NRL refurbishes VAULT2.0 for reflight

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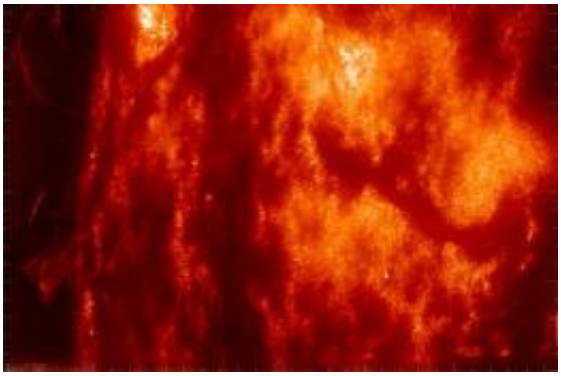

This is an image of the solar atmosphere obtained by VAULT during its 14 June 2002 sounding rocket flight. This is one of the highest resolution images of the solar atmosphere ever obtained in space and show structures at temperatures 10000 -- 50000 K. Credit: Naval Research Laboratory

Scientists at the Naval Research Laboratory (NRL) are refurbishing the Very-high Angular resolution ULtraviolet Telescope (VAULT) in preparation for two launches aboard NASA sounding rockets from the Navy's launch complex at the White Sands Missile Range starting in 2013. VAULT was initially flown as a sounding rocket payload in 1999 and 2002.

In the 1999 and 2002 flights, VAULT obtained 0.4 arcsecond spatial resolution images of the solar chromosphere and transition region in the Lyα line, which is the strongest line in the solar spectrum. Scientists think that the solar Lyα line that is observed by VAULT is central to the Sun-Earth relationship because it forms at the region where the magnetic

field begins to dominate the solar plasma and where the energy for solar eruptions is thought to accumulate. In addition, the strength and variability of the Lyα irradiance affects the chemistry of the mesosphere (e.g., ozone layer) as well as the Earth's climate on longer time scales. The images collected in the first two VAULT flights were the highest resolution images of the solar atmosphere from space until the launch of Hinode in 2006, and they remain the only Lyα images, as this capability does not currently exist in any solar mission.

The Lyα imaging is important to researchers because of its origin at a crucial region of the solar atmosphere -- the chromosphere-corona interface -- where the roots of the main drivers of space weather (i.e. the solar wind and solar eruptions) may lay, explained NRL's Dr. Angelos Vourlidas principal investigator for the VAULT2.0 project and a researcher in NRL's Space Science Division. Recent high-resolution observations from Hinode/SOT and EIS instruments show that the upper chromosphere may play a more important role in heating the corona by supplying the mass via Type-II spicules. For scientists to make further progress in understanding the solar chromosphere-corona connection, they search for clues that are located in sub-arcsecond structures with temperatures between 10000 and 50000 K, a regime not accessible by Hinode or the Solar Dynamics Observatory. Lyα observations are, therefore, ideal, for filling in this gap.

In the VAULT2.0 project, Vourlidas and his team will refurbish the VAULT telescope and improve its imaging capability with new electronics that will double its cadence to 6 seconds and lower its noise by a factor of four. It is hoped that VAULT2.0 will lead to new insights into the long-standing problem of coronal heating. VAULT2.0 will also leverage and enhance the scientific return of the Hinode , Solar Dynamics Observatory, and the upcoming Interface Region Imaging Spectrograph missions, and provide valuable information for the calibration and science planning of future Lyα telescopes. VAULT2.0

may also aid in providing a foundation for new space hardware experiment opportunities such as the Japanese-led Solar-C mission and climate-related experiments for NASA.

Provided by Naval Research Laboratory

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