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Characterisation of very low frequency (VLF) fluctuations at the Graz receiver knot in the INFREP system

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In the frame of the European VLF/LF radio receiver network (International Network for Frontier Research on Earthquake Precursors - INFREP) we investigate radio paths between several transmitters and receivers, among them the Graz VLF facility. For this knot the data coverage spans more than two years of continuous samples from 11 transmitters with a network wide 20 seconds temporal resolution. The main scientific objective is the characterisation of VLF fluctuations in amplitude and phase related with artificial and natural sources, e.g. disturbances due to seismic phenomena.
Examples of VLF disturbances due to seismic activity are given by Rozhnoi et al. (2009) and complementary investigations are carried out by Prattes et al. (2011). For VLF usually the (i) nighttime amplitude variations and (ii) terminator time methods are used. They have been regularly applied in data analysis of seismic events mainly in Asian area. Paths crossing the earthquake preparation zone and control links are used for earthquake events.
Various VLF waveguide properties are important, e.g. the length of the individual paths, the lower lithospheric-surface boundary and the upper {day, night}-time ionospheric {D, E}-layer physics. Beside the nominal diurnal and seasonal behaviour we are measuring natural variations, e.g. solar flare effects and manmade noise, i.e. local disturbances related with the urban environment of the receiver location. Measurements indicate that above a threshold of magnitude M$\sim$5 the methods are successful applicable.
We show for a time span of more than two years how VLF fluctuations and their seasonal variations relate with atmospheric parameters, e.g. temperatures, zonal wind, and heat- and momentum-fluxes and discuss the impact on seismic event detection via VLF methods. Complementary ground- and satellite-based investigations, e.g. in nearby ULF or LF frequency ranges, are useful.

References:
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