Comparison of meter-scale plasma irregularities probed by two equatorial radars located in Peru: Jicamarca and Huancayo

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A VHF radar interferometer has been installed near Huancayo (12.041^{o}S, 75.321^{o}W), Peru, to probe the equatorial ionosphere. The Huancayo radar has been named Cognitive Interferometric Radar Imager (CIRI) to reflect its cognitive sensing capabilities in order to study the equatorial ionosphere. This instrument is located 170 km east of the large VHF antenna array of Jicamarca Radio Observatory (11.952^{o}S, 76.874^{o}W). Initially, CIRI consists of two channels, each containing four lines of Coaxial-Collinear antennas that contribute to a total gain of approximately 22.6 dB. The frequency of operation was chosen to be 47.586 MHz and includes a transmitter with a peak power of 15 kW. For a two-day period starting on March 1, 2015, the Jicamarca radar operated in low power mode called JULIA intermittently due to maintenance, but its operation was mostly consistent during nighttime hours. Hence, the possibility of performing a comparative study with observatories installed in close proximity was accomplished for the first time. Two-day simultaneous observations of the equatorial ionosphere with these two instruments resulted in three events of meter-scale plasma density irregularities at each site. The events consisted of one nighttime Electrojet and two Spread-F's. The layers were typically observed first at Jicamarca and approximately 15 minutes later at Huancayo, indicating an apparent eastward zonal motion of the irregularities. This paper addresses radio scattering science of these radar echoes and discusses their similarities, differences, and implications of their corresponding morphologies in equatorial plasma dynamics. In addition, improvements, new capabilities, and future deployments of CIRI with at least three sets of receiver antennas for interferometry configuration and sensing will be presented.