The extratropical transition of Tropical Storm Cindy from a GLM, ISS LIS, and GPM perspective

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\textbf{Introduction}

\textbf{Background}

The distribution of lightning with respect to tropical convection precipitation systems has been well established in previous studies and more recently by the successful Tropical Rainfall Measuring Mission (TRMM). However, TRMM did not provide information about precipitation features powered by IOTC latitude. Hence we focus on the evolution of lightning within extra tropical systems. To facilitate such studies, lightning data from the Geostationary Lightning Mapper (GLM) onboard GOES-16 was combined with precipitation features obtained from the Global Precipitation Measurement (GPM) mission constellation of satellites.

\textbf{Objectives}

- Compare lightning (e.g., flash density) to precipitation characteristics (e.g., precipitation amount, mixed phase region) at different latitudes
- Investigate trends in lightning characteristics as Tropical Storm Cindy transitions from tropical to extra tropical (~June 23 21Z), as well as when it made landfall (~June 22 09Z)
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\textbf{Data}

- Lightning
  - GOES-16 Geostationary Lightning Mapper (GLM): temporal resolution: 2 ms; spatial resolution (at nadir): 8 km – GLM data are non-operational data still undergoing testing prior to official release
  - Flashes: temporal constraint of 330 ms and 16.5 km
- Precipitation
  - NASA-JAXA Global Precipitation Measurement (GPM) mission
    - Core Observatory satellites Dual-frequency Precipitation Radar (DPR); operates at Ku- and Ka-bands
    - Multi-channel microwave radiometer (GMI): \textsuperscript{1}\textsuperscript{1}  
- GPM International constellation satellites also carry microwave radiometers
  - IMERG: 30-minute
- Precipitation estimates at 0.1° by the Integrated Multi-satellite Retrievals for GPM
- Inter-calibrates, merges, and interpolates GPM microwave precipitation estimates and combines them with IR satellite estimates and precipitation gauge analyses

\textbf{Results}

- Radar
  - Weather Surveillance Radar 1988 Doppler (WSR-88D)
  - Reflectivity (Z) from ECHL (Lake Charles, LA) and KJAL (Jackson, KY)

\textbf{Conclusions and Future Work}

\textbf{Conclusions}

- A correlation between maximum radar reflectivity and flash density appears while Cindy was transitioning from a tropical storm to a tropical depression. However, during this time, there appeared to be a decrease in radar reflectivity. After Cindy became extra tropical, there appeared to be a correlation between maximum radar reflectivity and average flash density, as well as average areal rate and average flash density.

\textbf{Future Work}

- Extend this analysis to other tropical systems during the 2017 Hurricane Season to investigate lightning and storm transitions to more-detailed flash data and improved releases of GOES data.

\textbf{References}


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