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TGF and gamma-ray glow highlights from the ALOFT 2023 flight campaign

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During the summer of 2023 the Airborne Lighting Observatory for FEGS and TGFs (ALOFT) field campaign was performed. With a NASA ER-2 research aircraft, flying at 20 km altitude, ALOFT observed Terrestrial Gamma ray Flashes (TGF) and gamma-glowing thunderclouds in Central America and Caribbean. The ALOFT payload included several gamma-ray detectors, an imaging array of photometers sensitive to different wavelengths, electric field change meters, a suite of microwave radiometers and radars for cloud characterization and an extensive set of ground-based radio observations.

During the campaign 10 flights, 60 hours total, were performed. As real time gamma-ray detections were downlinked, we knew when the aircraft was passing a gamma-glowing cloud and could instruct the pilot to return to the same thundercloud as long as the cloud was glowing. During the campaign ALOFT observed a total of 130 transient gamma-ray events and hundreds of gamma-ray glows. With the richness of the ALOFT observations, we learned that thundercloud can glow for much longer than minute scale and over much larger areas than previously reported. We also learned that transient gamma-ray events come in a large variety and new types of events were discovered. In this presentation we will give an overview of the main results and discoveries by the ALOFT campaign

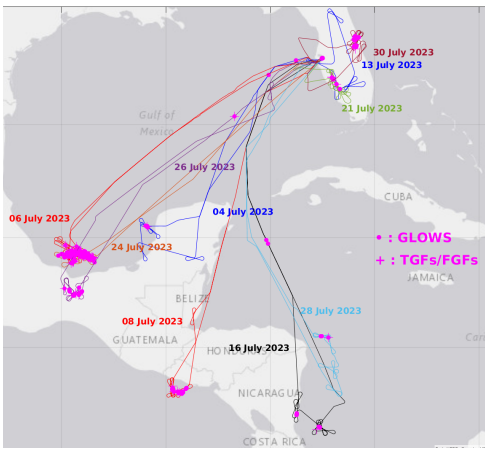

Figure 1. The 10 flights during the ALOFT campaign. Detections of gamma-ray events in purple.