



## Sporadic perturbations in the high latitude D-region ionosphere

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The propagation of very low frequency (VLF) radio waves permits us to study the response of the D-region (~60-90 km) to sporadic events originating in space or in the Earth. In this study, we use the 37.5 kHz VLF signal transmitted from NRK (Iceland, L=5.5) recorded at Sodankylä (Finland, L=5.5) during the period 2010 – 2017. The analysis considered the positive variations of the VLF perturbations with respect to the quiescent level (Figure 1). We compare the observed variations with changes in nitric oxide (NO) concentration, atmospheric temperature, solar proton events. We found that the positive variations are mainly associated with temperature and NO concentration enhancements. Some large positive variations in 2012 also coincided with a period of sudden stratospheric warming, and solar proton event emissions.

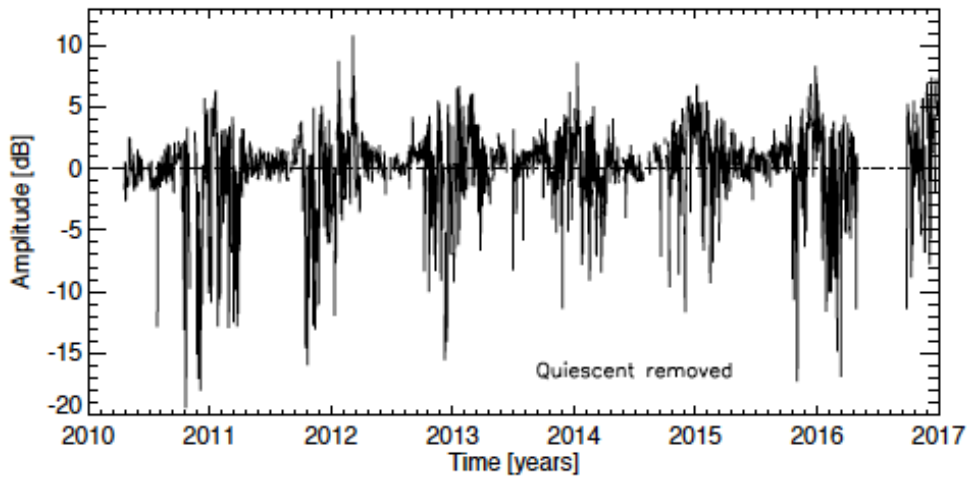


Figure 1. Daily variation of the recorded daytime VLF amplitude in Finland after removing the quiescent level.