Contribution ID: **16** Type: **not specified**

Probing the context of TGF events at the Pierre Auger Observatory using VLF sensors

Tuesday, 16 July 2024 14:45 (30 minutes)

Data from radio instruments are imperative to understanding the context of high-energy events in the atmosphere. Terrestrial gamma-ray flashes (TGFs) are extremely dynamic events that have several distinctive radio profiles in VLF including slow pulses (Pu et al. 2019) and energetic intracloud pulses (EIP; Lyu et al. 2021) in upward TGFs, both recently detected in association with downward TGFs as well (Chaffin et al. 2024). In addition, downward TGFs have been associated with powerful compact return strokes (CRS) in -CG lightning (Wu et al. 2021; Wada et al. 2022). The relationship between TGFs and their radio emissions can be very complicated, as indicated by a multi-pulse TGF event coupled with VLF recordings observed by our group during a winter thunderstorm in Japan in 2015, which we will briefly present. VLF technology can be used to determine localization of TGF events as well as indicate the occurrence of specific lightning processes such as leader steps and subsequent return strokes. Employing a large enough dynamic range remains the primary challenge to VLF-LF instruments that aim to effectively characterize leader steps at the same time as the most powerful return strokes. The Pierre Auger Observatory provides a unique opportunity to perform simultaneous VLF-LF and gamma-ray measurements of TGF events in a format that allows for the optimal geometrical setup for VLF-LF sensors involving a separation distance which is outside the near radiation field but close enough to be sensitive to distinguish leader steps on weaker events.

Primary author: SANCHEZ, James (University of California, Santa Cruz)

Co-authors: Dr LEAL, Adonis (New Mexico Institute of Mining and Technology); Dr SMITH, David (University of California, Santa Cruz); Dr ORTBERG, John (University of California, Santa Cruz); COLALILLO, Roberta (Istituto Nazionale di Fisica Nucleare)

Presenter: SANCHEZ, James (University of California, Santa Cruz)

Session Classification: Atmospheric Electricity