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Poster
Critical infrastructures, such as satellite communication systems, are significantly affected by the state of the ionosphere, the region between the Earth's atmosphere, and satellite orbits. Extreme space weather events that pose risks to these systems can be analyzed through their impacts on the ionosphere, necessitating a comprehensive understanding of ionospheric dynamics. Among the ionospheric layers, the D-region remains poorly studied due to its challenging altitude, which is inaccessible to space-based measurements and beyond the reach of ground- and air-based instruments. Very Low Frequency (VLF) radio waves, which propagate between the Earth and the ionosphere in a guided manner, offer a valuable tool for investigating this region. However, the limited availability of VLF receivers, particularly in the Middle East, underscores the urgency of expanding VLF monitoring capabilities, especially during the rising phase of solar cycle 25. To address this gap, a VLF receiver - an AWESOME (Atmospheric Weather Electromagnetic System for Observation Modeling and Education) system from Georgia Tech - was installed at the summit of Samaria Hill to facilitate routine monitoring of anticipated solar and geomagnetic events predicted by current models. This study presents an analysis and modeling of VLF signal amplitude and phase variations during selected X-class solar flares and intense geomagnetic storms. The findings aim to advance the understanding of the D-region ionosphere within the Mediterranean sector and contribute to improved modeling of space weather impacts on critical technological systems.

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