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A Non-Local Spread-F-like Event Over Arecibo as the Possible Result of a Solar Wind Pressure Pulse

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Solar wind pressure pulses are known to modify electrodynamics of the terrestrial magnetosphere. In this paper, we present a possible electrodynamic reaction of the ionosphere to a small and brief pressure pulse observed by local and non-local instrument systems over Arecibo Observatory, Puerto Rico and extending over at least the mesoscale. Initially, a strong, four hour long, mid-latitude spread-F-like event was observed through a high frequency, wide-beam radar system, Penn State Ionospheric Radar Imager (PIRI), deployed near Arecibo (18.36° E, 66.75° S, and $f = 4.42$ MHz). The same spread-F event was also observed using the dual, narrow-beam 430 MHz Arecibo incoherent scatter radar. Furthermore, GPS delta-vTEC measurements from Caribbean island sector revealed that the event was apparently moving from west to east and then east to west crossing over Arecibo twice. Similar GPS-TEC measurements from the South American sector showed that an equatorial spread-F was also present. We use SuperMAG magnetometer and NASA's OMNI solar wind data to show that a small solar wind pressure pulse and rapid changes in the solar wind magnetic field are likely causes for the observed ionospheric features over Arecibo.