

New insights on the physics of equatorial 150 km radar echoes

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This is a review talk about the physics of equatorial 150 km radar echoes prepared by a team of Jicamarca experimenters who have been observing the phenomenon for many decades. Despite the early discovery of these echoes at Jicamarca in 1964 the production mechanisms of 150 km region electron density fluctuations causing these echoes remain poorly understood after five decades but there are some new insights emerging which should be shared and discussed at this stage. The focus of the talk will be these new developments that includes (a) recognition of two classes of 150 km region VHF echoes that can be associated with an enhanced incoherent scattering and field-aligned wave growth processes, respectively, (b) investigation of the impact of lower thermospheric gravity waves in shaping the fine structure and possibly the envelope of the characteristic “necklace shaped” range-time-intensity (RTI) maps of 150 km radar returns, (c) correlations between fluctuations detected in VIPIR ionosonde and VHF radar soundings of the region, (d) investigation of sub-minute time-scale fluctuations detected in high time resolution RTI’s, and (e) numerical models and simulations of photoelectron driven enhancement of the ion and electron lines of the incoherent scatter spectrum.