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# Radio-quiet ionosonde observations for HF absorption monitoring

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## 1 Extended Abstract

There is increasing interest in real-time monitoring of the HF-band absorption in the *D* layer of the ionosphere, due to its potential impact on radio technologies[1]. In high latitudes various riometers are available providing continuous observations of the HF absorption level. However, in mid and low latitudes, where typically solar flares are the main driver of *D*-layer enhancements, few such instruments are in use.

Various techniques are being developed and evaluated to extract such information from ionosonde observations. Some possible methods include the analysis of the strength of received echoes in ionograms—either the absolute amplitude or the ratio of O and X polarised amplitudes at a given frequency—or the use of the standard $f_{min}$ characteristics (the lowest frequency for which any echo is detected)[2, 3]. This methods all have a limitation in frequency range covered: $f_{min}$ provides no frequency dependent information at all, while the other methods are limited to the critical frequency of the $F_2$ layer which can be severely decreased during geomagnetic storms.

We investigate here yet another method for monitoring radio absorption using ionosondes, based on the variations in the radio noise received while operating the instrument in a radio-quiet mode. We can make these measurements from $foF_2$ up to the upper frequency limit of the instrument (30 MHz for the ionosondes used here). The spectra of received emissions are dominated by broadcasting bands, which exhibit a typical diurnal pattern in received intensity due to daily variation in $MUF$. Effects of solar flare can readily be identified as sharp deviations from this normal pattern.

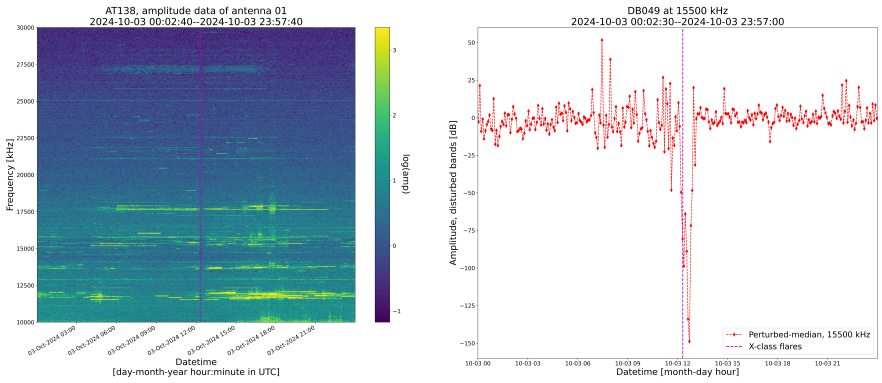


**Figure 1.** Left: spectrogram showing reception of various broadcasting band affected by a solar flare; right: time evolution of the amplitude of 15.5 MHz reception, showing a clear signature of the solar flare.

## References

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