

# **A New Experiment and Inversion Method for Jicamarca ISR Topside Observations**

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A new experiment for incoherent scatter radar (ISR) observations of the equatorial topside ionosphere is being developed at Jicamarca Radio Observatory, in Peru. This new experiment employs joint measurements made with the uncoded long-pulse and the double-pulse/Faraday rotation ISR modes, combined with an optimal approach for inversion of the ionospheric plasma parameters from the measurements. The double-pulse/Faraday rotation mode measures autocorrelation functions of the ionospheric plasma at ranges below 450km, and provides absolute values of electron density. These measurements are used in the inversion process of the long-pulse observations above 450km. For the inversion of the parameter profiles, we use the so-called "full-profile" method, first suggested by Holt et al. (1992). In this method, a complete forward model of the measurements is developed, and it is used to invert full height profiles of the ionospheric parameters. The full-profile method is optimal since it takes into account all the factors affecting the measurements. The inversion process is computationally intensive, since the nonlinearity of the forward model increases as factors affecting the measurements are incorporated. Furthermore, a correct description of the parameter profiles requires a large number of variables, which must be solved for in an acceptable time period. Efficient numerical computation is an issue that has to be addressed in the full-profile analysis approach due to the large number of autocorrelation functions calculated during the inversion process. First results using simulated data and actual measurements suggest that height profiles from 450km up to 1600km of ionospheric plasma parameters (electron density, ion and electron temperatures and ion composition) can be obtained with this new experiment. In this talk, we will be describing this new experiment in more detail and presenting its results.