

Sounding rocket launches, new public models and data highlight progress

BY LINDA HABASH KRAUSE

The **Atmospheric and Space Environments Technical Committee** encourages the exchange of information about the interactions between aerospace systems and their surroundings.

In August, researchers at the **Missouri University of Science and Technology** completed setup of their replica of a low-Earth orbit plasma environment. Housed within a gas chamber of the university's **Gas and Plasma Dynamics Laboratory**, this setup was funded by the **National Science Foundation, NASA's Lunar Surface Technology Research program and the Air Force Office of Scientific Research**, with additional financial support from **NASA's Missouri Space Grant Consortium**. The chamber allows for precise measurements of plasma densities and temperatures comparable to actual space conditions.

Several missions observed this year's solar phenomena. In early April, NASA launched three **sounding rockets** from **Wallops Island** in Virginia as part of the **Atmospheric Perturbations Around Eclipse Path 2 mission** to explore the effects of solar eclipses on ionospheric plasma and thermospheric cooling. These rockets, launched in succession 45 minutes apart, measured "charged and neutral particle density and surrounding electric and magnetic fields" before, during and after the April 8 eclipse, according to a news release.

Later that month, the **Focusing Optics X-ray Solar Imager 4 and the High-Resolution Coronal Imager (Hi-C) Flare sounding rockets** were launched from the Poker Flat Research Range in Alaska. FOXSI-4, equipped with specialized optical modules and detectors, observed solar X-rays during an **M-class solar flare** detected by **NOAA's Geostationary Operational Environmental Satellites**. Simultaneously, Hi-C Flare's low-noise cameras, built by **NASA's Marshall Space Flight Center** in Alabama, captured detailed observations during the flare. This coordinated effort provided unprecedented multimission observations of solar flare activity and the extreme energies involved in these phenomena.

In July, the **Marshall Grazing Incidence X-ray Spectrometer 2 sounding rocket** was launched to investigate how magnetic energy converts to heat. Researchers targeted the sun's corona with **X-ray spectroscopy**. In September, the **Full-sun Ultraviolet Rocket Spectrometer sounding rocket** was launched to collect the first high-resolution far-ultraviolet spectrum of the entire sun. These missions, combined with data from **NASA's Interface Region Imaging Spectrograph satellite**, provided greater detail about solar phenomena and their impacts on Earth's technological systems.

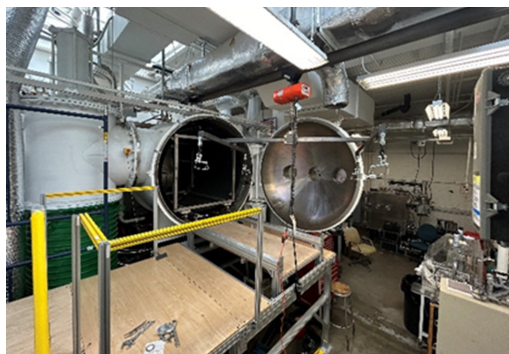
Several models were updated and released through **NASA's Community Coordinated Modeling Center**. In July, the **WideBand ionospheric scintillation MODEL v17**, which predicts ionospheric scintillation effects, was made available through the CCMC Instant-Run service. **MAGE model suite v0.75** was released in April, so researchers could study the solar impact on Earth's magnetosphere, ionosphere and ring current. The **Horizontal Wind Model**, released in March, allows custom conditions to be set for upper thermosphere wind simulations. **CORHEL-CME model v1.0**, released in February, allows researchers to simulate coronal mass ejections in realistic environments. Also released in February was the **DTM 2020 model**, which describes the thermosphere's temperature, density and composition.

In June, **NOAA's National Centers for Environmental Information** announced the end of its ionosonde data program, concluding a decade of near real-time ionospheric data collection. Observations from some 100 ground-based ionosondes will remain accessible, providing long-term archives for space weather research.

In May, NASA retired its **DC-8** aircraft, a versatile airborne platform for atmospheric, climate and space science research. After 37 years of service, the plane will now be used for training future aircraft technicians at Idaho State University.

In January, **NASA's Ingenuity Mars helicopter** completed its 72nd and final flight. One of the helicopter's rotor blades was damaged upon landing. Ingenuity made history in 2021 as the first aircraft to achieve powered flight on another planet. Over the course of its mission, it provided information on flight performance, Martian surface terrain and atmospheric conditions. ★

Contributors: *Emmanuel Kofi Asuako Wie-Addo, Nelson Green and Daoru Han*



◀ Researchers at the Missouri University of Science and Technology modified this vacuum chamber in the Gas and Plasma Dynamics Laboratory to simulate a plasma environment in low-Earth orbit.

Missouri University of Science and Technology