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Maximum Usable Frequency current forecast verification and new local prediction model development

An important service that Space Weather Centres offer is HF propagation predictions for use by airlines, other users of long-distance radio communication and, especially, in the case of the military. One aim of this project is to report on the verification of Maximum Usable Frequency (MUF) predictions, given by the Ionospheric Communication Enhanced Profile Analysis and Circuit Prediction Program (ICEPAC) and the analysis of large deviations from the predictions. We compared measured near vertical incidence skywave (NVIS) MUF profiles, which is essentially the F-region critical frequency (foF2), to the predicted ICEPAC profiles for the ionosonde located in Grahamstown, South Africa. The study period considered long-term predictions from 2010 to 2019. Using the RMSE skill score as the primary metric to quantify the performance of the prediction model, we found that the average daily skill score was found to be 0.57, with a standard deviation of 0.16.

The majority of days lie within two standard deviations. However, 37% of days that fell below 2 standard deviations could not be reasonably connected to solar storm activity. The results of this study provide a baseline for future models to evaluate the accuracy of HF propagation predictions.

The second larger aim is to develop a more suitable and focused prediction model of MUF profiles for Southern Africa, using local conditions. We have found that solar zenith angle, 10.7 cm solar radio flux and the Kp index are the strongest drivers to reproduce MUF profiles to a correlation > 0.81. We will focus on a combination of these input parameters as they are highly established to be accurately forecasted themselves.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

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