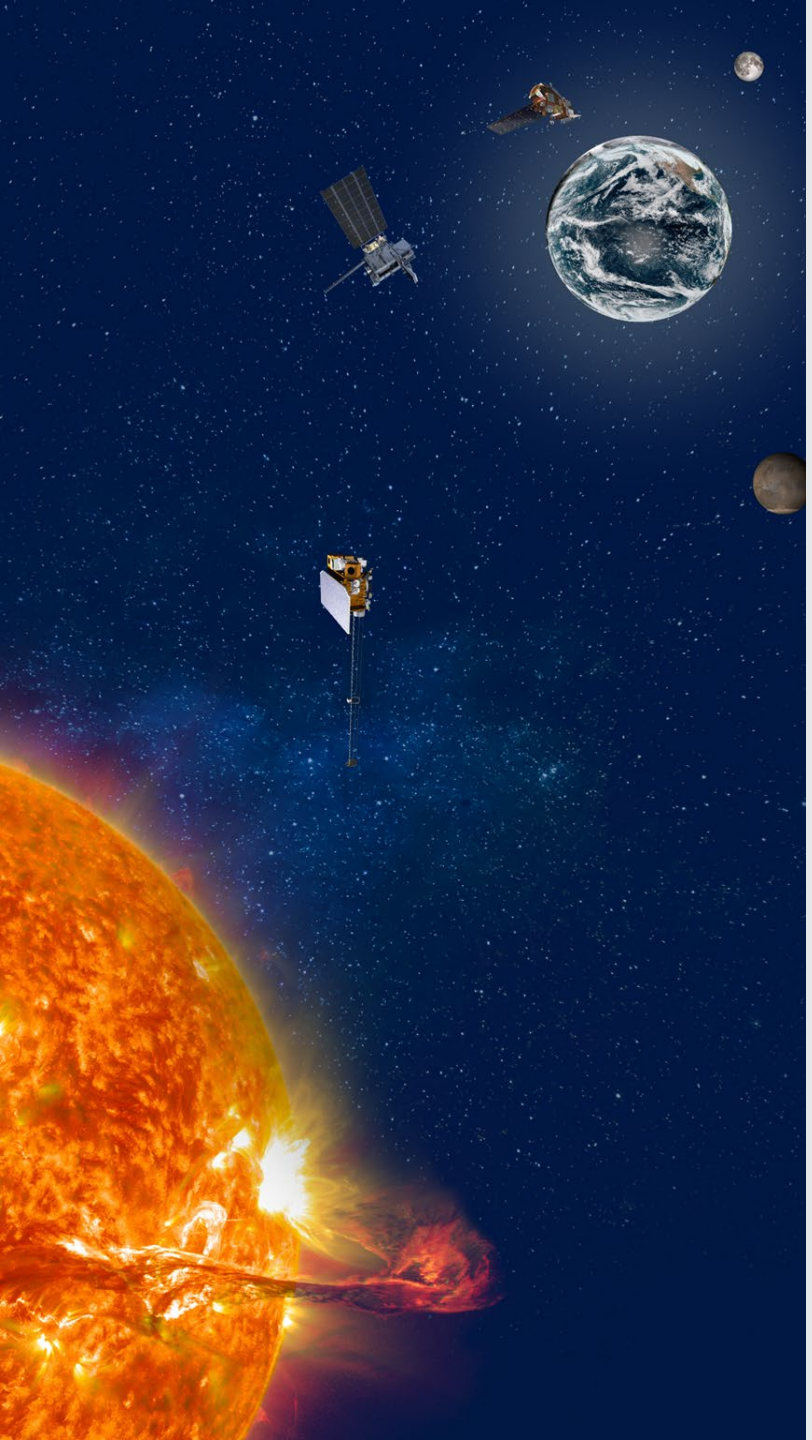


SWO Technology Investments: Joint Venture (JV) and Small Business Innovation Research (SBIR)

Irfan Azeem, Chief, Science and Engineering Division
Nai-Yu Wang, Scientist, Innovation and Incubation Projects

Advancing Space Weather Observations

- **NESDIS Strategic Objectives for Space Weather:** Advance Space Weather observational leadership from all applicable orbits consistent with the agency's responsibilities within the National Space Weather Strategy and Action Plan.
- SW Next program aims to provide continuity to critical observations and *augment space weather observational capabilities*.
- The **SWO FY22-25 Strategic Plan (Plan)** establishes strategic goals and objectives to guide the NESDIS' SWO activities over the next four years.
- One of the Goal Areas is Innovation

SWO FY22-25 Strategic Goals: Innovation

Goal: Identify, develop, and demonstrate innovative ideas for operational data collection systems and space-based architectures to inform planning, resources management, and investment decisions.

Objectives

1. Use research investigations to inform operational concepts for deployment of new observing systems.
2. Assess and acquire new capabilities to address unmet and emerging requirements.
3. Modernize space-based architectures with new cost-effective technologies.
4. Actively coordinate and collaborate on activities that leverage partners' resources and investments.

SWO is leveraging internal and external resources to address its Innovation objectives

NOAA/NESDIS Joint Venture Program

Advancing NOAA's observational and data system capabilities by leveraging investments and capabilities being developed by other federal partners & industry **to provide high return on funds**

- Joint Venture Activities
  - Exploit partner data (Data Exploitation)
  - Exploit partner technologies (Tech Exploitation)

What JV Is and What It Is Not

- **Joint Venture is:**
  - Demonstration and evaluation of unproven technology, new ways to incorporate technology, or data sources with potential high return for missions and operations
  - Technology development, that if proven, is expected to be ready for use in future missions or operations, but is not a critical path
  - Pathway to leverage SBIR awards to supports small businesses with the goal of increasing vendor base and competition within industry and potential outside investment
  - “Buying down risk” to encourage funding for others to fund development
- **Joint Venture is NOT:**
  - Purely tech. maturation

TRITON: Tiny Remote Sensing Instrument for Oxygen and Nitrogen

Objective

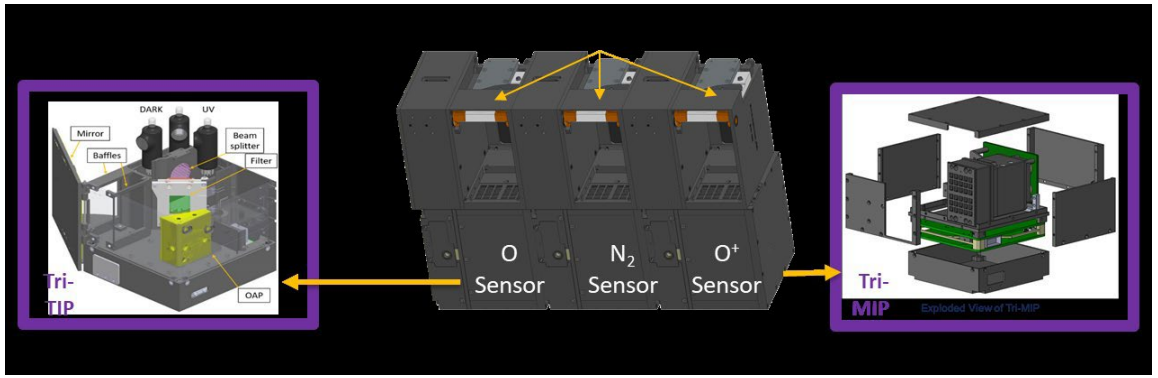
Develop low size, weight, and power remote sensing instrument to characterize daytime thermospheric density; demonstrate **TRL 4** status of TRITON

Approach

NRL, funded by JV, is leveraging heritage FUV & MUV photometers to develop a new generation of CubeSat form factor instrument for thermospheric remote sensing.

6U CubeSat class TRITON core consists of 3 sensor/mirror pairs:

- 1 x O sensor + 1 x scan mirror
- 1 x N2 sensor + 1 x scan mirror
- 1 x O+ sensor + 1 x scan mirror

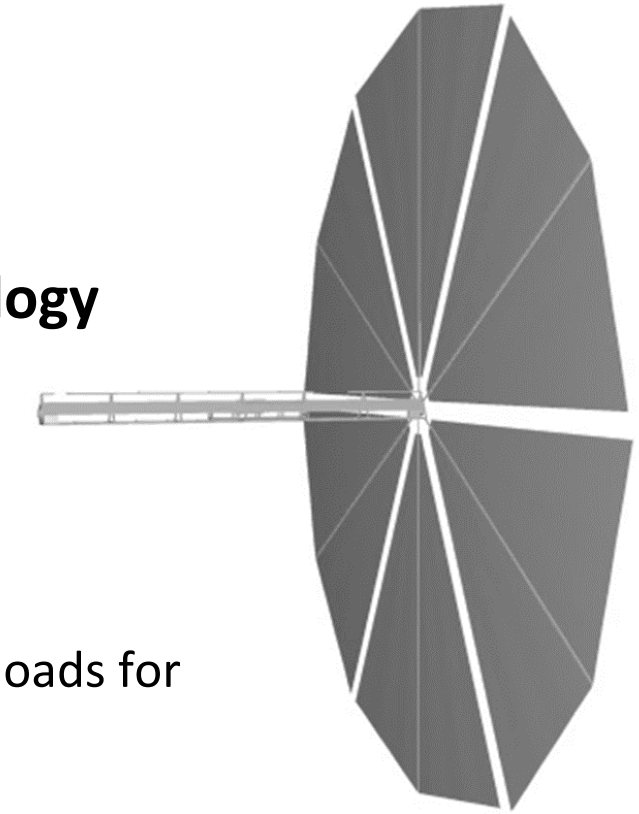


Naval Research Laboratory

This JV development effort increases the technology readiness level of TRITON from TRL 2 to TRL 4

Solar Sail Technology Optimization for Space Weather Observations

- **NESDIS is supporting several efforts related to solar sail technology**
  - Evaluating cost and design to acquire sail/sensor interaction data from a future solar sail flight demo
  - Building a solar sail membrane for a future solar sail satellite mission
  - Examining sail-embedded antennas and developing compact science payloads for solar sail missions



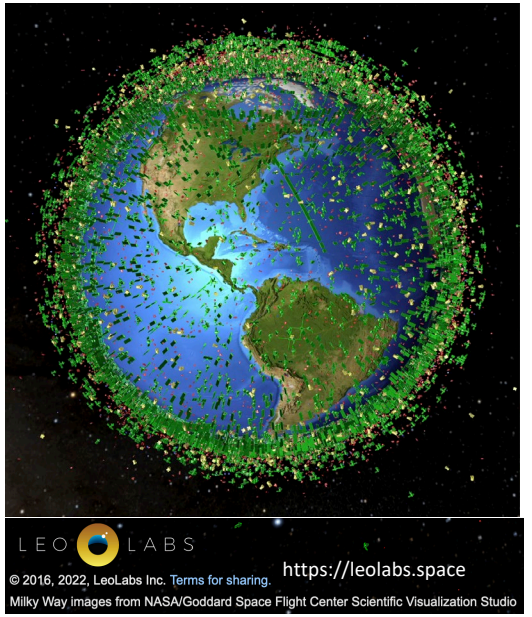
NeXolve and NASA Marshall Space Flight Center

Improving Thermospheric Density Forecast Capabilities through Utilization of SpaceX/Starlink Satellite Data

Objective: To produce a thermosphere neutral density database using tracking data from Starlink satellites and demonstrate the feasibility of this database in driving a data assimilation system with the WAM-IPE

- Derive neutral densities on-station Starlink data at ~550 km
- Determine the optimum number of satellites needed for real-time operations
- Implement a data-assimilative (DA) system to ingest orbit-averaged densities into Whole Atmosphere Model - Ionosphere Plasmasphere Electrodynamics (WAM-IPE)
- Assess the DA model performance

Crowding in LEO



University of Colorado, Boulder

NOAA SBIR Program

Six critical challenges that highlight important NOAA mission and research priorities

- 9.1 Extreme Events and Cascading Hazards
- 9.2 Coastal Resilience
- 9.3 The Changing Ocean
- 9.4 Water Availability, Quality, and Risk
- **9.5 Effects of Space Weather**
- 9.6 Monitoring and Modeling for Climate Change Mitigation

AMERICA'S SEED FUND SBIR — POWERED BY NOAA

Seven space weather Phase 1 awards made in FY2023

- AI Based Long Range Space Weather Prediction System, PI: Brad Morrison, Atlantic Industries, Inc. TX
- Developing a proof-of-concept Neutral Density Monitoring and Alert Service for satellite operators, PI: Michael Contreras, Ensemble Government Services, LLC, MD
- Nitric Oxide Measurements to improve Atmospheric Densities (NOMAD), PI: Dr. Kent Tobiska, Space Environment Technologies, CA
- Controlled Altitude Ballooning (CAB) for monitoring Energetic Particle effects on the Atmosphere, PI: Dr. Pradeep Shinde, Space Balloon Technologies Corp., FL
- In-Situ Space Weather Analysis, Erik Long, Orbotic Systems Inc., CA
- Active Material Technology to Improve Solar Sail Performance for Space Weather Monitoring, PI: Dr. Branden Farmer, NeXolve, AL
- Machine Intelligence for Space Weather (MINTS), PI: Alexander Engell, NextGen Federal Systems, LLC. , WV

Summary

- SWO is developing its plan for technology innovation and infusion
- Leveraging internal and external resources to implement innovation projects
- SBIR opportunities for space weather projects
- Look forward to working with the space weather community to identify potential future JV projects