

BULGARIAN ANTARCTIC ASTRONOMICAL OBSERVATORY. EXPERIMENTS AND RESULTS

M. Dechev¹, K. Kozarev¹, P. Petkov², V. Radeva³, I. Nachev², G. Borisov¹

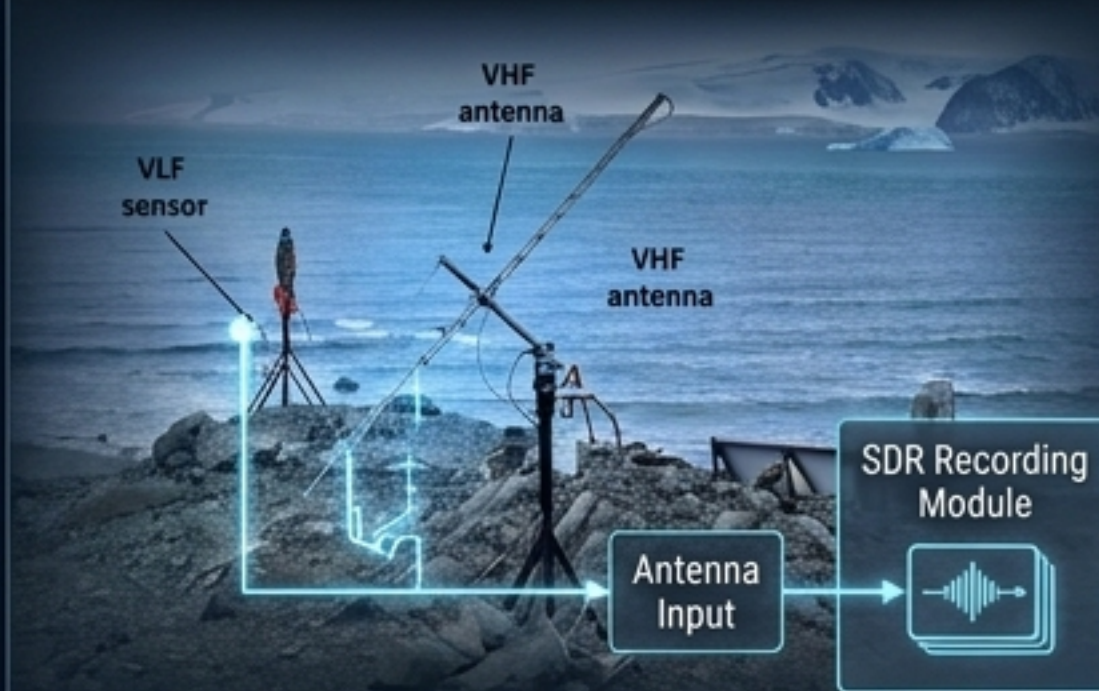
¹ Institute of Astronomy and National Astronomical Observatory, Bulgarian Academy of Sciences, BG-1784 Sofia, Bulgaria; ² Technical University of Sofia, Bulgaria; ³ Nikola Vaptsarov Naval Academy, Varna, Bulgaria.

1. INTRODUCTION & SITE



- **Location:** St. Kliment Ohridski base, Livingston Island (62°38'29"S, 60°21'53"W).
- **The Environment:** Exceptionally radio-quiet polar location. Allows for >20 hours of continuous daily solar tracking during the Antarctic summer.
- **The Mission:** Deployed during the 33rd Bulgarian Antarctic Expedition (Jan-Feb 2025), perfectly timed to capture the Solar Cycle 25 maximum.
- **Objective:** Investigate solar-terrestrial interactions (flares, CMEs) and their localized impacts on ionospheric dynamics, geomagnetic fields, and high-energy particle fluxes.

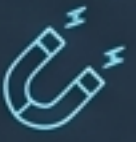
2. SYNCHRONIZED EXPERIMENTS



1. VHF Spectrography: Direct solar burst tracking (50-1000 MHz) using a CALLISTO-type log-periodic antenna with a 0.5-second temporal resolution.



2. VLF D-layer Monitoring: Tracking phase and amplitude shifts in the Earth-ionosphere waveguide via long-range transmitters (Cutler, Maine & Lualualei, Hawaii).

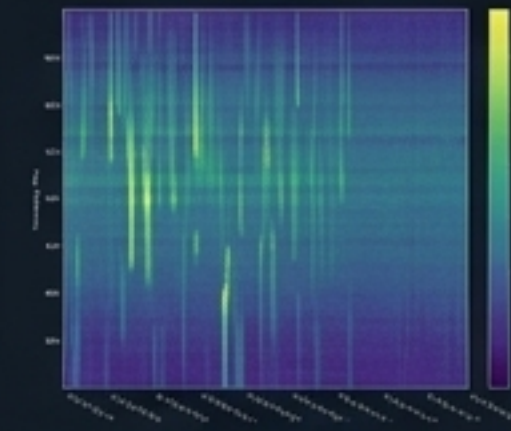
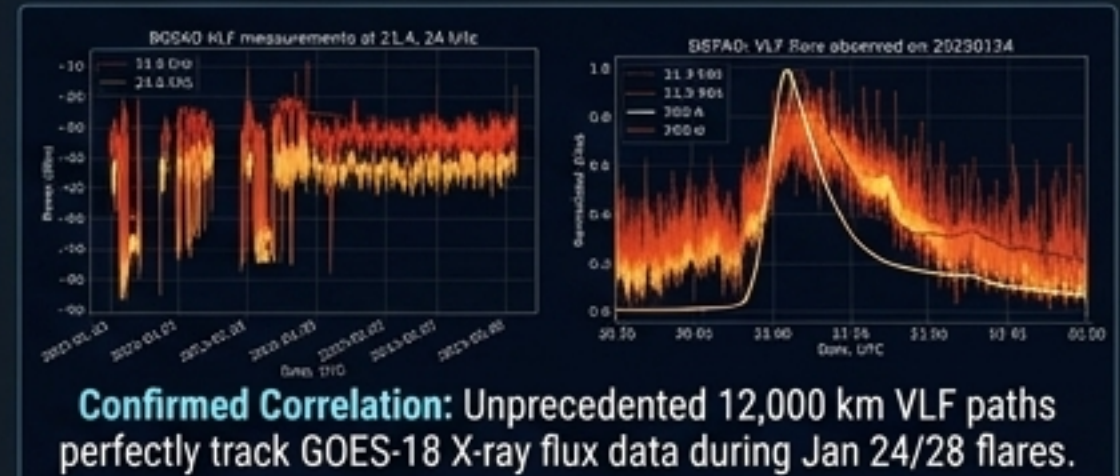


3. Magnetometry: Monitoring highly localized short-term fluctuations in the Earth's magnetic field triggered by solar wind dynamics.

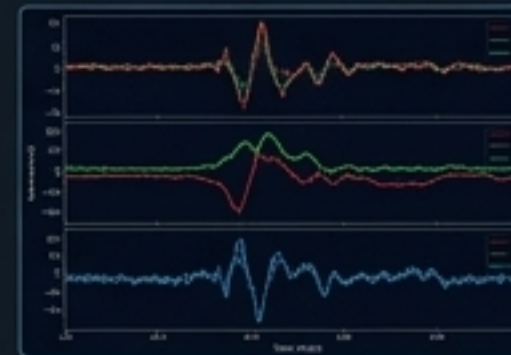


4. Dosimetry: Passive polyallyl diglycol carbonate detectors measuring high-energy particle fluxes (alpha, proton) for predictive space weather modeling.

3. EARLY RESULTS & VALIDATION



High-Resolution Capture: Multiple Type III solar radio bursts identified as vertical spectral lines, signaling coronal electron acceleration.



Global Agreement: Local magnetometric data demonstrates excellent synchronization with baseline INTERMAGNET network stations (Vernadsky AIA / Orcadas ORC).

Validation complete: Data proves exceptional system reliability in extreme conditions, establishing Bulgaria's permanent capacity for cutting-edge polar space weather monitoring.