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Analysis of Mars Express Ionogram Data via a Multilayer Artificial Neural Network COLLIN WILKINSON, ARRON POTTER, GREG PALMER, FIRDEVS DURU FDURU@COE.EDU, Coe College — Mars Advanced Radar for Subsurface and Ionospheric Sounding (MARSIS), which is a low frequency radar on the Mars Express (MEX) Spacecraft, can provide electron plasma densities of the ionosphere local at the spacecraft in addition to densities obtained with remote sounding. The local electron densities are obtained, with a standard error of about 2%, by measuring the electron plasma frequencies with an electronic ruler on ionograms, which are plots of echo intensity as a function of time and frequency. This is done by using a tool created at the University of Iowa (Duru et al., 2008). This approach is time consuming due to the rapid accumulation of ionogram data. In 2013, results from an algorithm-based analysis of ionograms were reported by Andrews et al., but this method did not improve the human error. In the interest of fast, accurate data interpretation, a neural network (NN) has been created based on the Fast Artificial Neural Network C libraries. This NN consists of artificial neurons, with 4 layers of 12960, 10000, 1000 and 1 neuron(s) each, consecutively. This network was trained using 40 iterations of 1000 orbits. The algorithm-based method of Andrews et al. had a standard error of ˜40%, while the neural network has achieved error on the order of ˜20%.

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