

# VHF Interferometer Observations of Natural Lightning Lightning Physics

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A continuous sampling broadband VHF digital interferometer (INTF) has been operated at Langmuir Laboratory in New Mexico since 2011. By continuously sampling the VHF emission from lightning, the sensitivity of the interferometer is greatly improved. The instrument has now had three successful operating seasons, and with each season the interferometer has been improved. For the 2013 storm season, the front end receiver was redesigned to further improve the sensitivity and angular uncertainty of the interferometer. Also added was a time synchronous fast electric field change sensor to aid in the analysis of the data. The data produced by the INTF and the Langmuir Lightning Mapping Array (LMA) are highly complimentary. The INTF provides very high time resolution mapping and somewhat improved sensitivity, and the 3D LMA observations completely remove the ambiguities normally present in 2D interferometer mapping results.

To be presented are examples of natural intracloud and cloud-to-ground flashes from the 2012 and 2013 storm seasons. The DITF maps show lightning in great detail, with animations of the maps being analogous to high speed video observations of lightning with the benefit of not being limited to channels which extend below the cloud base. The excellent sensitivity of the INTF allows activity in the positive breakdown region to be clearly visible. Activity in the positive breakdown region is copious and surprisingly complex, and there is evidence that the INTF is detecting and locating emissions from positive leaders into virgin air.