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Narrow infrasound pulses from lightning; are they of electrostatic or thermal origin?

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Narrow ($\sim$1–2 s) infrasound pulses that followed, with $\sim$11 to $\sim$50 s delays, rapid changes of electrostatic field were observed by a microbarometer array in the Czech Republic during thunderstorm activity. The angles of arrival (azimuth and elevation) were analyzed for selected distinct events. Comparisons of distances and azimuths of infrasound sources from the center of microbarometer array with lightning locations determined by EUCLID lightning detection network show that most of the selected events are most likely associated with intra-cloud (IC) discharges. Preceding rapid changes of electrostatic field, potential association of infrasound pulses with IC discharges, and high elevation angles of arrival for near infrasound sources indicate that an electrostatic mechanism is probably responsible for their generation. It is discussed that distinguishing of the relative role of thermal and electrostatic mechanism is difficult, and that none of published models of electrostatic production of infrasound thunder can explain the presented observations precisely. A modification of the current models, based on consideration of at least two charged layers is suggested. Further theoretical and experimental investigations are however needed to get a better description of the generation mechanism of those infrasound pulses.