

Meteorological Application of Infrasound-Data: Acoustic Radiation from Lightning Discharges

Lightning discharges which occurred in August 2010 around station IS26 (Germany) as source of infrasound signals and their behavior were investigated in a cooperation between ZAMG, ALDIS (Austrian Lightning Detection and Information System) and TU Graz / Institute of High Voltage Engineering and System Management. ALDIS operates a lightning location system (LLS) which is used to observe lightning discharges and information about several lightning parameters was provided for the following studies which resulted in a diploma thesis. The observed waveforms were compared with theoretical waveforms and the frequency content of the infrasound signals was analysed.

ALDIS is a joint project of OVE, Siemens and Austrian Power Grid AG and provided the lightning parameters data used in this work. To investigate infrasound signals produced by lightning discharges ALDIS allocated a dataset including parameters of lightning discharges within a radius of 50km around IS26 Freyung / Germany for the period 2.-24.8.2010. The system setup focused on Cloud to Ground discharges (CG). Studies were accomplished for the 5th of August. Altogether 387 lightning strokes were detected on the selected day. 128 corresponding infrasonic signals could be found using the software WinPMCC. Most flashes in a close vicinity to IS26 were detected.

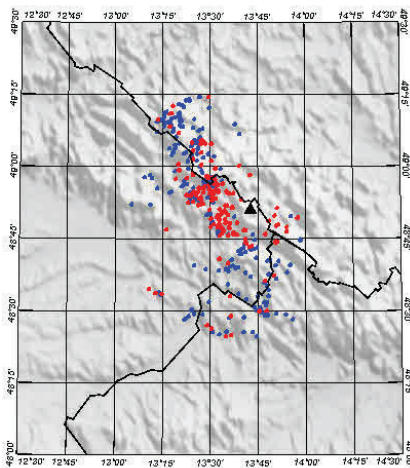


Figure 1: Infrasound and lightning around IS26 on August 5th 2010;

Signature:

- red: corresponding IS Signal
- blue: no IS Signal

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The peak current I reported by ALDIS was varying 0 and 1501 kA. It was shown that detection works well within a distance up to 25km. In addition, it was shown that there is neither an obvious correlation between the detectability of infrasound and the peak current of the lightning strike nor a correlation between peak-to-peak pressure, peak current and distance.

Data was analysed with Software WinPMCC (Pouillot et al., 2008) and Geotool. Significant pressure variations measured at IS26 are in good agreement with the expected arrival time. A comparison between measured and calculated back azimuths showed a derivation of $\pm 10^\circ$ as stated in the work of Assink et al. (2008). The general structure of the signals agrees to the theory developed by Dessler and Bohannon (see Bohannon, 1980) that predicts infrasonic signals originating from an electrostatic mechanism. Waveforms of single-stroke and multiple-stroke flashes were examined, as well examples of Cloud to Ground (GC) and Cloud to Cloud (CC) induced signals.

References:

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- Pouillot Ch., Chavy C., Quicke G. (2008): *WinPMCC User Manual*, Axlog Ingenierie, 64p

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