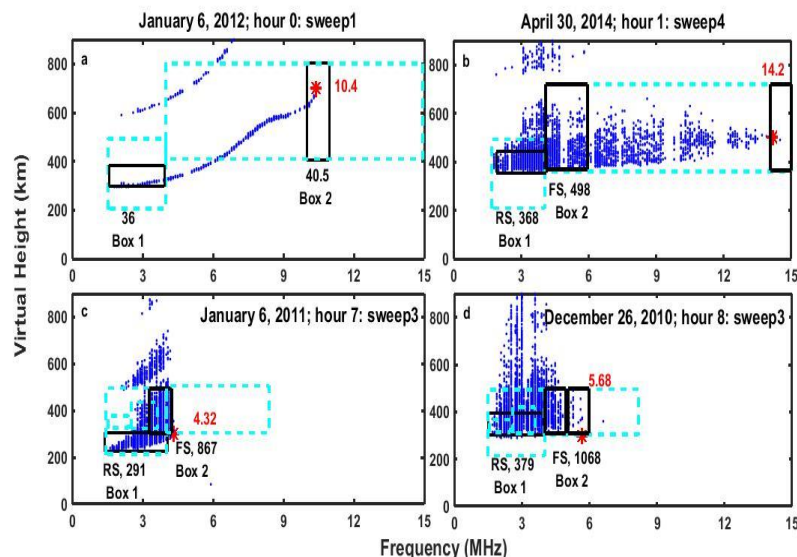


Spread F studies using Digisonde instruments

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A comprehensive statistical study of Spread F using digisonde data from low, midlatitude and high latitude global sites has been conducted. Data from five midlatitude stations in the north-American include: Ramey AFB, Puerto Rico (18.5°N, 67.1°W, -14° declination angle) for 1996-2011, Wallops Island, Virginia (37.95°N, 75.5°W, -11° declination angle) for 1996-2011, Dyess, Texas (32.4°N, 99.8°W, 6.9° decl. angle) for 1996-2009, Boulder, Colorado (40°N, 105.3°W, 10° decl. angle) for 2004-2011, and Vandenberg AFB, California (34.8°N, 120.5°W, 13° decl. angle) for 1996-2009. Low-latitude stations include: Ascension Island (7.9°S, 14.4°W, -15.09° decl. angle) from 2000-2014, Kwajalein (8.71°N, 167.7°E, 7.5° decl. angle) from 2004-2012. Data from high latitude stations are currently being processed and include: Julisruh, Germany (54.6° N, 13.4° E, 4.66° decl. angle) for 2007-2020, Qaanaaq (77.46°, 69.22° W, -41.32° decl. angle) for 1990-2014, Norilsk (69.35°, 88.19° E, 17.25° decl. angle) for 2010-2013, Narassarsuaq (61.19°, 45.42° W, -21.4° decl. angle) for 1998-2008. Multiple algorithms have been written to process the raw data and determine spread F by using edge detection and pattern recognition techniques. Pattern recognition algorithms are used to determine the presence of both range and frequency spread F. Algorithms have also been written to find foF2 and hmF2 values for obtaining the density profile of the ionosphere. Vertical Incidence Pulsed Ionospheric Radar (VIPR) data was also processed for a few of these sites for determining the foF2 values and the comparison between the two instruments. These foF2 values were compared with manually scaled data obtained by using SAO (Standard Archiving Output) Explorer software for Digisonde data to determine the accuracy level of the algorithm. Correlation between digisonde, COSMIC-1/FORMOSAT-3 satellite data and SAMI2 and IRI models values to check for validity of data. Findings based on work carried out to date include determination of seasonal and solar cycle variation patterns.



a) A non-spread F event. Different kinds of Spread F event; b) Range Spread F; c) Range and Frequency Spread F; d) Spread F in a form of a big blob. The left axis is the virtual height in km and the bottom axis is the frequency in MHz. The dotted lines are the boundary boxes and the solid line box is the box selected by the algorithm for determining Range (RS, Box 1) and Frequency (FS, Box 2) spread F for an individual ionogram. The corresponding numbers with RS and FS are the pixel counts in each box which determine the spread F. The red star and the corresponding number is the foF2 value determined for the individual ionogram.

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