NCAR efforts utilizing lightning products applicable to NextGen global aviation

Cathy Kessinger, Wiebke Deierling,
Matthias Steiner, David Johnson, Nancy Rehak

National Center for Atmospheric Research

Boulder, CO

Emails: kessinge@ucar.edu, deierlin@ucar.edu

Next Generation Requirements

- FAA Next Gen requirements for Global Airspace
  - Identification and forecasting of deep convection occurrence and intensity
  - Identification and forecasting of turbulence occurrence and intensity

- How can total lightning products improve deep convection identification and forecasts?

- Polar orbiter data provide opportunity of proof of concept

- Gaps:
  - Polar orbiter data latency negates real time use
  - Polar orbiter data have low spatial update rate that limits utility

Total Lightning as an Indicator of Storm Severity

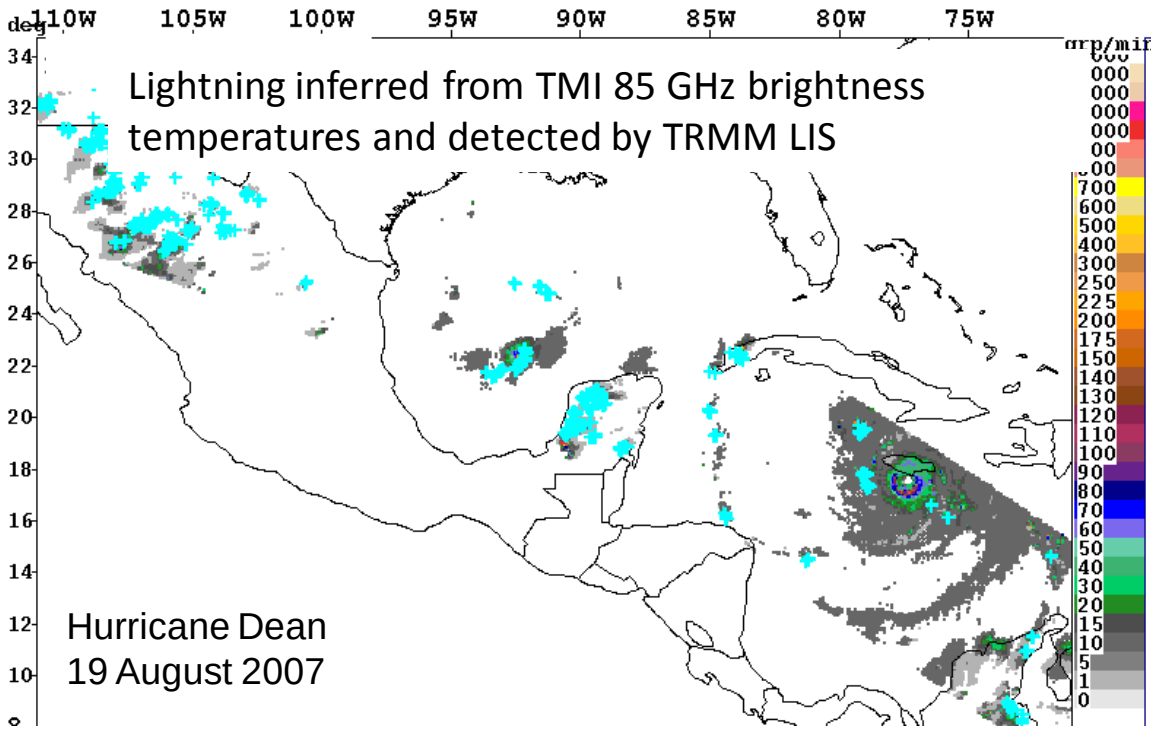
- Total lightning correlates well to storm parameters such as updraft strength, cloud top height, ice mass
- Total lightning measurements may improve the indication and forecast of convection and of convective turbulence
- Future launches of GOES-R and possibly third generation Meteosat satellites will make total lightning measurements available for 24/7 hemispheric coverage

Goal: Evaluate use of total lightning data in aviation decision support systems, like Global GTG, to determine possible improvements in the detection/forecast of hazardous weather.

Sponsored by NASA ROSES

Characteristics of Oceanic Convective Storms

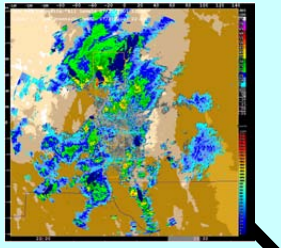
- Feasibility study to investigate product designed to meet FAA Next Gen requirements for Global Airspace. Data sets used:
  - Observed lightning: TRMM LIS
  - Inferred lightning: TRMM TMI and DMSP (37 and 85 GHz)
  - Low Earth orbit satellite imagery: TRMM VIRS
- Final product: global "Weather Hazard Map" of convection, lightning and turbulence
- If proven, technique applicable to oceanic and continental regions globally
  - Anticipating GOES-R GLM
- Leveraging/connecting with other ROSES proposals
  - Global Graphical Turbulence Guidance, John Williams
  - Global Convection Diagnosis and Nowcasting, Huaqing Cai



Comprehensive Lightning Forecast System

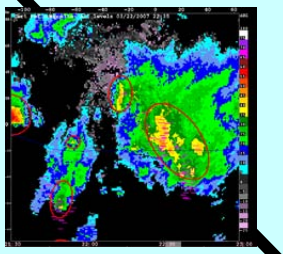
NCAR-ATEC 4D Weather (4DWX) Development

0 min



Detection & Monitoring

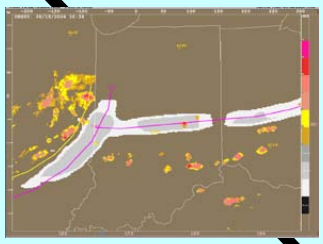
5-15 min



Near Real-time

Saxen et al, 2002

30-60 min

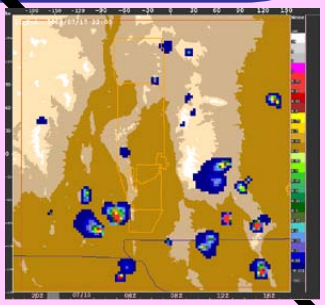


Nowcasting

Mueller et al, 2003
Nelson et al, 2009

Tactical Planning

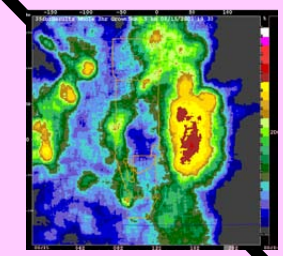
1-48 hrs



Forecasting

Deierling et al, 2009

Long term



Climatology

Saxen et al, 2008

Strategic Planning

Forecast Lead Time