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URSI Extended Abstract

A machine learning model for scintillation detection and classification in the high latitudes

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Ionospheric irregularities are structures in the ionosphere that cause fluctuations of the radio signals passing through them. The radio scintillations that are observed on the ground are a nuisance to the position navigation timing (PNT) solutions but they can also be used to remotely sense the ionosphere and study the irregularities. We have developed a methodology to classify scintillation signatures based on their region of occurrence: polar cap Vs auroral oval. An unsupervised machine learning (ML) model isolation forest is used to routinely detect of scintillation signals and a supervised neural network (NN) model is used to classify scintillation signatures. We use a standard Artificial NN with 5 hidden layers. We label the data using DMSP SSUSI-modeled boundaries for ionospheric pierce points at E and F region heights. We have applied it to CHAIN data from 4 stations and 2016-2020 years. We study patterns in the time series and study data during different geomagnetic activity, with or without cusp filter, and with and without the use of low rate scintillation data for initial event identification. In this work, show the nuances of using high rate phase and amplitude time series and spectral data for this study.