



Seismo-electromagnetic VLF link calibration in Europe

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The general background is the investigation of seismic activity with electromagnetic signals, i.e. to disentangle amplitude and phase modifications from a variety of sources.

This work focus on characterisation of very low frequency (VLF) radio links between several transmitters and the Graz receiver in the current active solar cycle. Particular emphasis is on solar flares related disturbances in the Earth-ionosphere waveguide, an important dayside non-seismic influence on the VLF paths. These variations can serve as a calibration tool of the facility even for nighttime periods when different seismo-electromagnetic (SEM) methods are applied, e.g. terminator time or nighttime amplitude. Supporting data are the GOES X-ray flux measurements.

As immediate objective we study individual C/M/X-class solar flare events in the sub-ionospheric VLF waveguide (amplitude fluctuations) and calculate statistical parameters with the C-class population.

The used system, which is part of a broader network of receiving stations, is primarily dedicated to investigate earthquake related phenomena and associated lithospheric atmospheric ionospheric coupling mechanisms. We receive simultaneously 12 VLF transmitters (amplitude and phase measurements) from the northern hemisphere with a selected temporal resolution of 20 seconds.

We conclude that the numerous C/M/X-class solar flare events, together with the the high signal-to-noise ratio of the facility, are a valuable combination for short-term VLF path characterisation in a robust manner. As outlook, due to the steady VLF measurements, a monitoring service for certain lower atmospheric variations can be envisaged.