

Quality improvements to the spectral data acquired from HF multi-static sounding system at the magnetic Equator

V. Vasquez¹, M. Milla², K. Kuyeng¹ and D. Scipion¹.

¹Radio Observatorio de Jicamarca, Instituto Geofísico del Perú, Lima, Perú.

²Pontificia Universidad Católica del Perú, Lima, Perú

The HF radar is a continuous wave multistatic radar composed of three transmitting stations and six receiving stations operating at two frequencies (2.72 MHz and 3.64 MHz) for ionospheric sounding. The system is deployed at the magnetic Equator in the regionally along the central coast and highlands of Peru. HF radar uses signals modulated with three different pseudo-random noise codings by each transmitter. This configuration allows the detection of the following parameters as a group delay (pseudorange), the Doppler shift, Signal-to-Noise (SNR). These measurements are used to estimate the regional plasma density as a function of space and time, to complement the Spread-F data obtained from the Jicamarca Radio Observatory main radar, improving its forecasting (Hysell, D. L., 2019).

These final parameters (altitude, SNR, Doppler shift) are obtained through the processing of the spectral data acquired from the signals of each HF transmitter. In order to improve the measurements of the final parameters obtained by the HF radar, an evaluation of the quality and consistency of the spectral data was realized. These involved a series of modifications such as the implementation of a multifrequency transmission system and a cluster detection algorithm to classify coherent echoes as signals and discard the noisy zone, resulting in spectral data free from interference and reducing the storage size of each spectra.

This work will present a brief description of the HF radar, the work done to improve the detectability of coherent echoes in the spectral data that influences to improve the Spread-F forecast and the comparisons between the final parameters.