeline from the research to the operational capabilities
- SWAP and EO actions help put in place the mechanisms and structure for the research and operational agencies to work together to support a common goal, improving space weather predictive capabilities
- NOAA’s focus is to introduce new products and/or improve existing products that are needed now

Positive developments on R2O2R!

Office of Management and Budget FY18

I. PRIORITIES FOR FEDERAL RESEARCH AND DEVELOPMENT

Improving Preparedness for and Response to Natural Disasters

“The Budget also continues to support space weather-related R&D, since space weather can affect not just the nation’s satellites and space explorers, but can potentially cause significant damage to our electrical grid and electronic systems”

Fy18 omnibus bill –

Specifies \$10 million for establishing a space weather research program –
“NASA should coordinate with NOAA and the Department of Defense to ensure that NASA is focused on research and technology that enables other agencies to dramatically improve their operational space weather assets and the forecasts”



Agency response:

2017 Operations-to-Research opportunity

- Announcement of opportunity released January, 2018 (award by early fall)
- Focus on solar wind structures and coronal mass ejections

2018 Operations-to-Research opportunity

- NASA, NOAA, NSF working to define topics now, expect an announcement by late Spring/early summer

NASA-NOAA R2O MOU Signed (Action 5.6.1); NASA-NSF MOU in Draft

- Defines joint modeling activities to streamline the transfer of research models to operational use

NOAA driving the priorities for future O2R research based on user needs and product-improvement priorities.

Action 4.5.2: DOC, in coordination with DHS, will support research into the social and economic impacts of space-weather effects. Include costs of impacts on electric power distribution system, airlines, satellites, and Global Navigation Satellite System

- **Study released in Sep 2017**

<https://www.weather.gov/media/news/SpaceWeatherEconomicImpactsReportOct-2017.pdf>

5.1 Improve Understanding of User Needs for Space-Weather Forecasting to Establish Lead-Time and Accuracy Goals

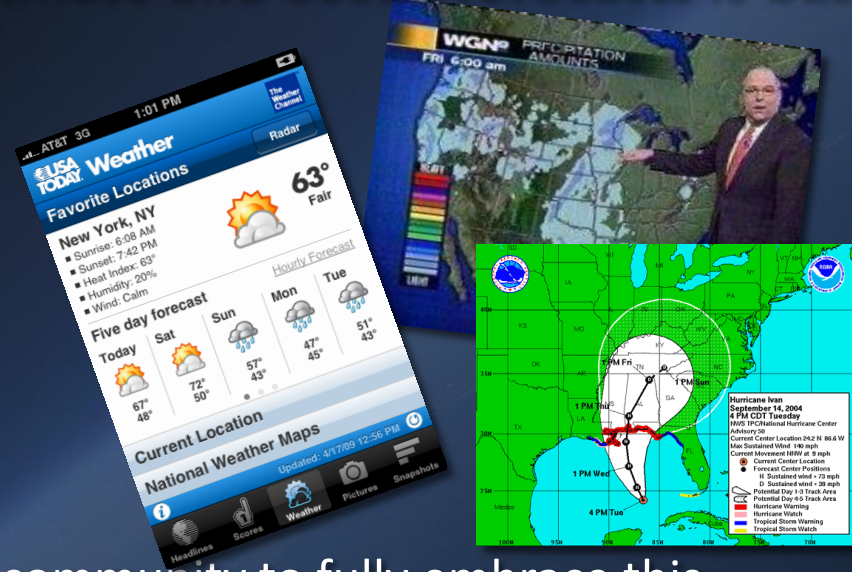
- Action 5.1.1: DOC will conduct a comprehensive survey of space-weather data and product requirements needed by user communities to help improve services

- **Abt Associates have contract – due date: Sep 2018**

But much still to be done...

Today's Forecast Modeling for Terrestrial Weather - Everything you read, see or hear about weather, climate and ocean forecasts is based on Numerical Weather Prediction

- ✓ Global Observing System
- ✓ Computers (supercomputers, work stations)
- ✓ Data Assimilation & Modeling/Science



It took 40 years for the terrestrial weather community to fully embrace this approach!

The **challenge** for space weather prediction is to replicate the success of the terrestrial weather community

SWORM must complete a strategy to public-private collaborations between the Federal Government, industry, and academia to enhance observing networks, conduct research, and develop models