

Radio Emissions from Electrical Activity in Martian Dust Storms

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Dust storms on Mars are predicted to be capable of producing electrostatic fields and discharges, even larger than those in dust storms on Earth. There are three key elements in the characterization of Martian electrostatic discharges: dependence on Martian environmental conditions, event rate, and the strength of the generated electric fields. The detection and characterization of electric activity in Martian dust storms has important implications for habitability, and preparations for human exploration of the red planet. Furthermore, electrostatic discharges may be linked to local chemistry and plays an important role in the predicted global electrical circuit.

Because of the continuous Mars telecommunication needs of NASA's Mars-based assets, the Deep Space Network (DSN) is the only facility in the world that combines long term, high cadence, observing opportunities with large sensitive telescopes, making it a unique asset worldwide in searching for and characterizing electrostatic activity from large scale convective dust storms at Mars. We will describe a newly inaugurated program at NASA's Madrid Deep Space Communication Complex to carry out a long-term monitoring campaign to search for and characterize the entire Mars hemisphere for powerful discharges during routine tracking of spacecraft at Mars on an entirely non-interfering basis. The ground-based detections will also have important implications for the design of a future instrument that could make similar in-situ measurements from orbit or from the surface of Mars, with far greater sensitivity and duty cycle, opening up a new window in our understanding of the Martian environment.

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