Daily and Annual Cycles of Precipitation and Convection over the Continental United States

Frédéric Fabry

McGill University

Montreal, Canada

ERAD 2012 – Toulouse, France – 28 June 2012

Daily and Annual Cycles of Precipitation and Convection over the Continental United States

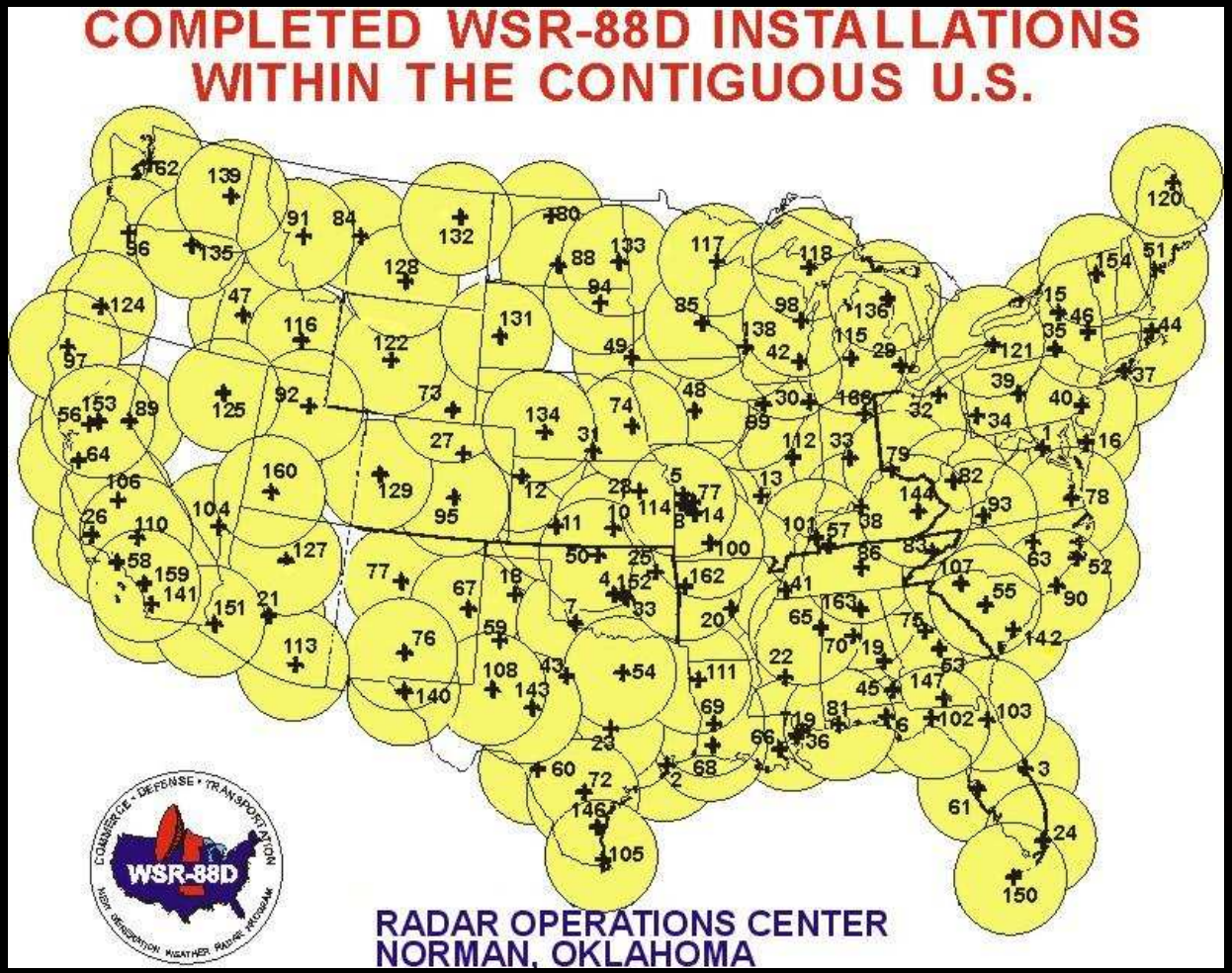
Frédéric Fabry

McGill University

Montreal, Canada

ERAD 2012 – Toulouse, France – 28 June 2012

Why? 1) The Data



- Same radars since the mid-90s
+ Good coverage
+ Attention to data quality
= Valuable info for climatology uses

- Ready-made mosaics (since Nov 1995) [blessing & curse]

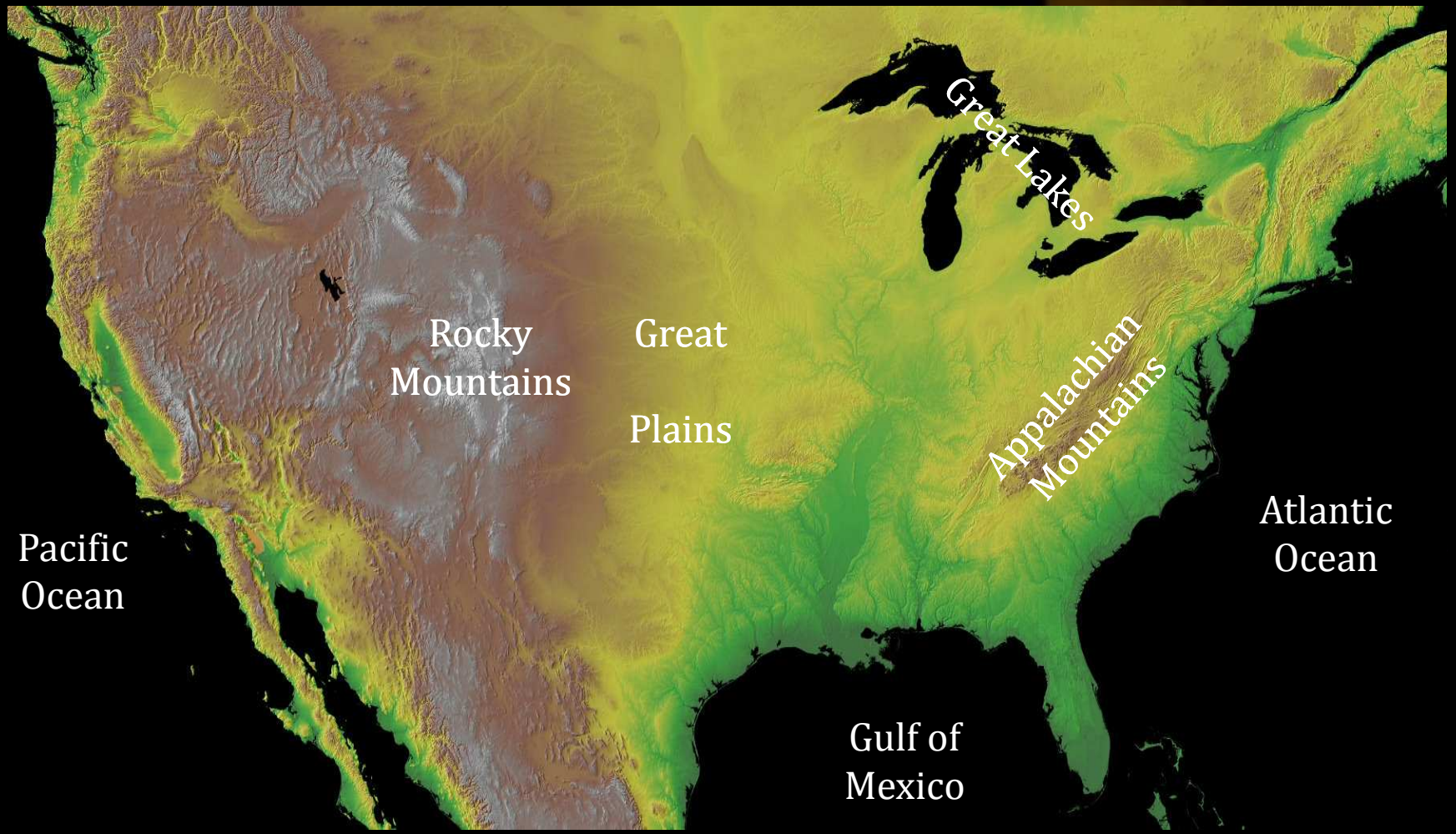
2) Uses of a Radar Echo Climatology

- Harder-to-obtain properties of precipitation and storms
  - How often? [Limited frequency statistics]
  - How strong? [Rare (areal) intensity statistics]
  - At what time? [Little records of timing info]

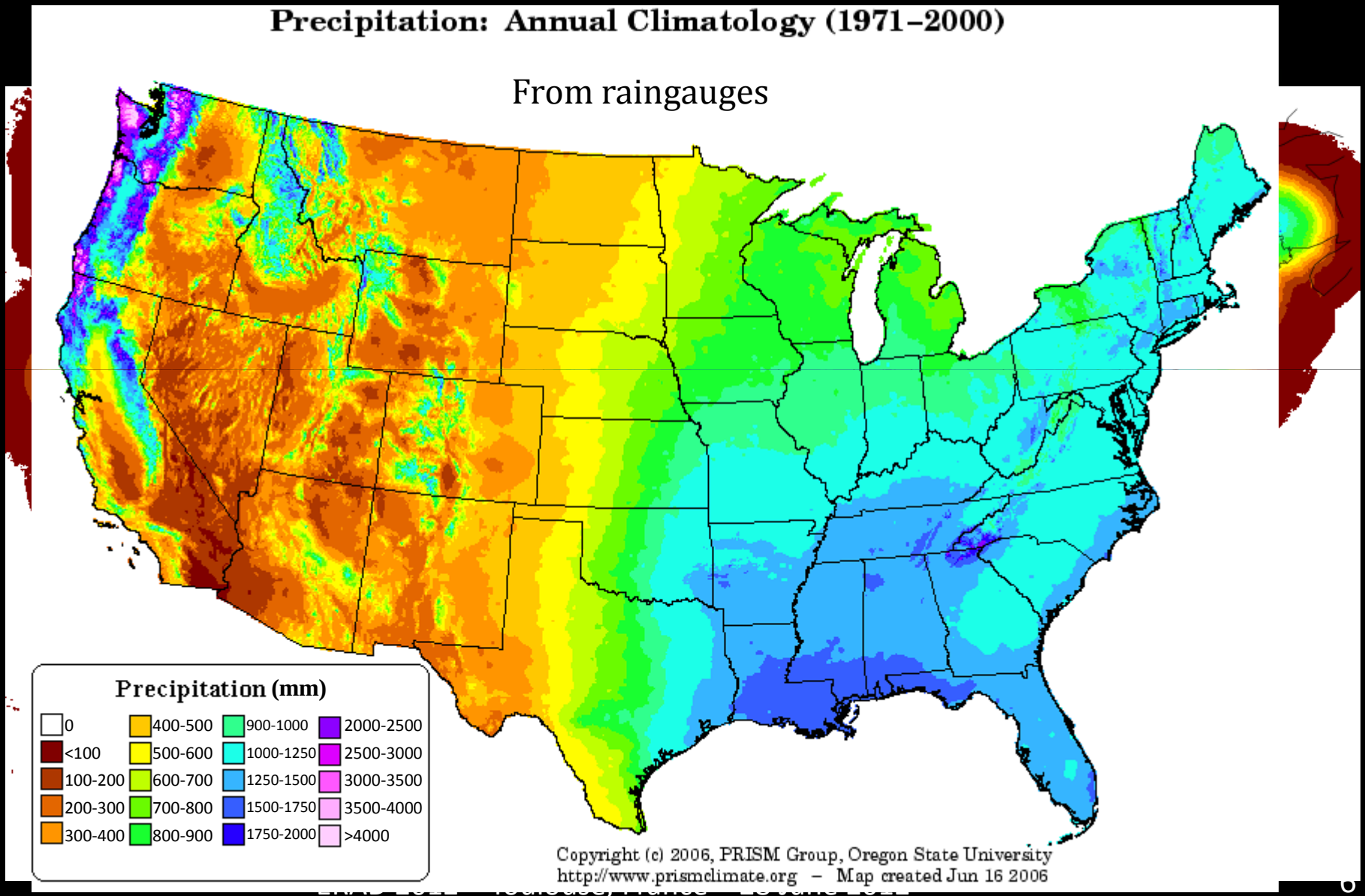
- Data quality issues
  - Quality of radar coverage (detection, precipitation)

- Unexplored resource for research and teaching
  - Repeated forcing revealed, no event peculiarities.

U.S. Geography and Topography

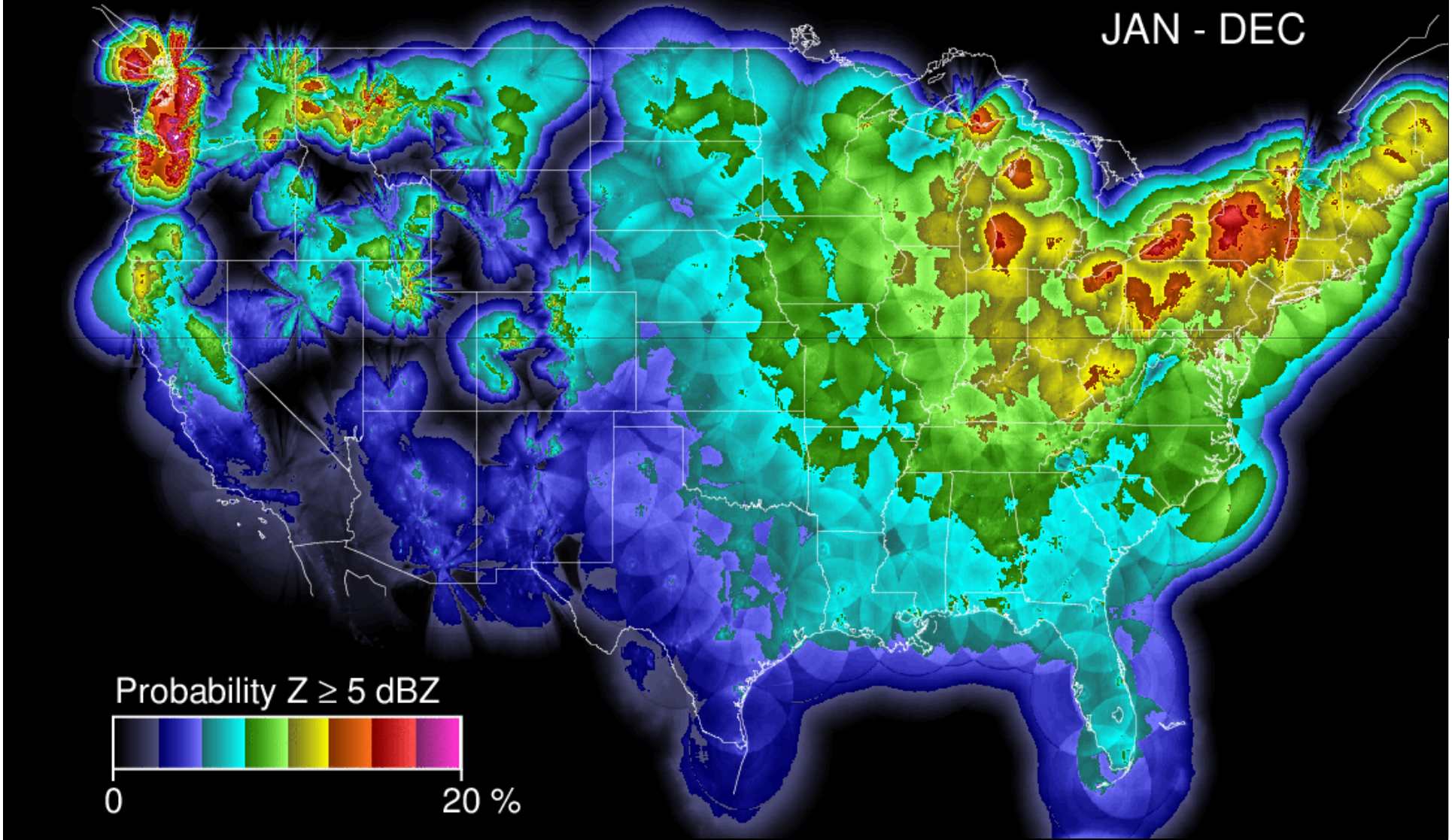


Radar and Gauge Based Climatology



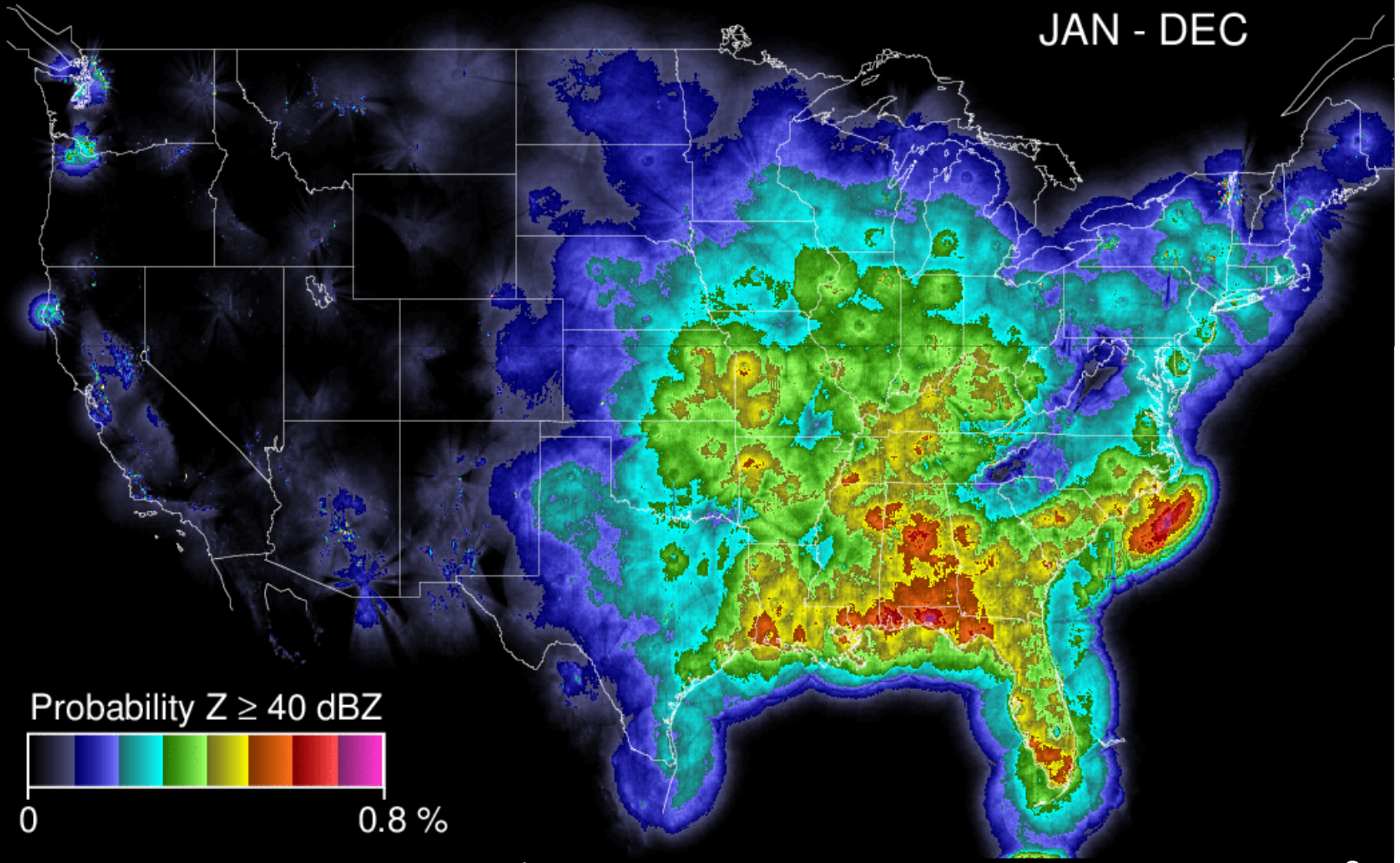
Radar Echo Occurrence Climatology

"All" weather echoes

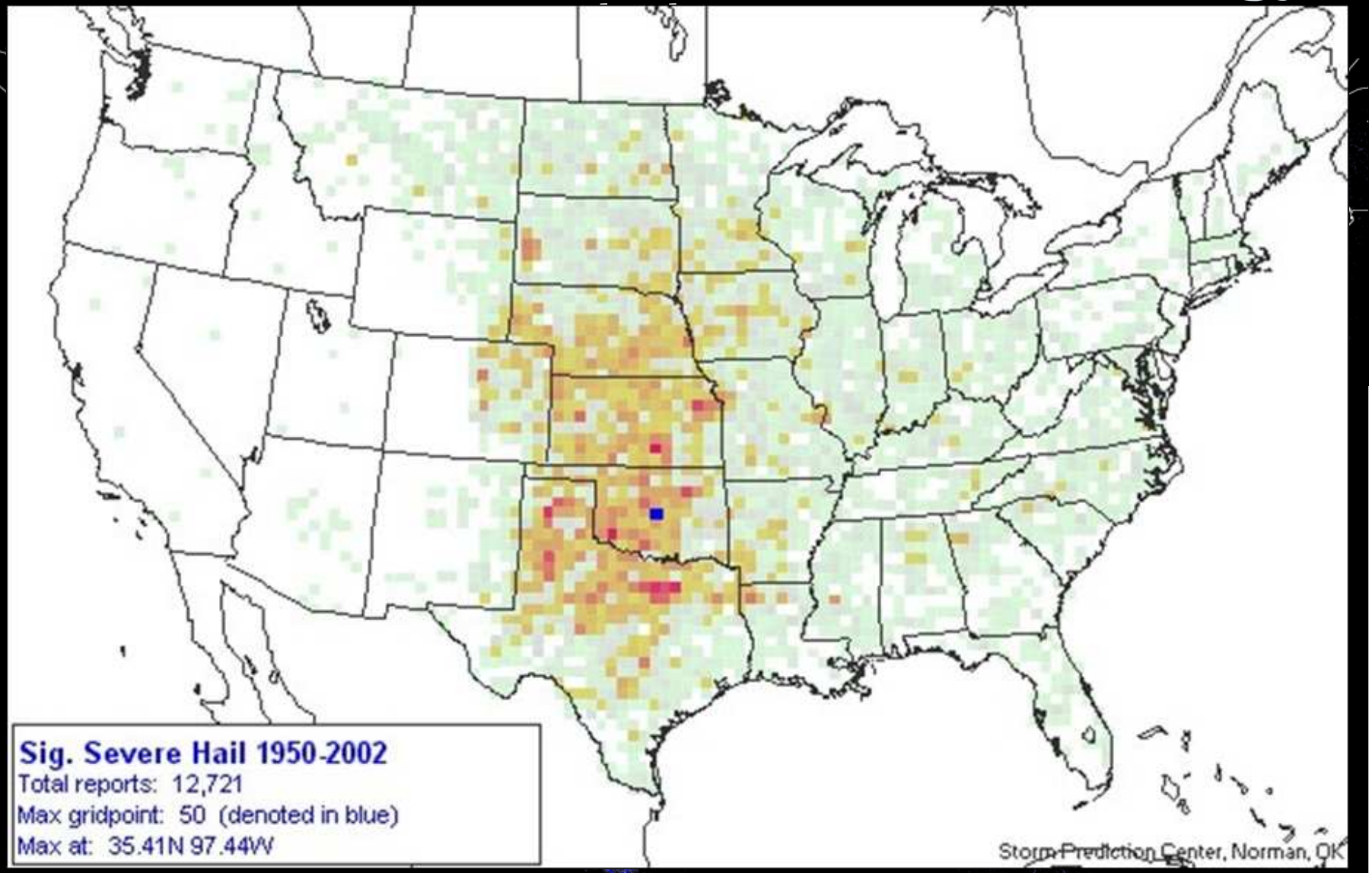


Radar Echo Occurrence Climatology

Convective echoes

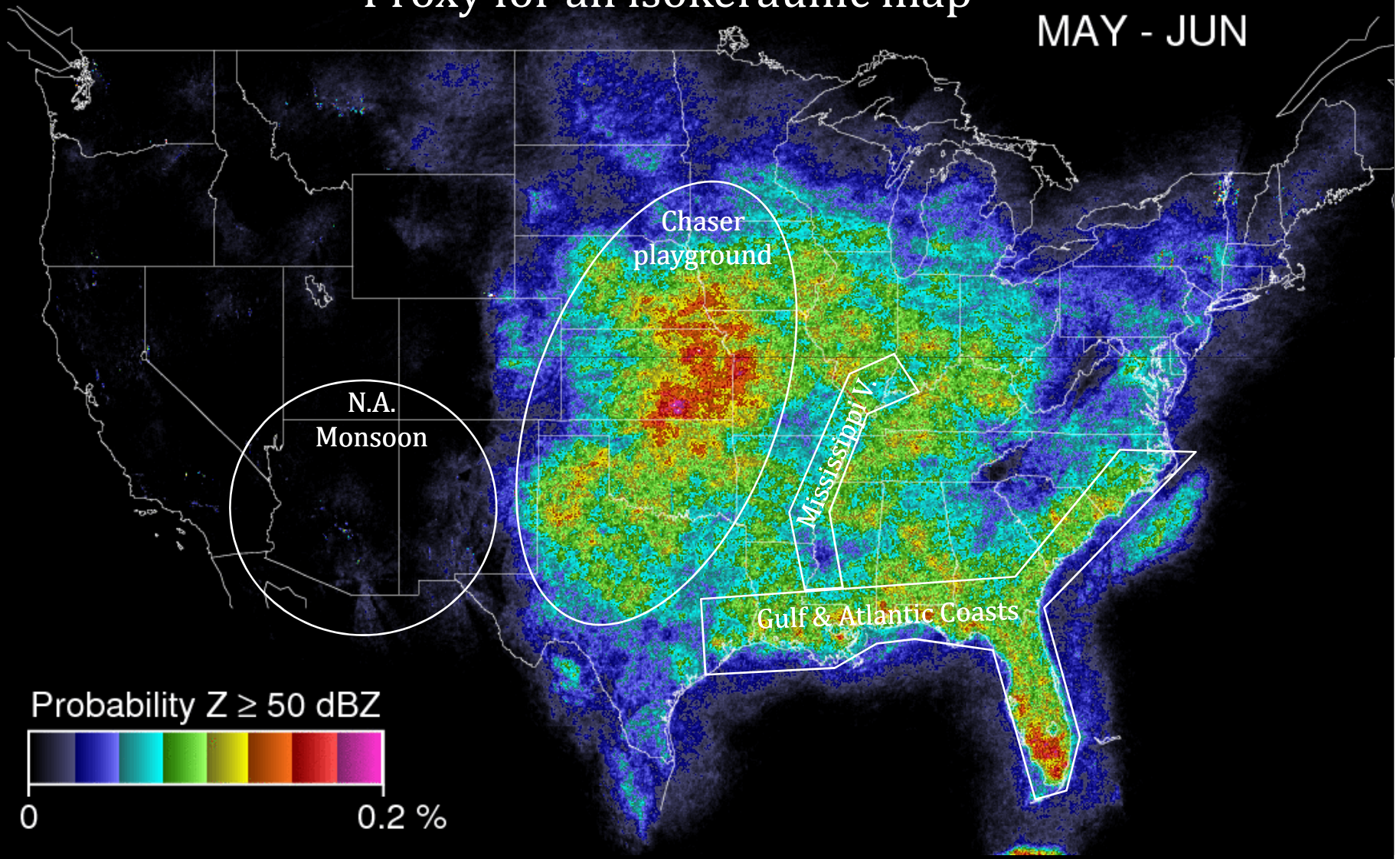


Radar Echo Occurrence Climatology

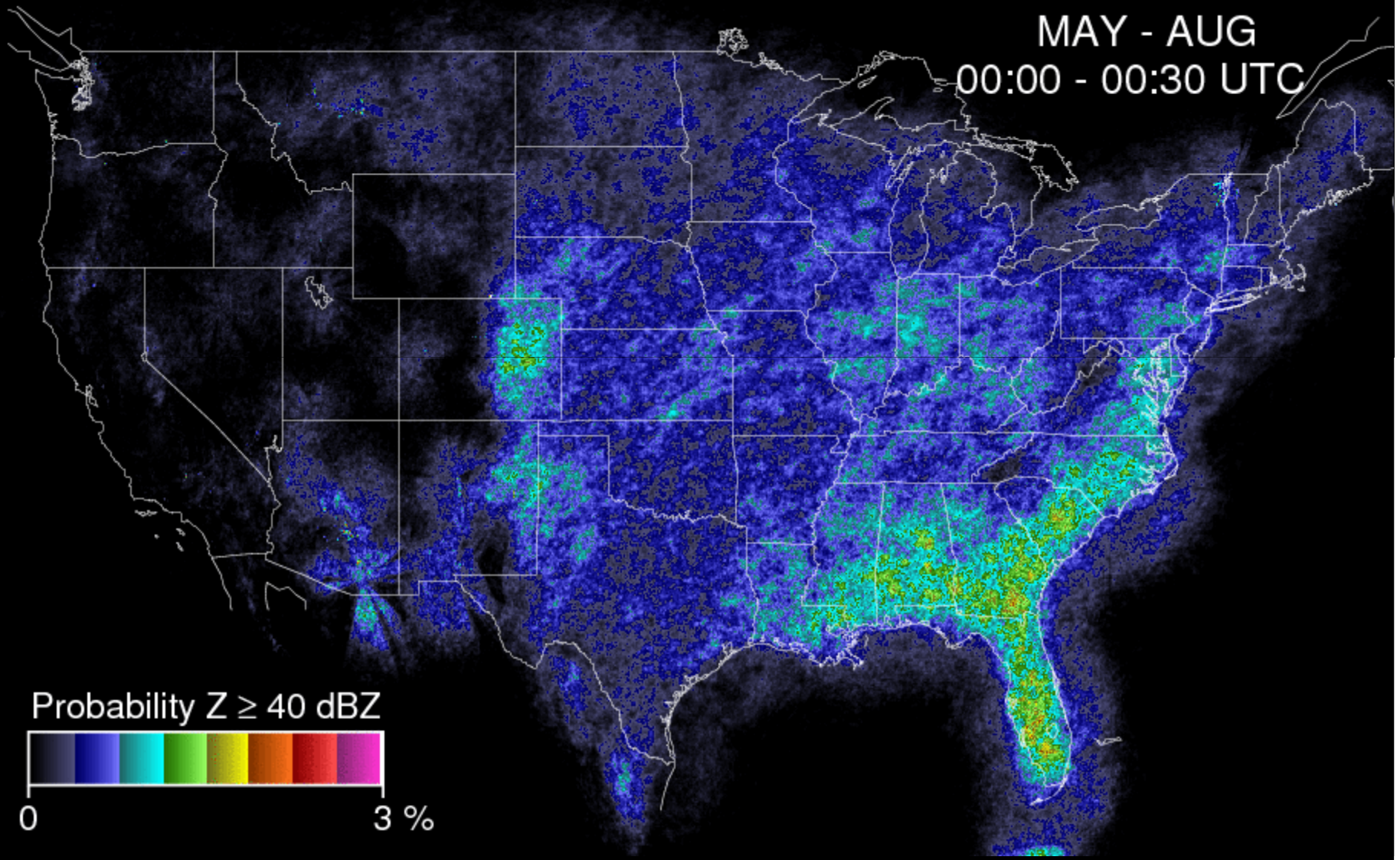


Severe Convection – Spring v. Summer

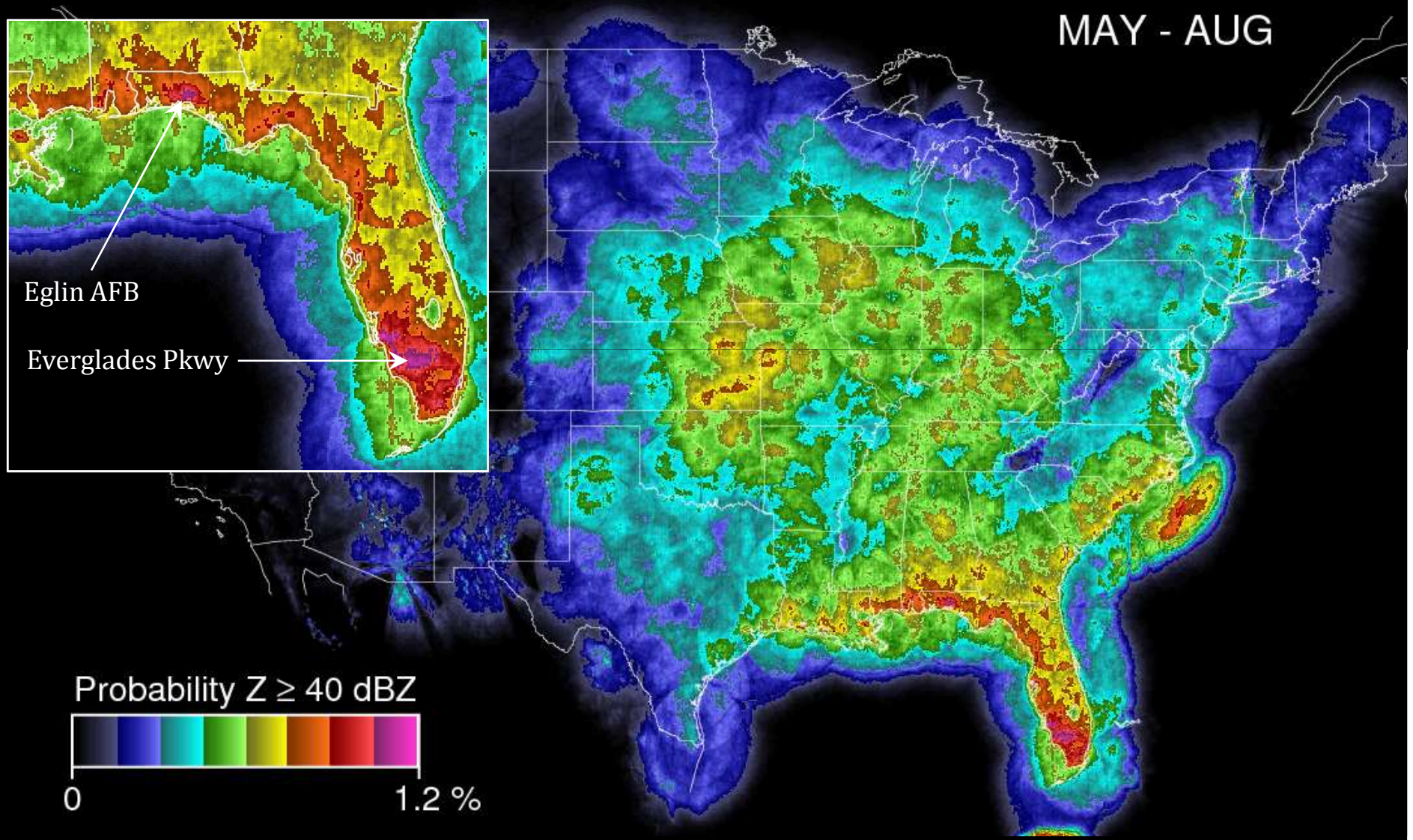
Proxy for an isokeraunic map



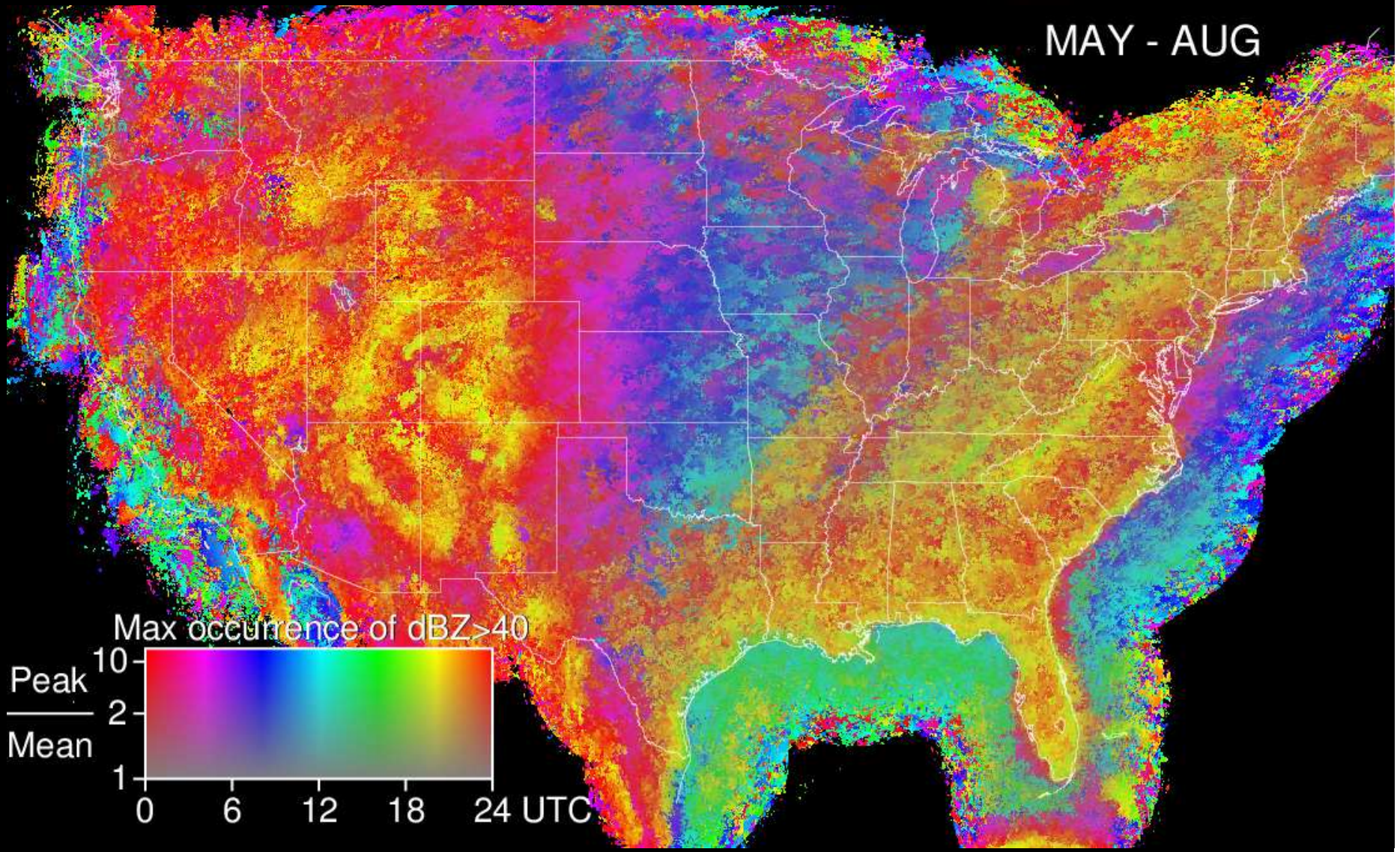
Diurnal Cycle – Summer Convection



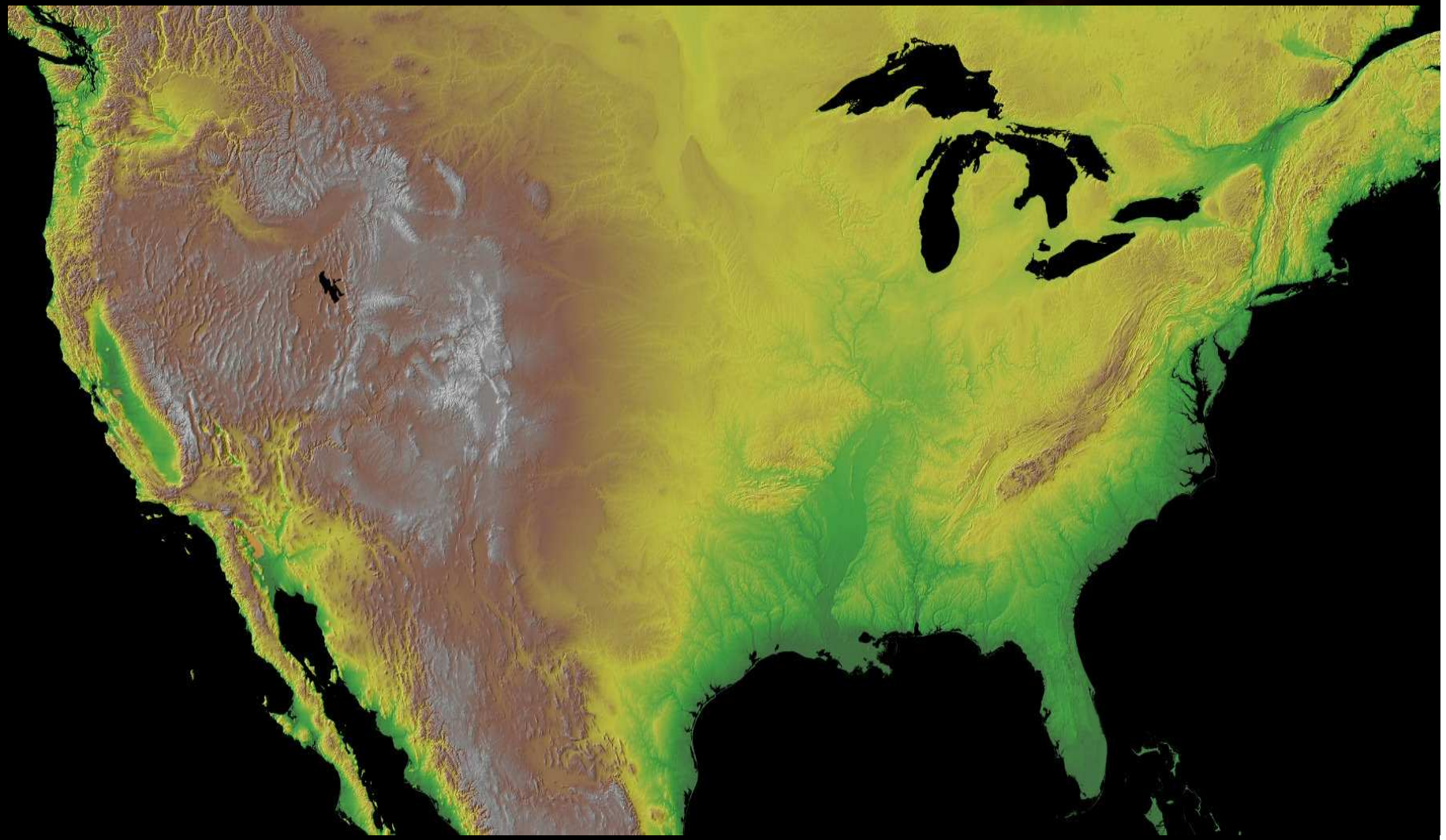
Likelihood of Convection



Time of Highest Likelihood of Convection



Topography



Terrain

Uses of a Radar Echo Climatology

- Flooding event characteristics

  From gauges, we know Intensity-Frequency-Duration rainfall properties. With radars, we can add area:

  1) For a catchment of a specific size, how often do we expect to exceed a particular threshold amount for the whole catchment?

  [To improve on "area reduction" factors]

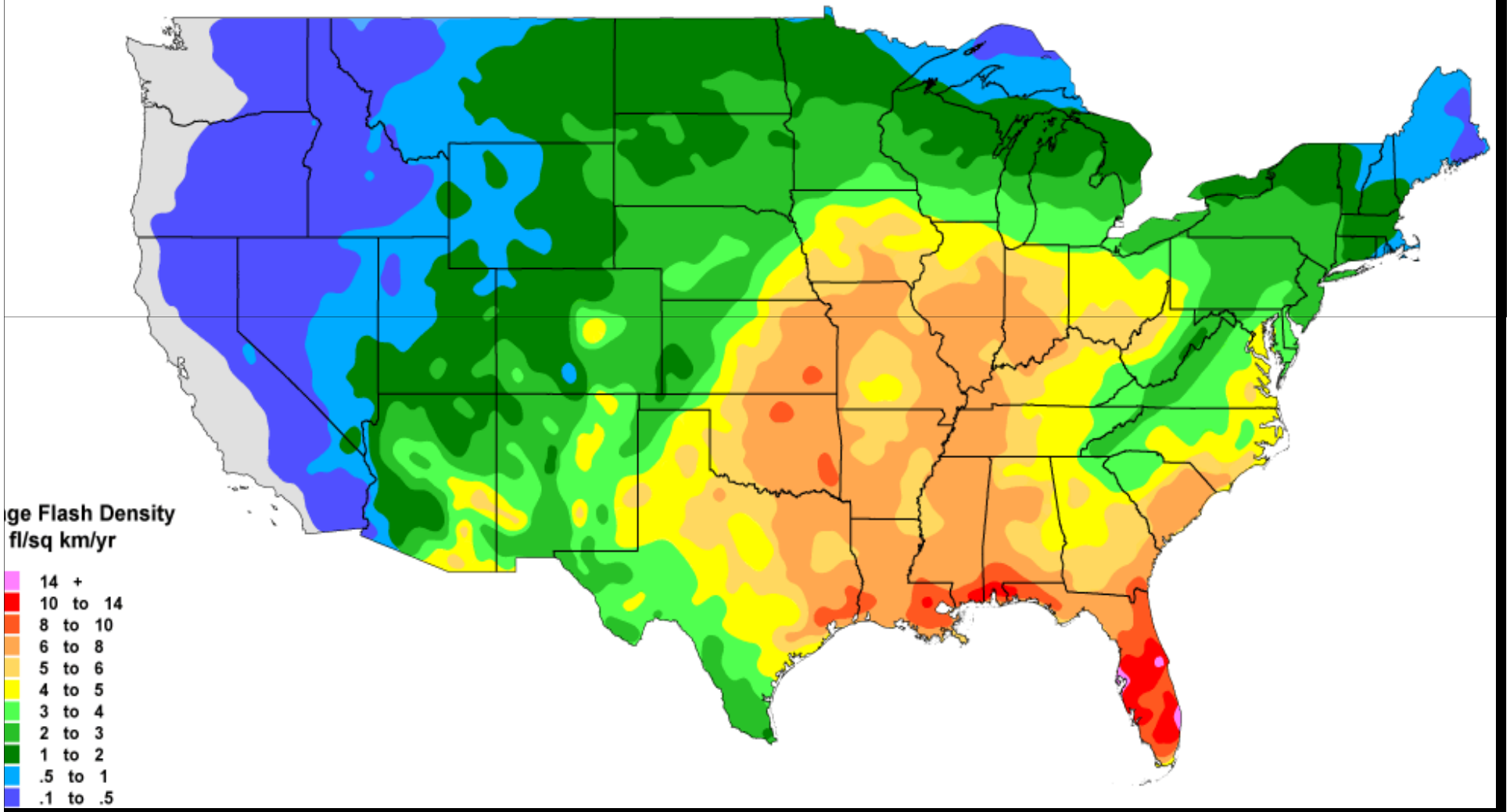
  2) For a catchment of a specific size, how often do we expect to exceed a particular threshold amount somewhere in that catchment?

  [Occurrence of overflow of portions of the catchment]

Uses of Radar Echo Climatology Data

- Document precipitation characteristics; implications
  - Frequency of occurrence v. intensity, timing
  - Event timing and catchment management practices
- Help for nowcasting
  - Is precipitation expected to appear, grow, or decay?
- Illustration of weather phenomena
  - Event type and their location/timing distribution
  - Breezes and convection (sea, land, mountain)
- Imagination is the limit. What are your thoughts?

Cloud-to-Ground Lightning Incidence in the Continental U.S. (1997 - 2010)



Severe Convection –Spring v. Summer