

# Statistical Properties of ENI CG/IC Flashes Relative to NLDN CG Flashes over CONUS

01/05/2015

Jess Charba MDL LAMP\* convection/lightning leader

Judy Ghirardelli MDL LAMP manager/leader

Fred Samplatsky MDL

Andy Kochenash MDL

Phil Bothwell SPC

Chris Sloop ENI



AMS 7<sup>th</sup> Conference on Meteorological Applications of Lightning Data

\* LAMP = Localized Aviation MOS Program developed by MDL



# What Types of Lightning Data Exist over CONUS?

- Cloud-to-ground (CG) flashes
  - Provided by National Lightning Detection Network (NLDN / Vaisala, Inc) since 1989
  - Provided by Earth Networks, Inc (ENI) since 2009
- Total lightning (TL) data
  - Consist of separate CG and in-cloud (IC) flashes
  - Provided by ENI since ~ 2009
  - Provided more recently by Vaisala\*

\* Vaisala IC data not included in study ...MDL did not have access to an archive



# What Questions Were Addressed in Study?

- How do recent NLDN and ENI CG statistics compare?
  - Have recent CG data evolved over time?
- How do recent ENI CG and IC statistics compare?
  - Have recent data evolved over time?

These questions are important to NWS because –

- Accurate, stable data are needed for forecast/warning and modelling applications



# Data Samples/Stratifications Used in Study

- NLDN and ENI samples = **Jan 2012 to present**
- Consider major ENI upgrades
  - 04 Jun 2013
  - 04 Jun 2014
- Data analysis
  - Flash counts tabulated in 10 km gridboxes by day (12z - 12z)
  - Study restricted to **warm season** (Apr – Sep)
- Warm season sub-divisions
  - “Before Jun 2013 ENI upgrade”
  - “Btwn Jun 2013 and 2014 ENI upgrades”
  - “After Jun 2014 ENI upgrade”



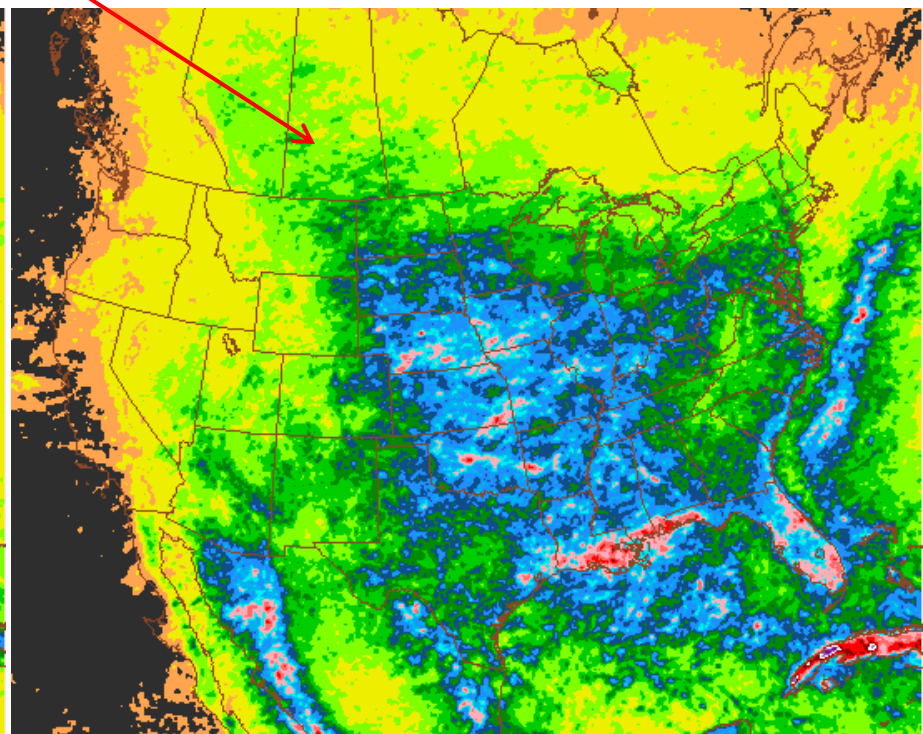
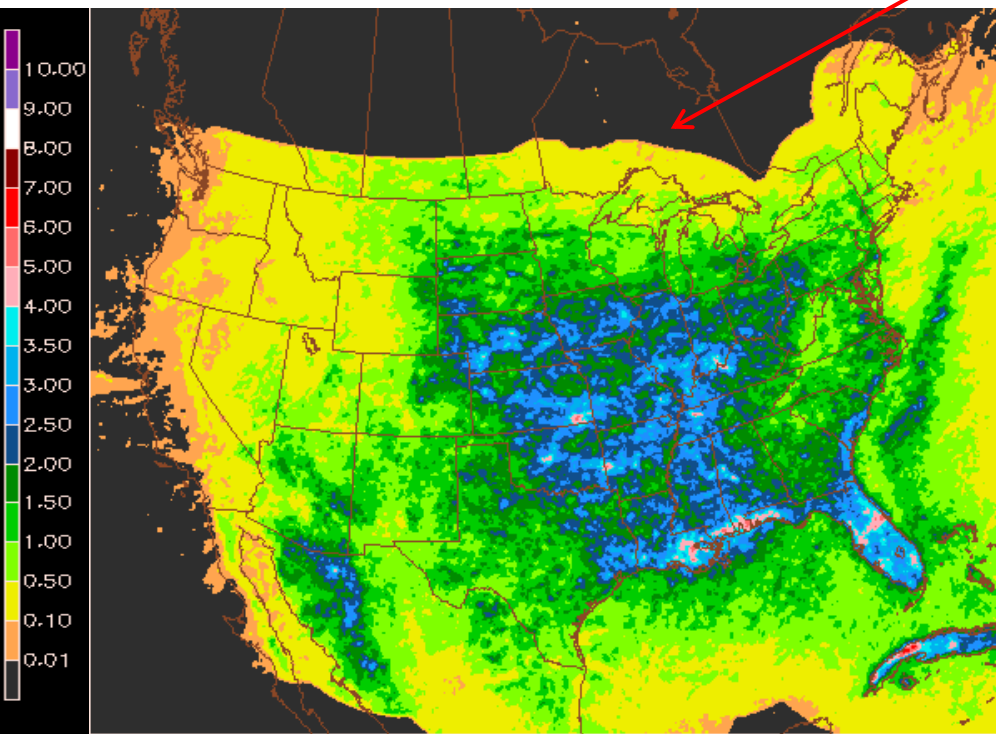
# Mean Daily CG Count

Full warm seasons of 2012 - 2014

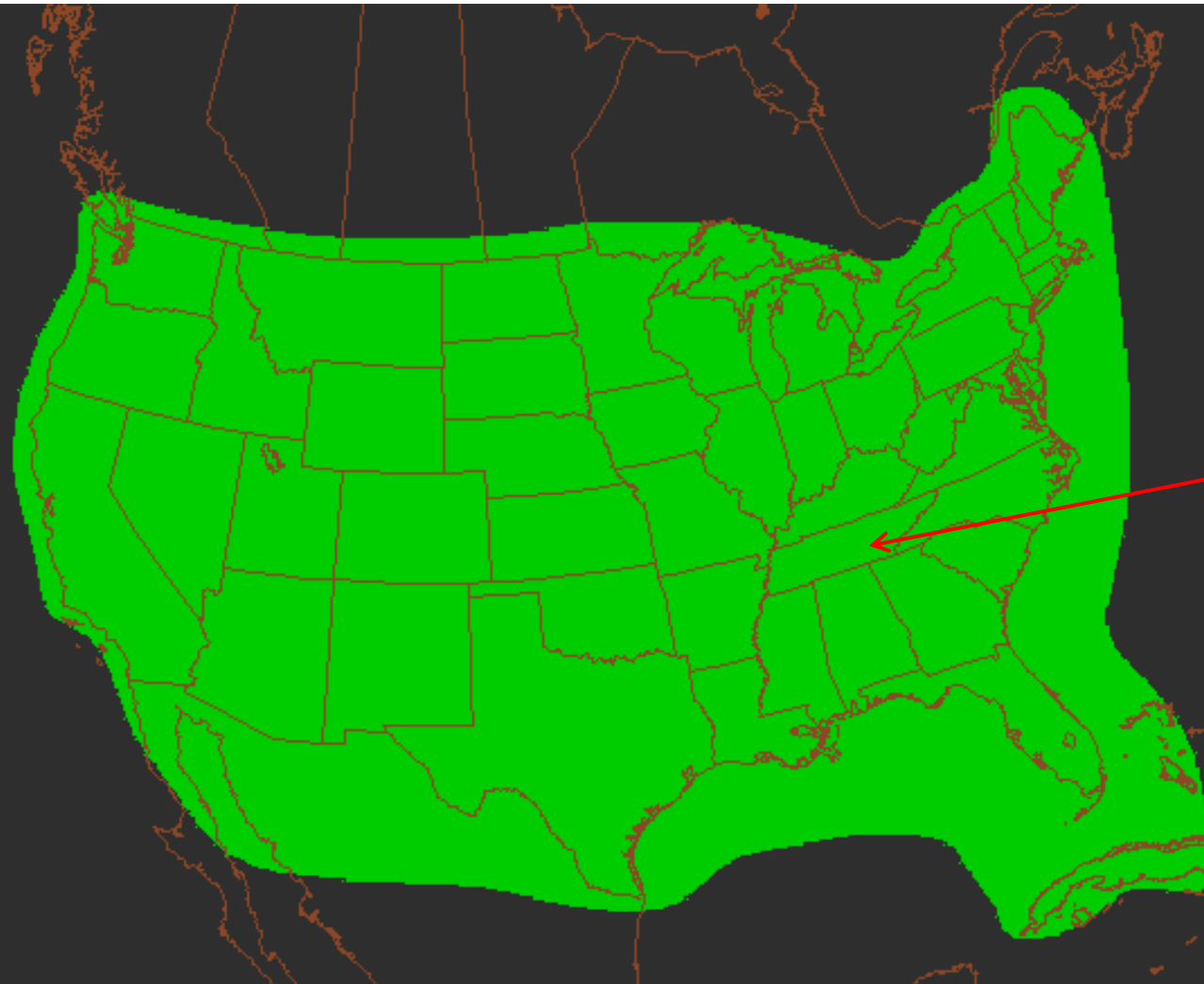
NLDN

NLDN CG coverage is less than for ENI

ENI



# Flash Count Tabulation Grid and “CONUS” Aggregating Area

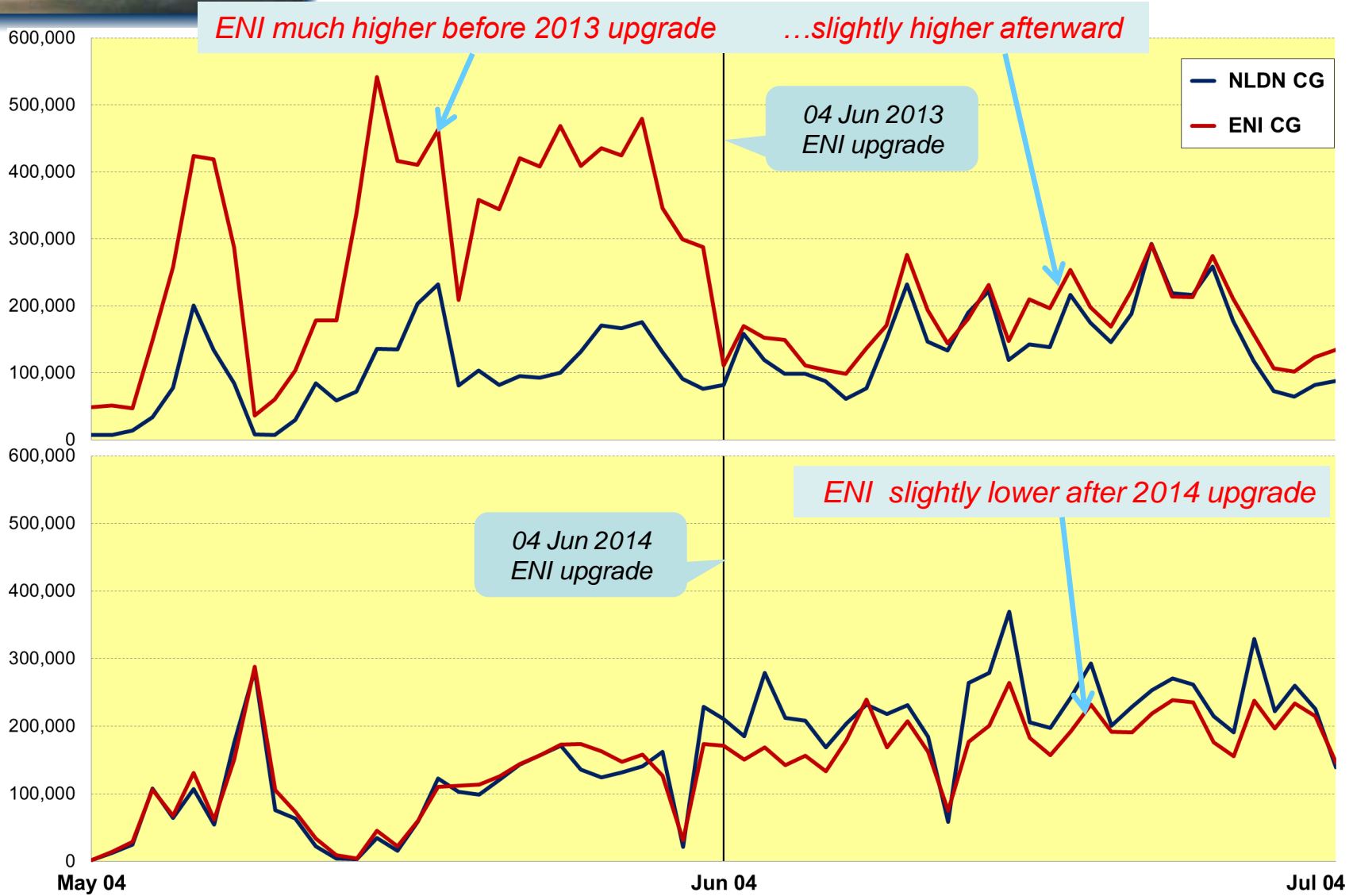


Grid boundary

“CONUS” aggregating area

# NLDN and ENI Daily CG Count over CONUS

Date period = +/- 30 days from ENI upgrade dates





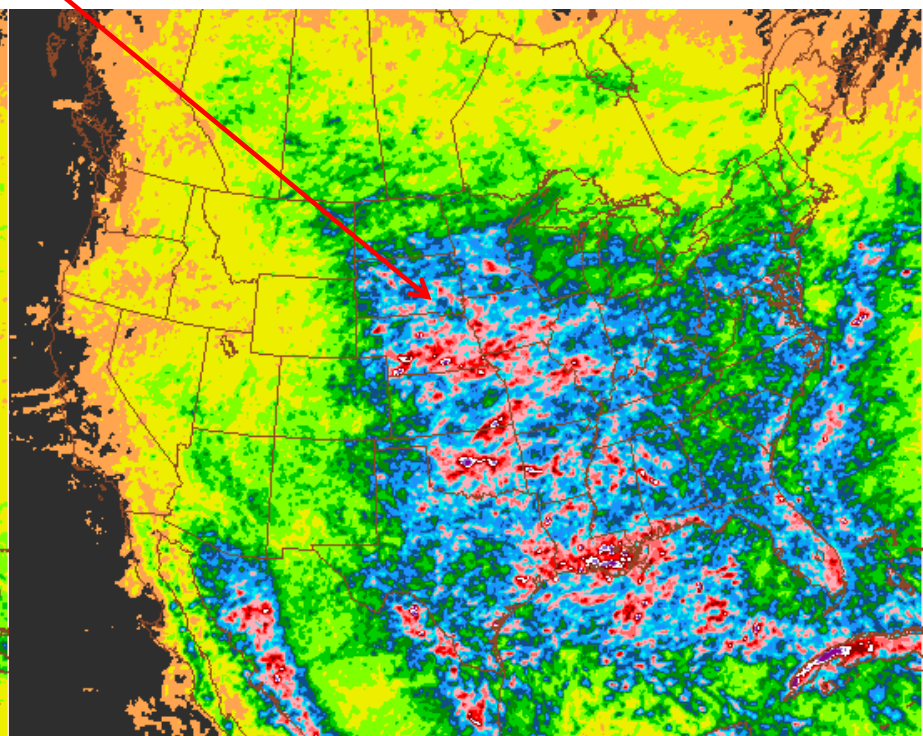
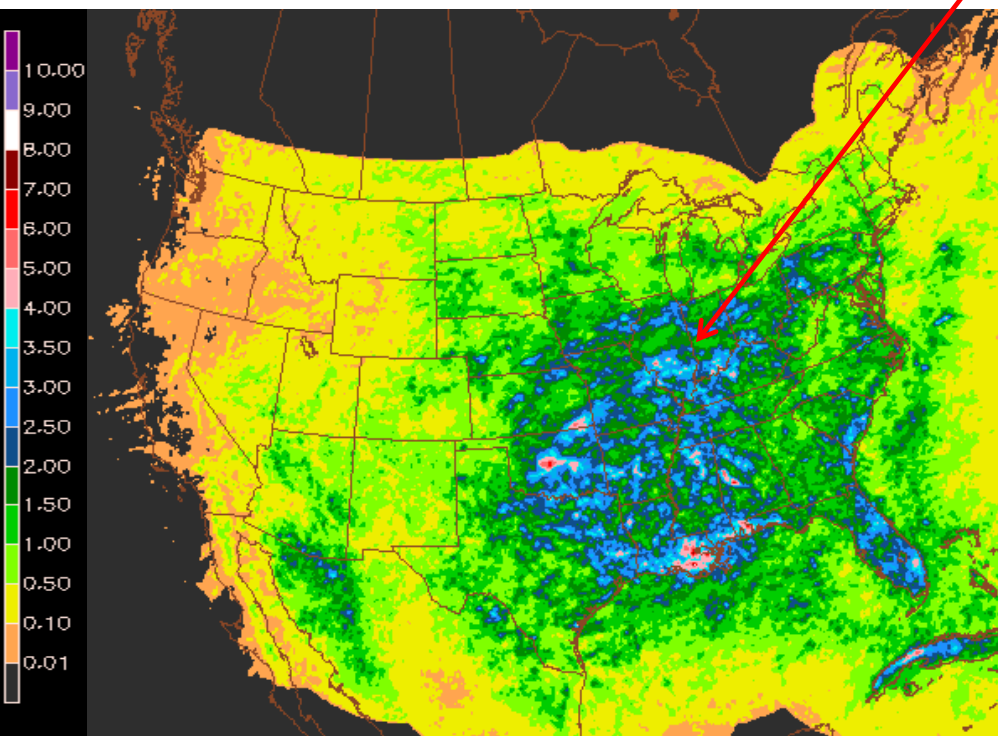
# Mean Daily CG Count

Before June 2013 ENI upgrade

NLDN

*ENI much higher*

ENI







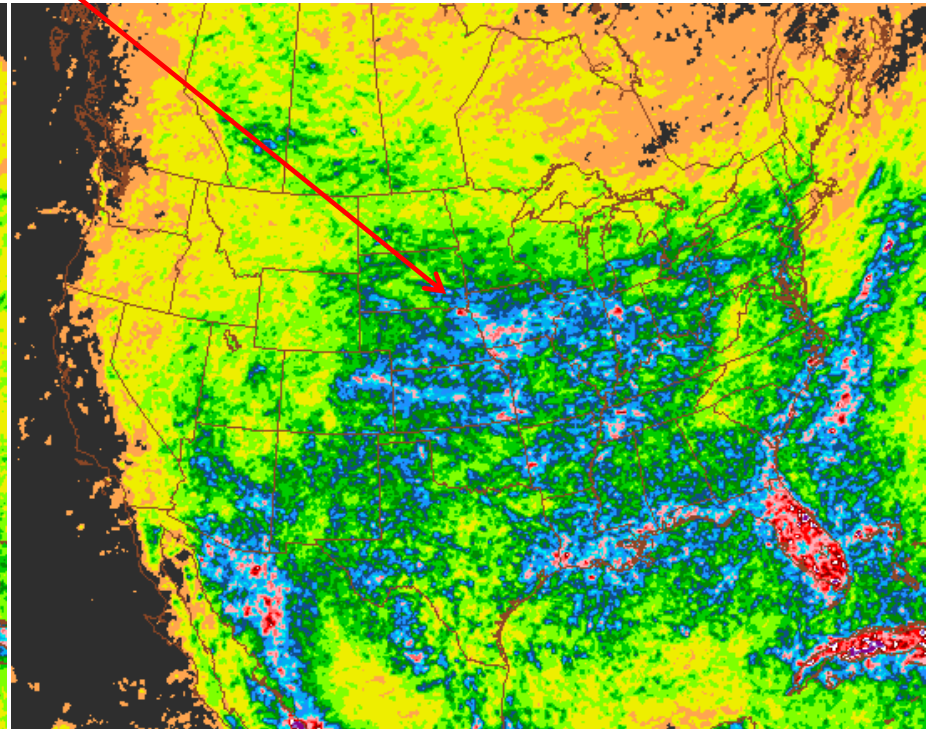
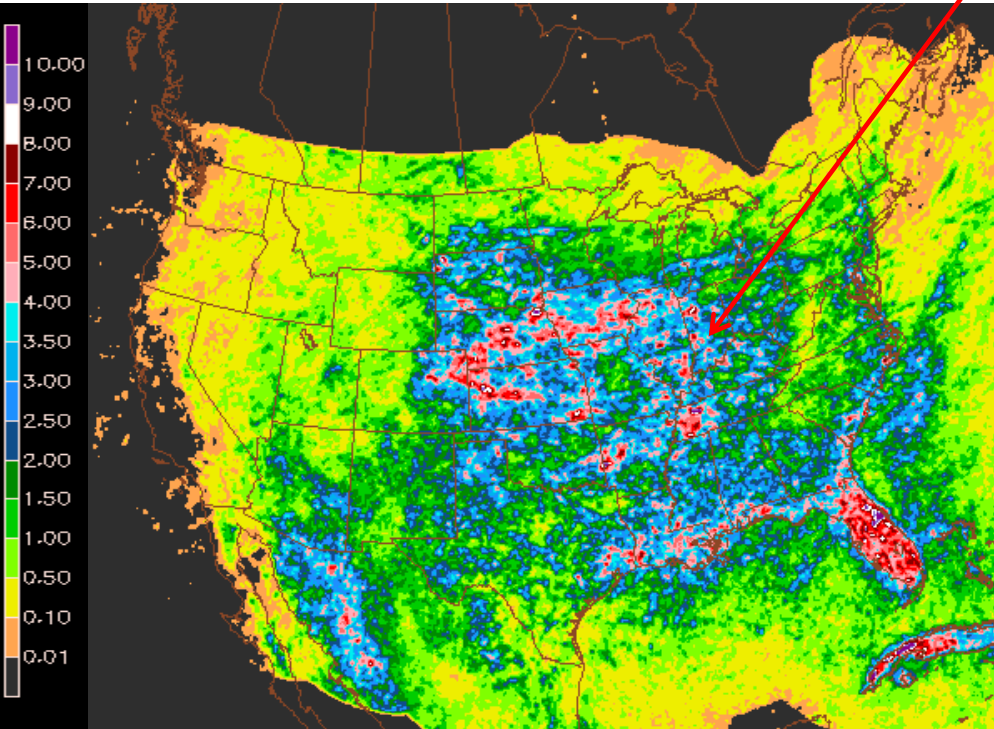
# Mean Daily CG Count

After June 2014 ENI upgrade

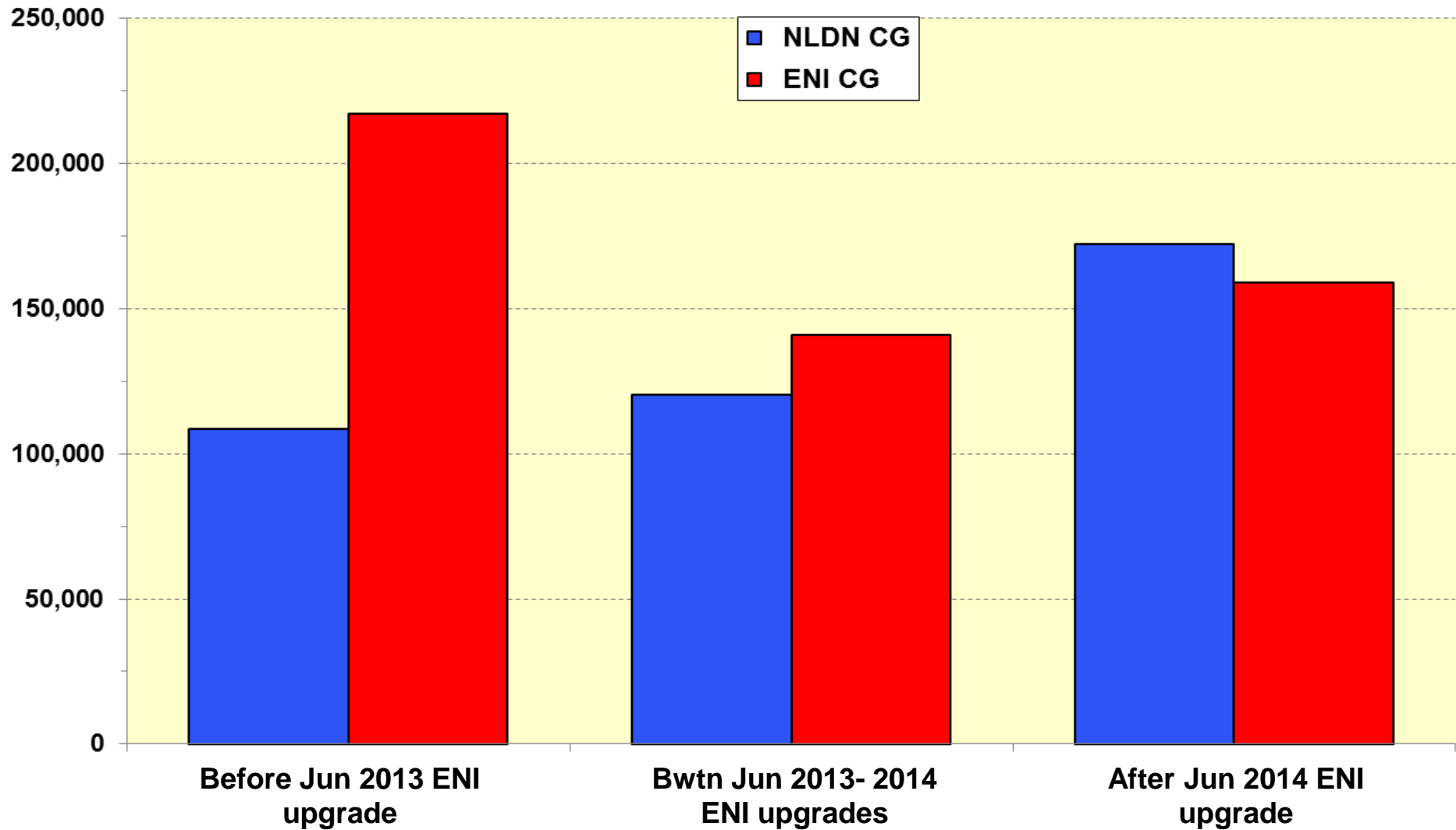
NLDN

*ENI slightly lower*

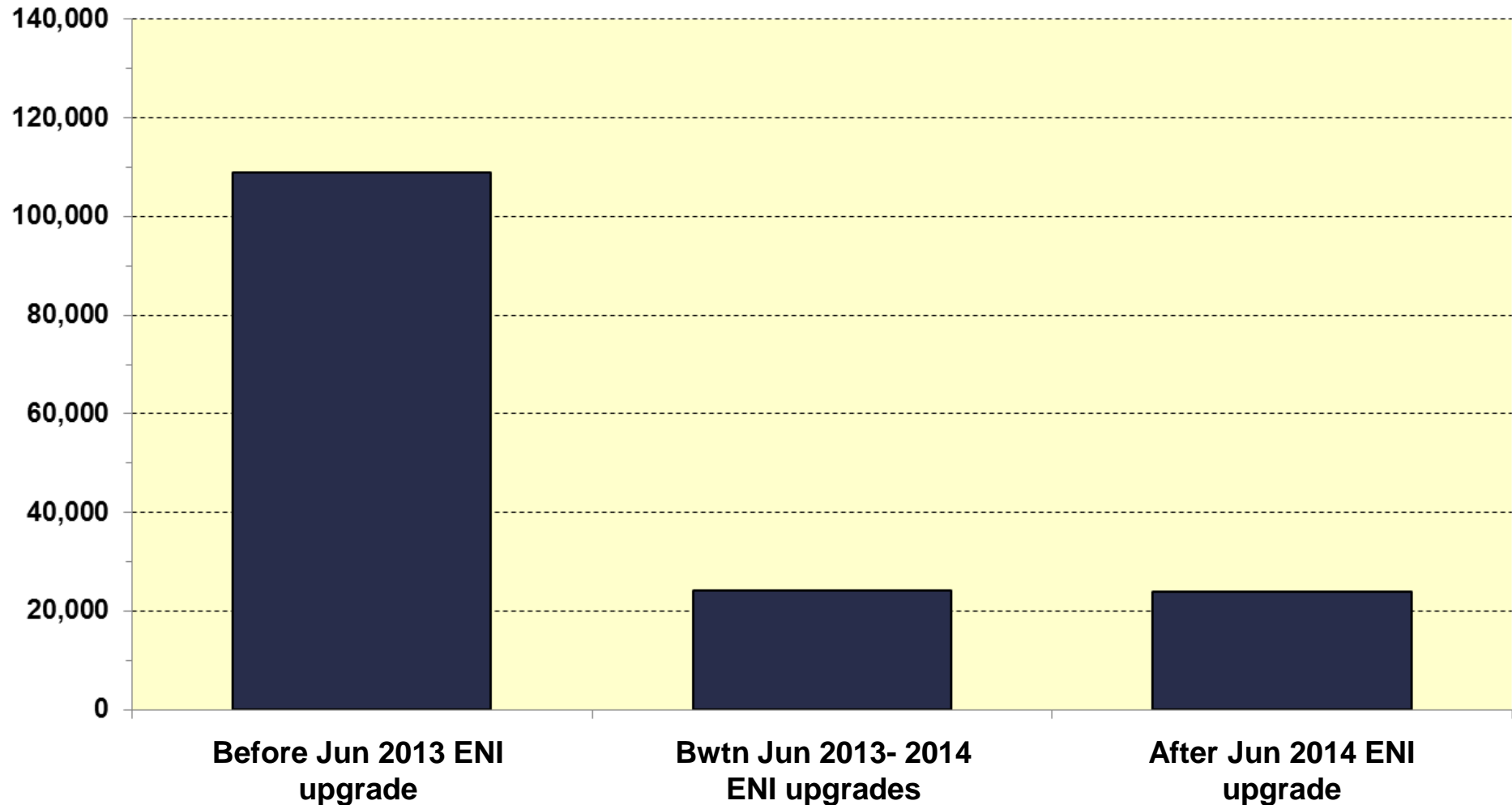
ENI



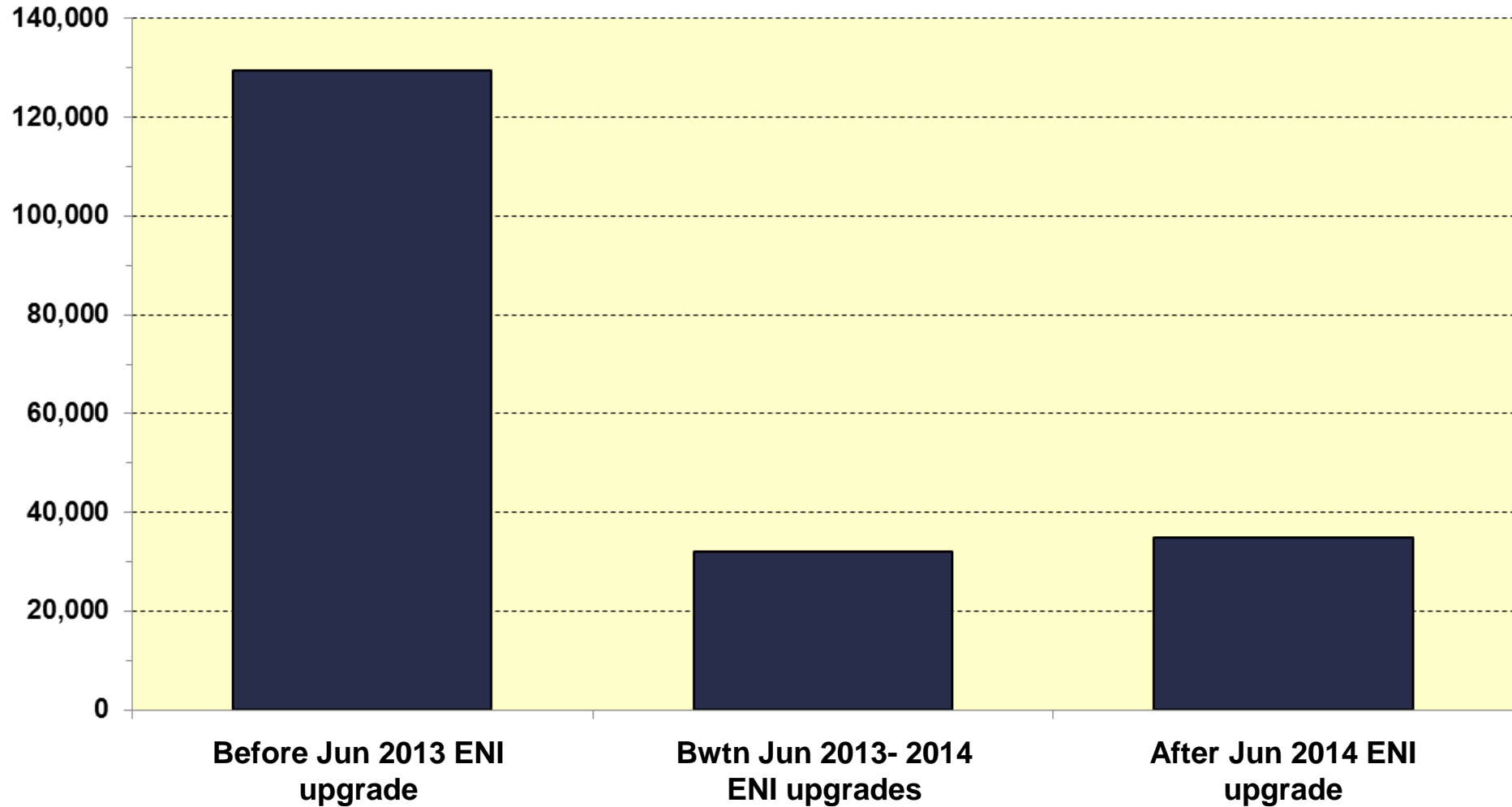
# Mean Daily NLDN and ENI CG Count over CONUS



# Mean Absolute Difference of ENI and NLDN Daily CG over CONUS

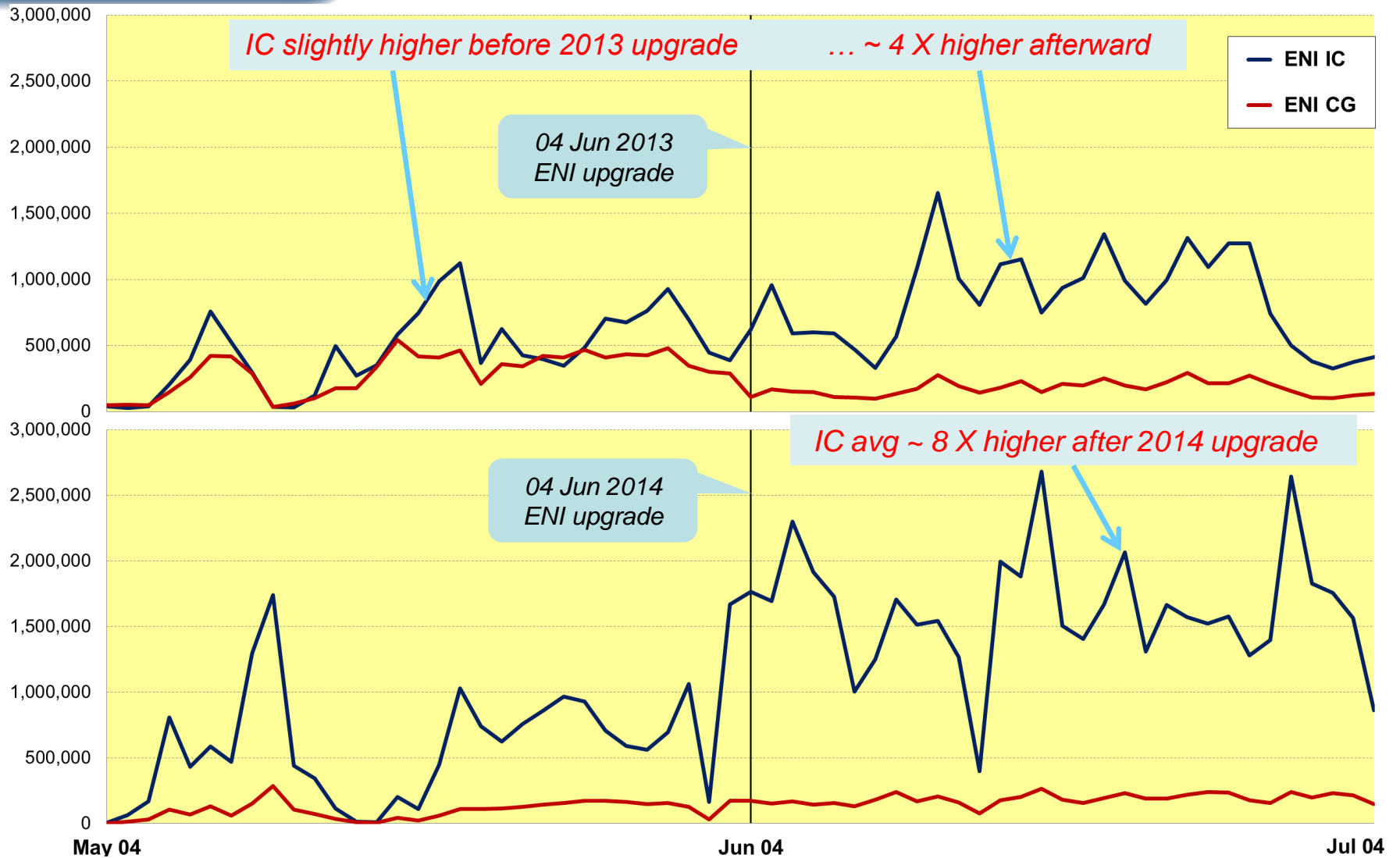


# RMS Difference of ENI and NLDN Daily CG over CONUS



# ENI Daily IC vs CG Count over CONUS

Date period = +/- 30 days about ENI upgrades

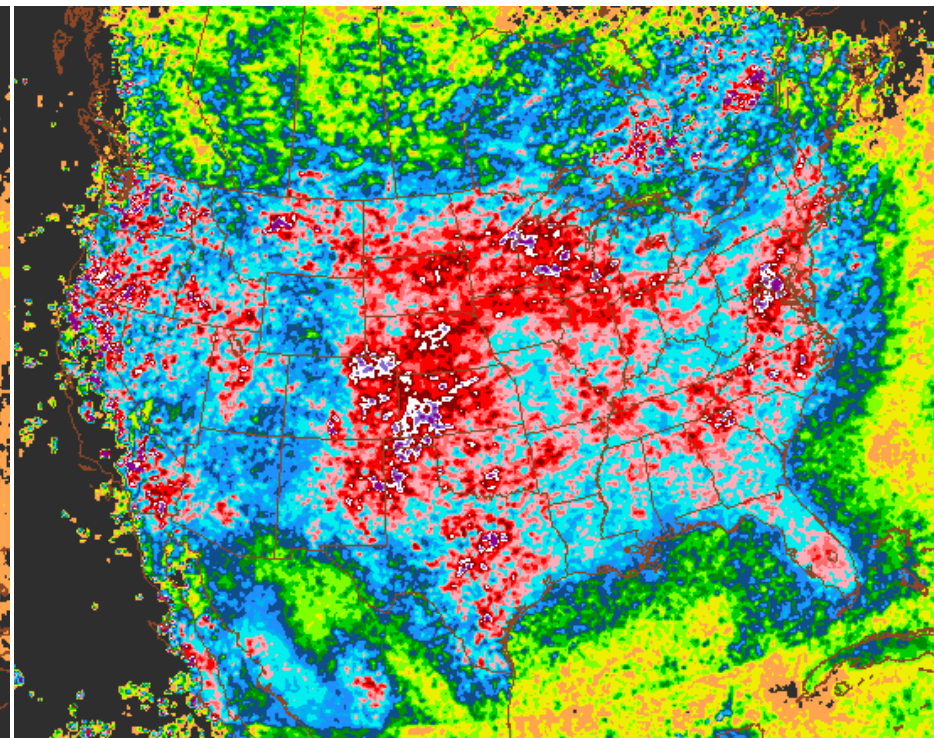
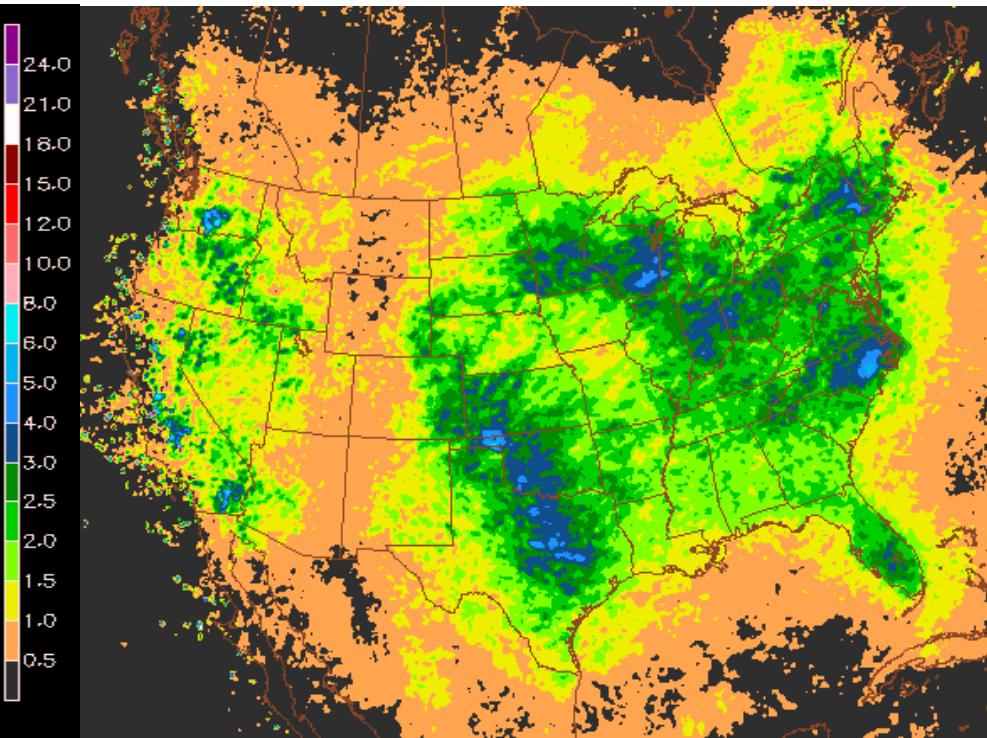




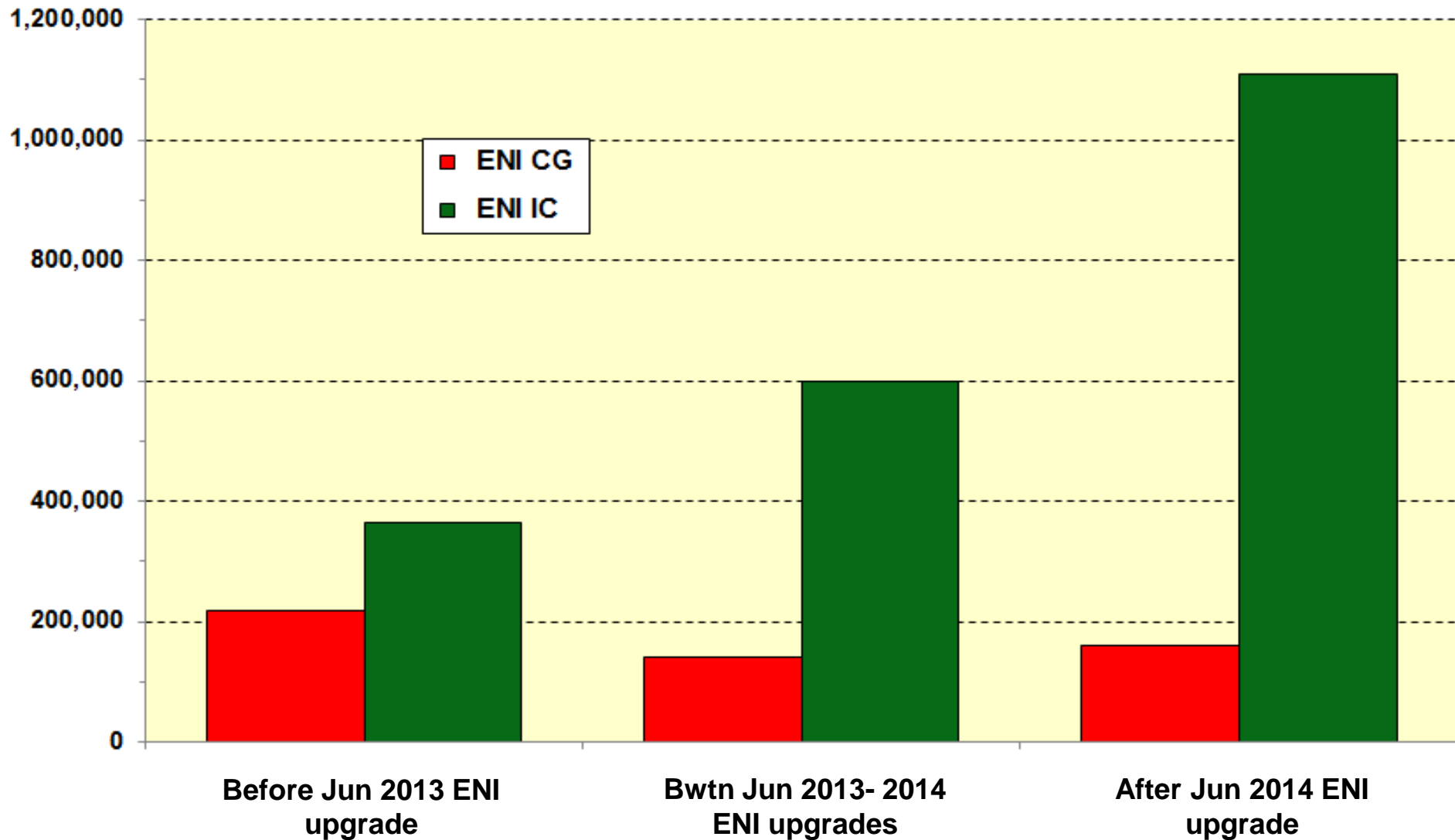
# Mean of ENI Daily IC/CG

*Before June 2013 upgrade*

*After June 2014 upgrade*



# Daily Mean ENI IC and CG Count over CONUS





# Summary of Findings

- ENI warm season CG counts were generally -
  - Much higher than NLDN CG counts before June 2013 ENI upgrade
  - Slightly higher than NLDN CG counts between 2013 and 2014 ENI upgrades
  - Slightly lower than NLDN CG counts since June 2014 ENI upgrade

Note: Possible evolution of NLDN CG counts during this period is not known

- ENI warm season IC versus CG counts –
  - IC slightly higher before June 2013 upgrade
  - IC ~ 4 times higher between 2013 and 2014 upgrades
  - IC ~ 7 times higher since June 2014 ENI upgrade

Note: True IC versus CG counts are not known





# Conclusions

- ENI upgrade in June 2013 has greatly improved CG flash count consistency with NLDN CG counts over CONUS
- ENI upgrades in 2013 and 2014 have greatly increased IC flash counts over CONUS



# Questions ?