

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

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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”



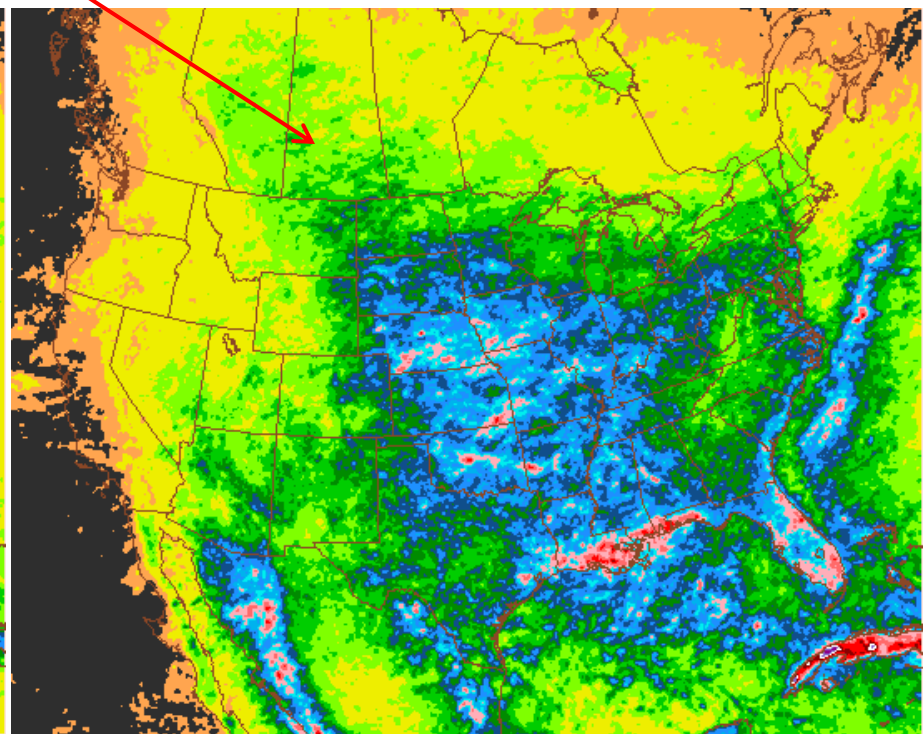
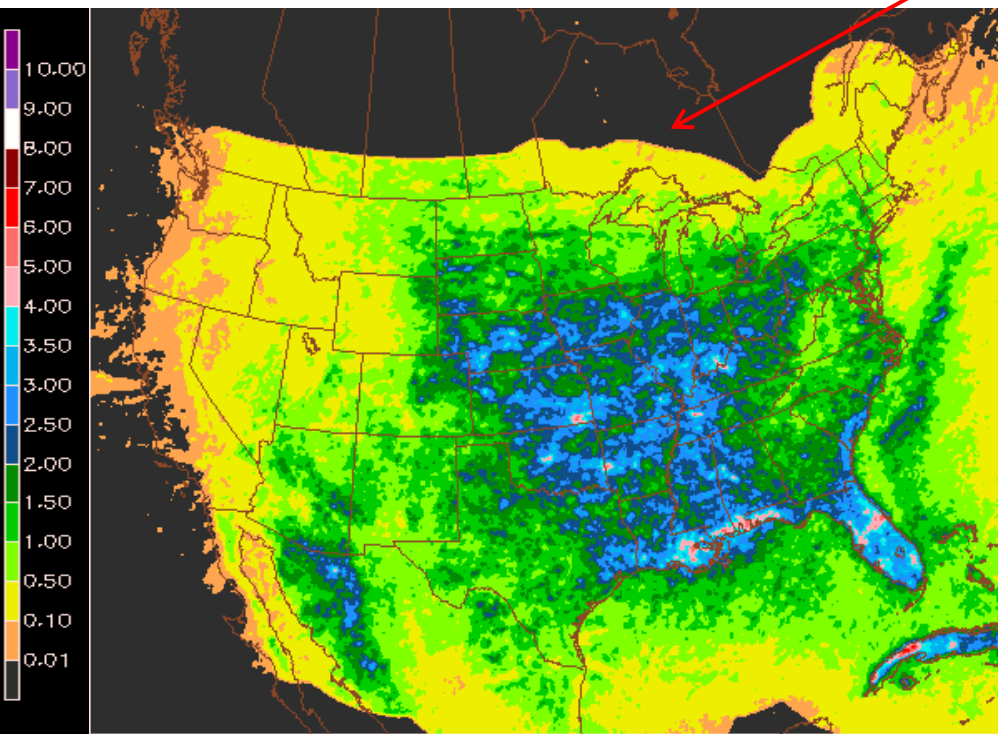
Mean Daily CG Count

Full warm seasons of 2012 - 2014

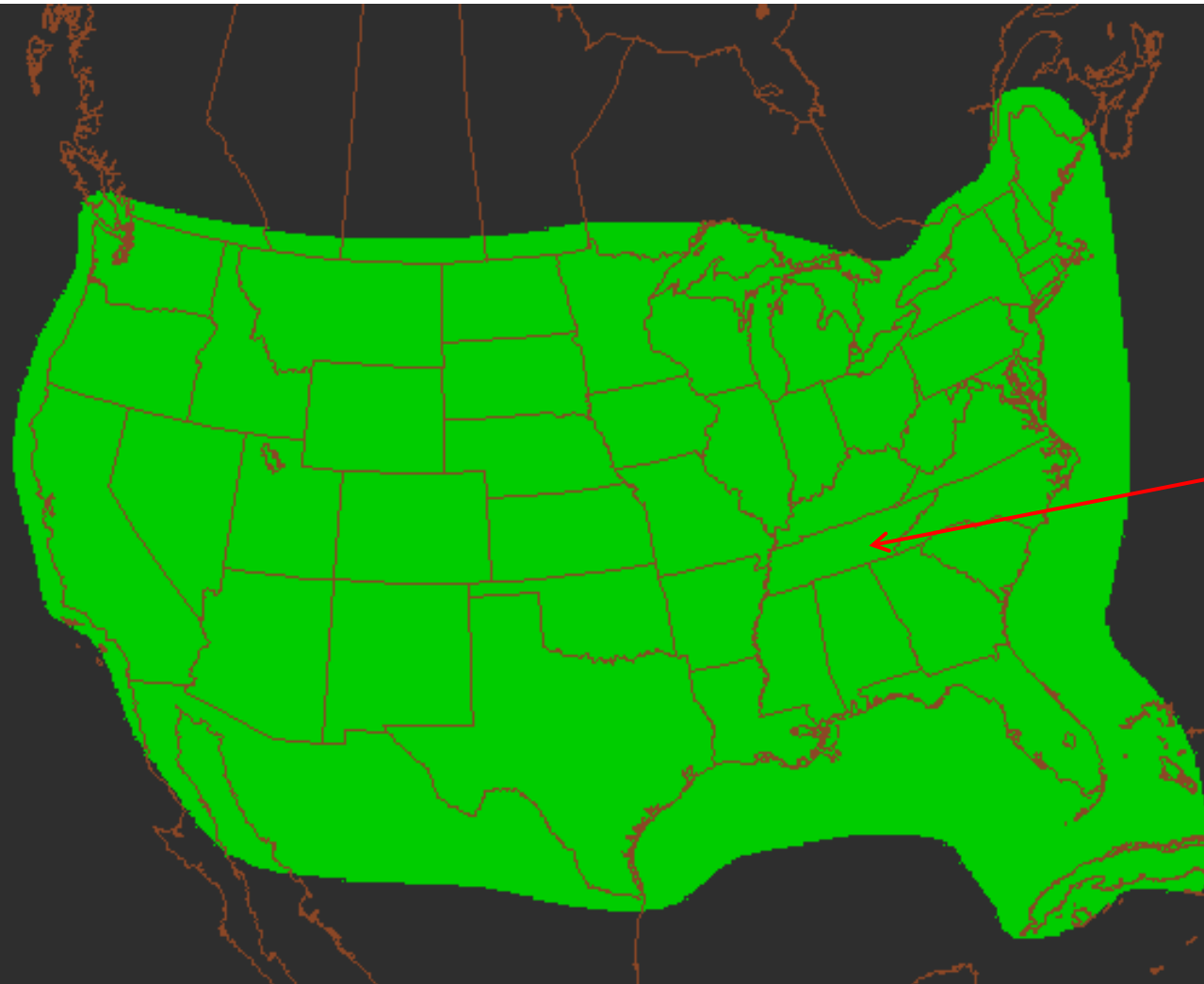
NLDN

NLDN CG coverage is less than for ENI

ENI



Flash Count Tabulation Grid and “CONUS” Aggregating Area

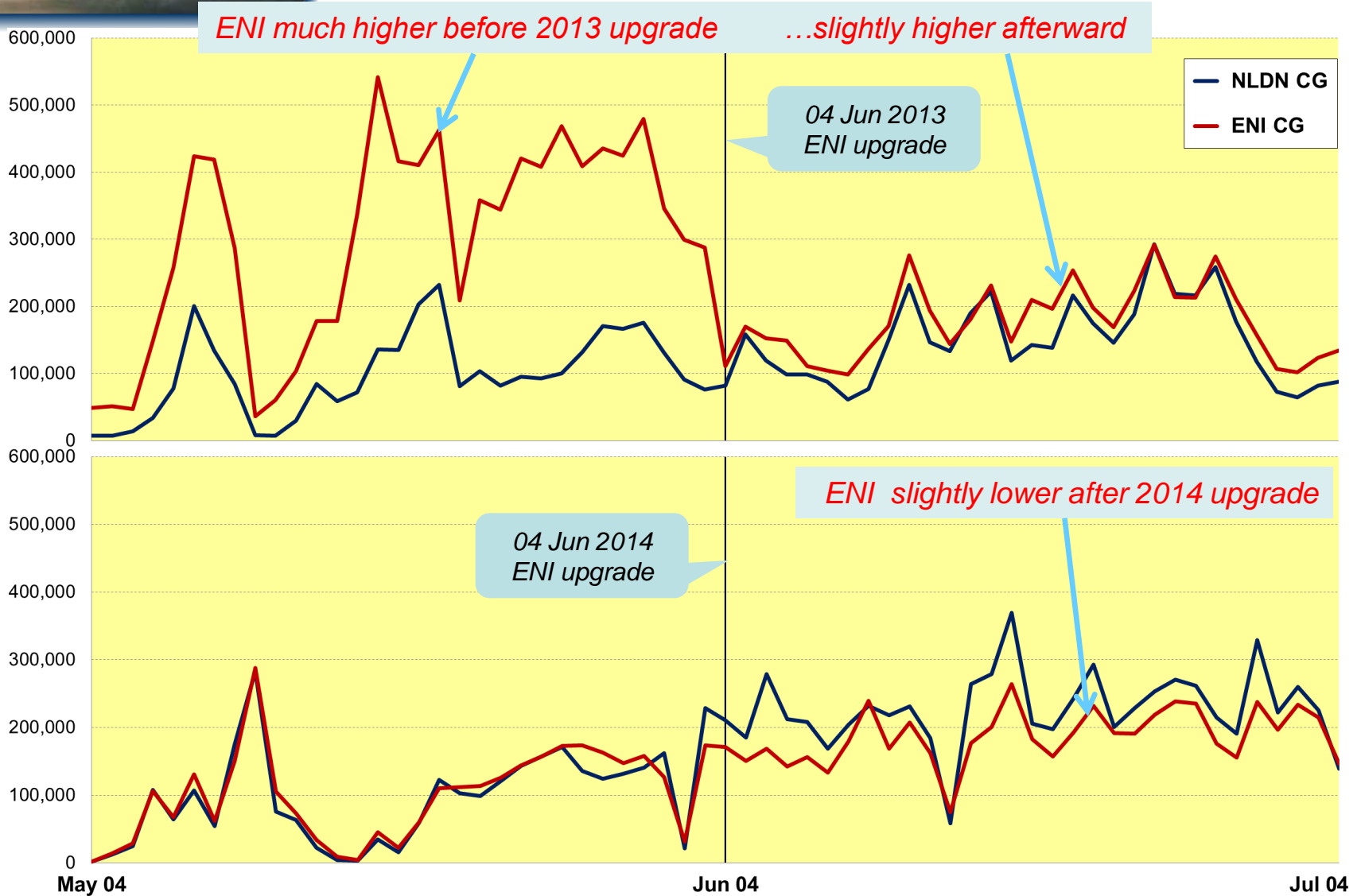


Grid boundary

“CONUS” aggregating area

NLDN and ENI Daily CG Count over CONUS

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





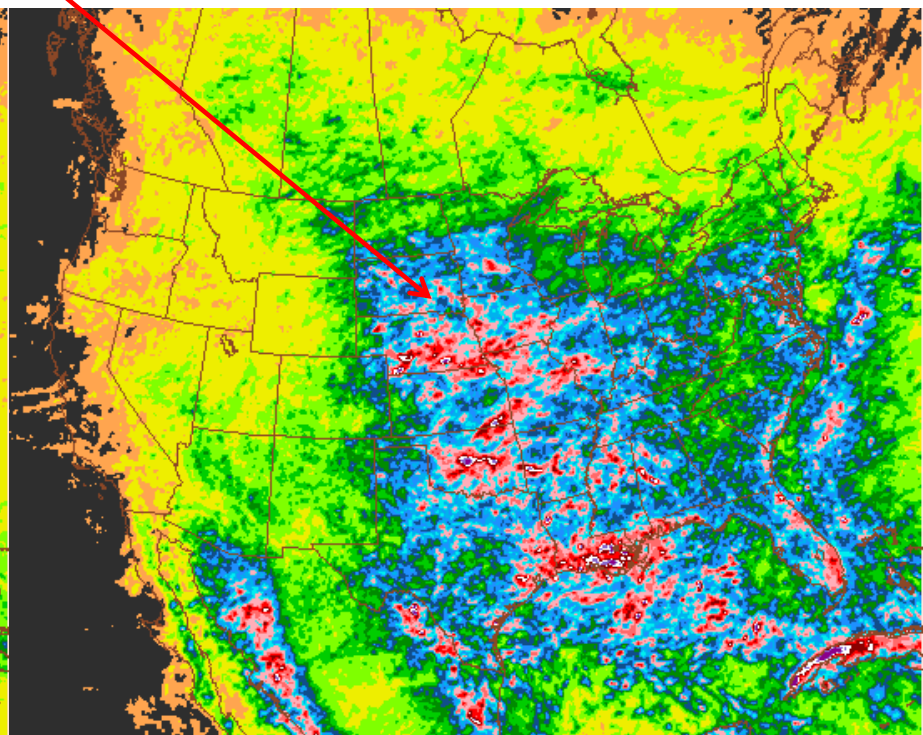
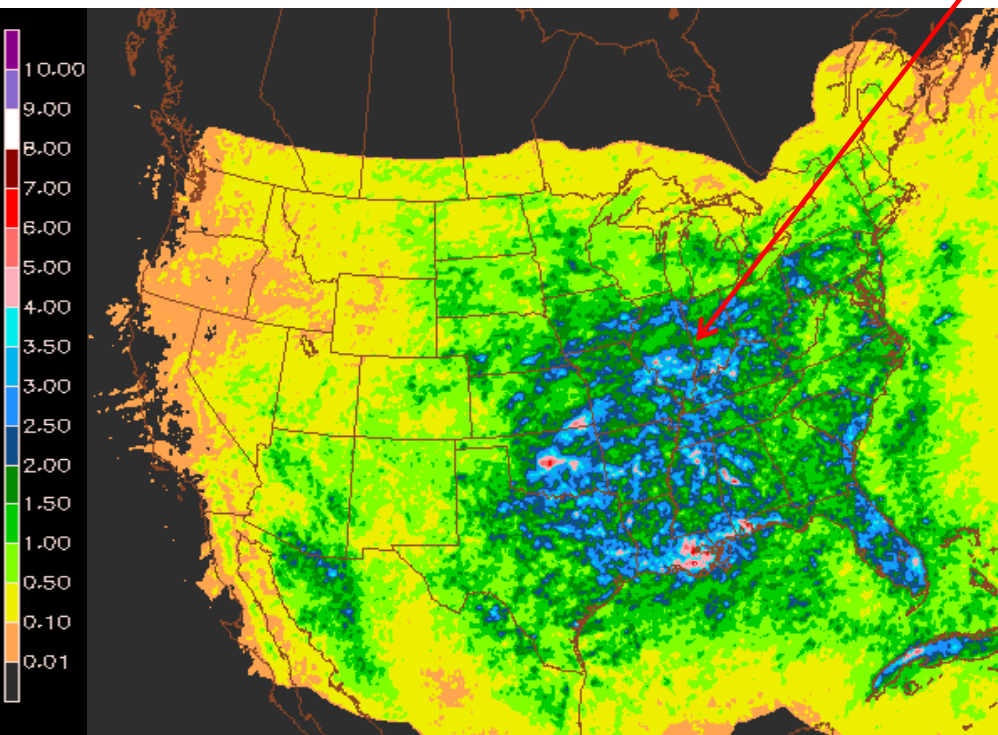
Mean Daily CG Count

Before June 2013 ENI upgrade

NLDN

ENI much higher

ENI





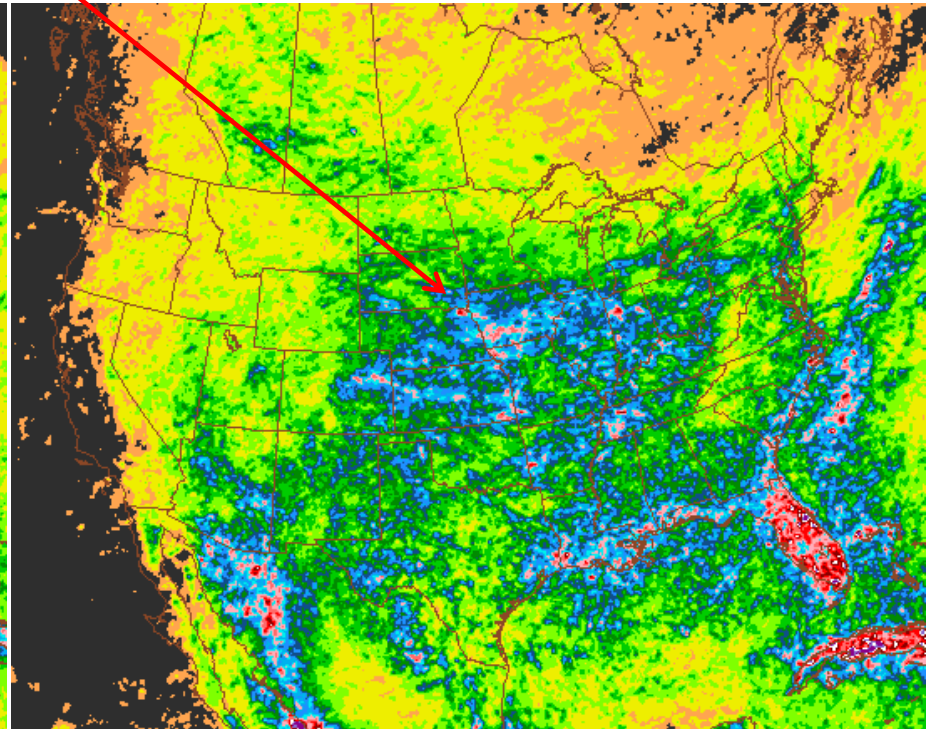
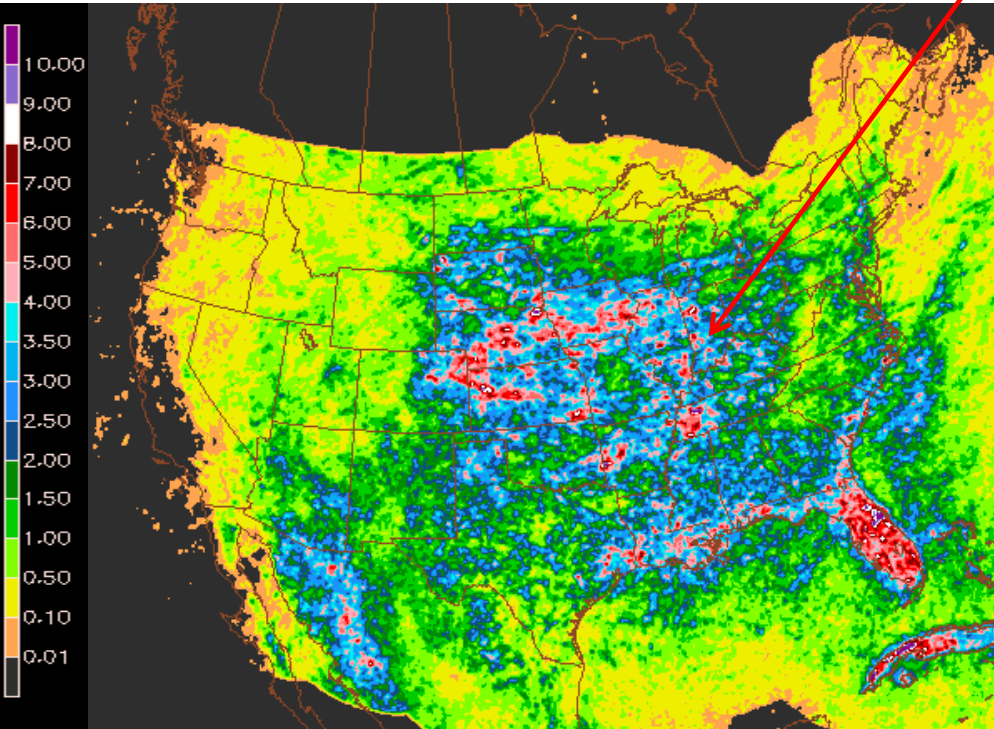
Mean Daily CG Count

After June 2014 ENI upgrade

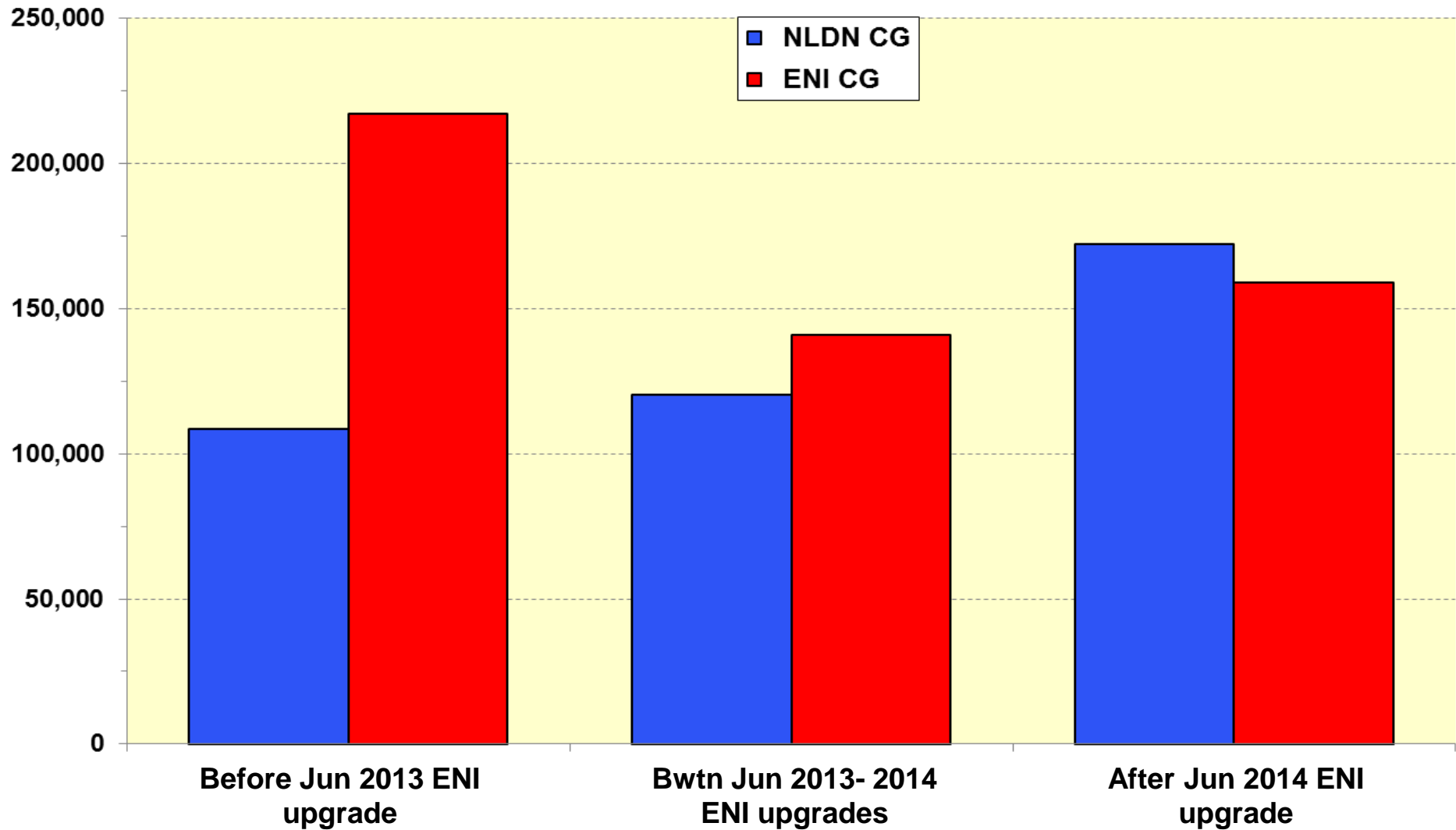
NLDN

ENI slightly lower

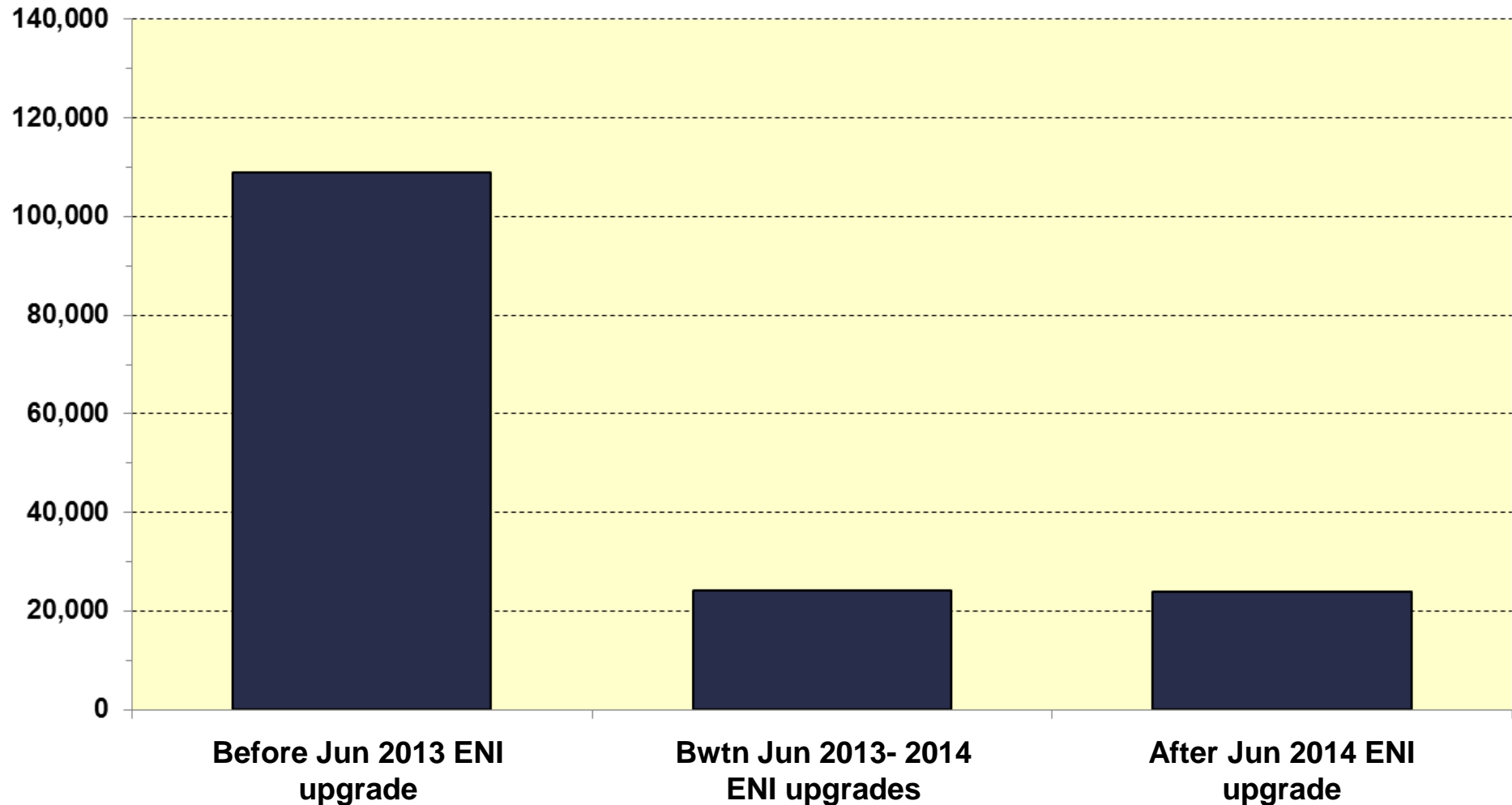
ENI



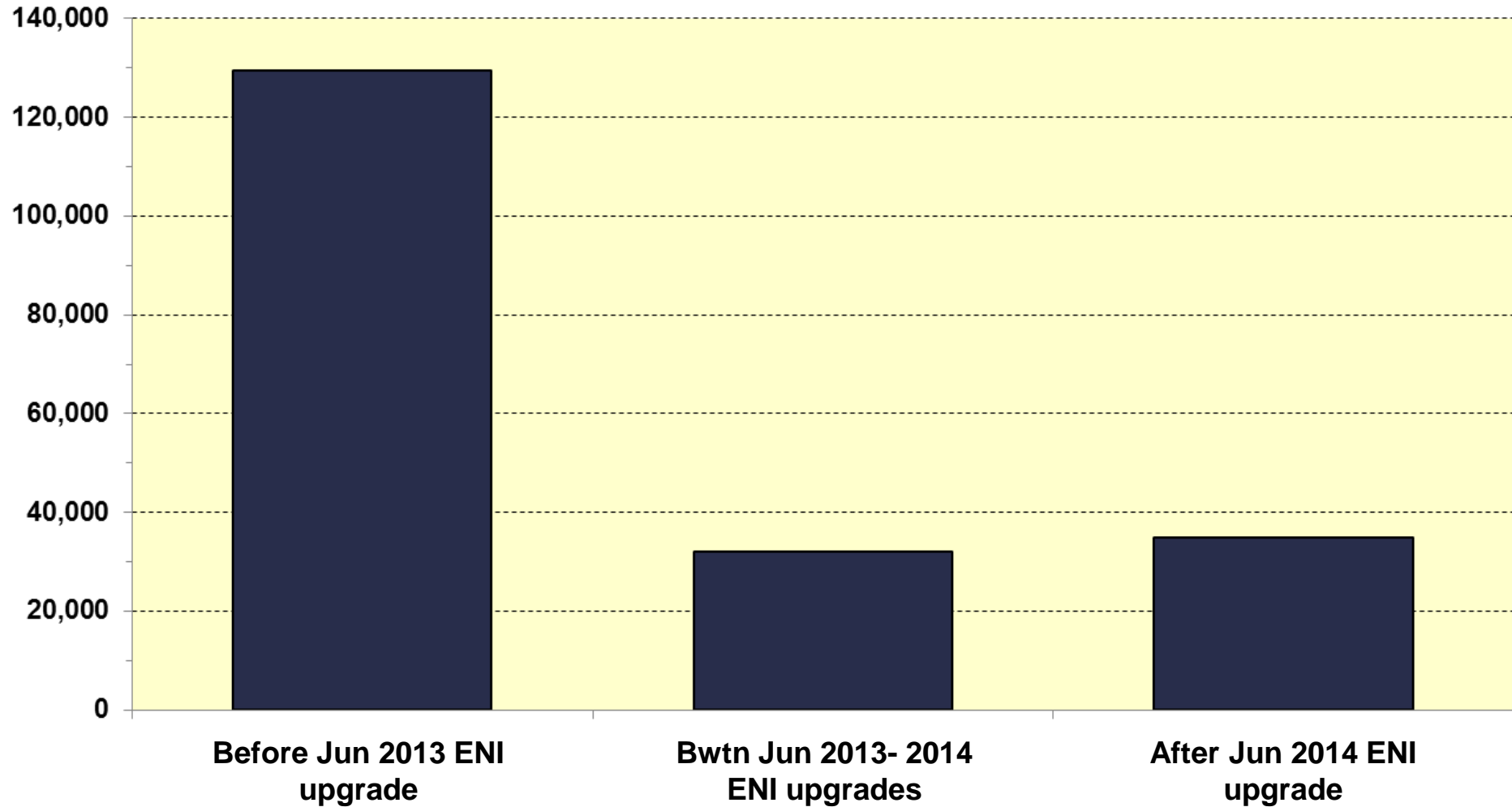
Mean Daily NLDN and ENI CG Count over CONUS



Mean Absolute Difference of ENI and NLDN Daily CG over CONUS

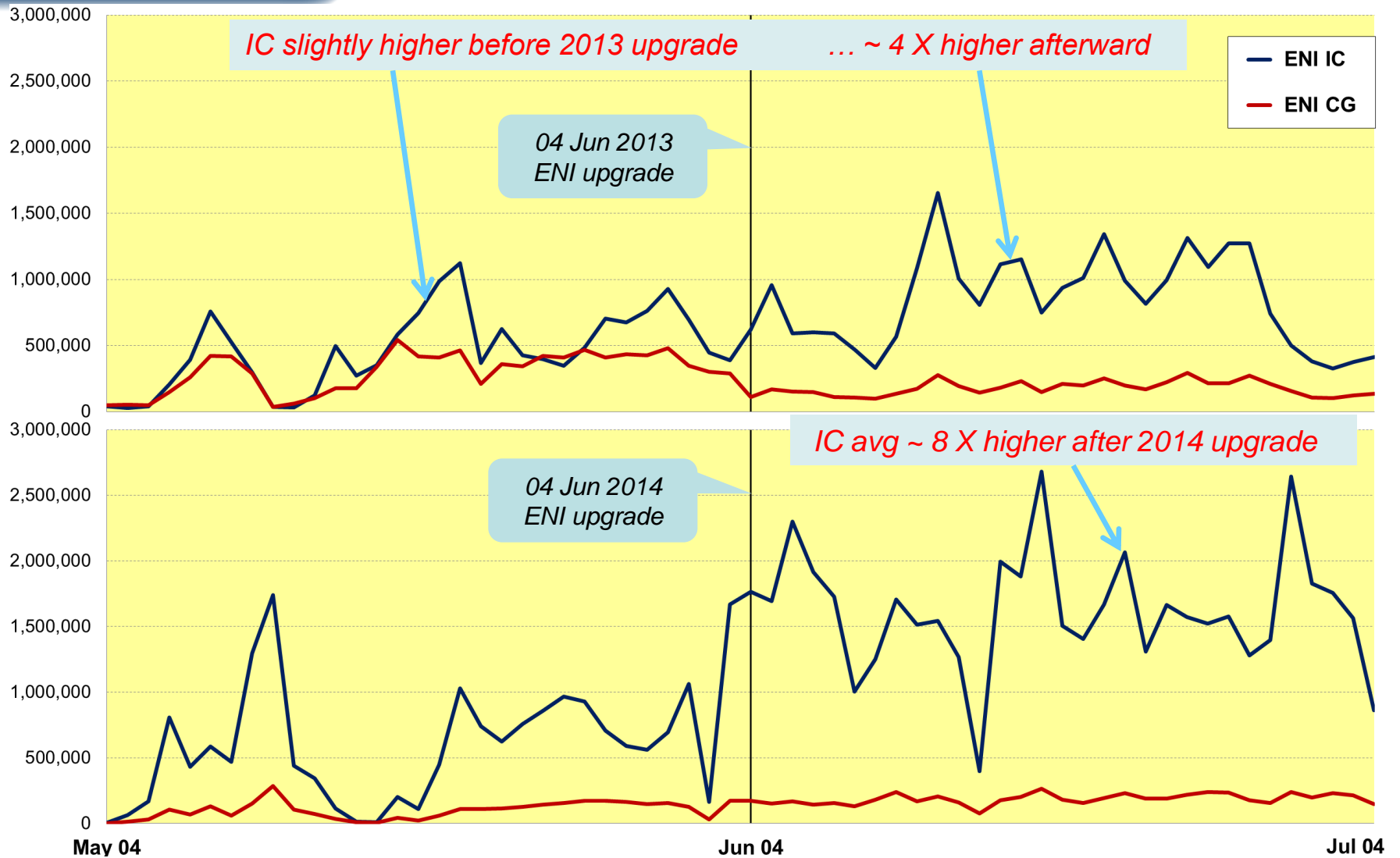


RMS Difference of ENI and NLDN Daily CG over CONUS



ENI Daily IC vs CG Count over CONUS

Date period = +/- 30 days about ENI upgrades

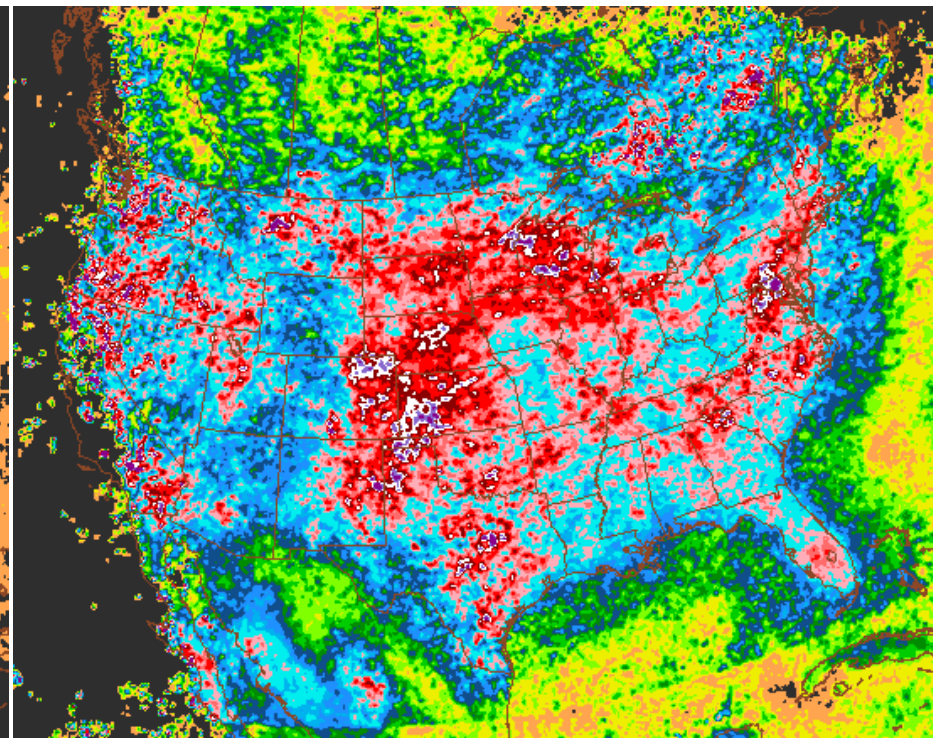
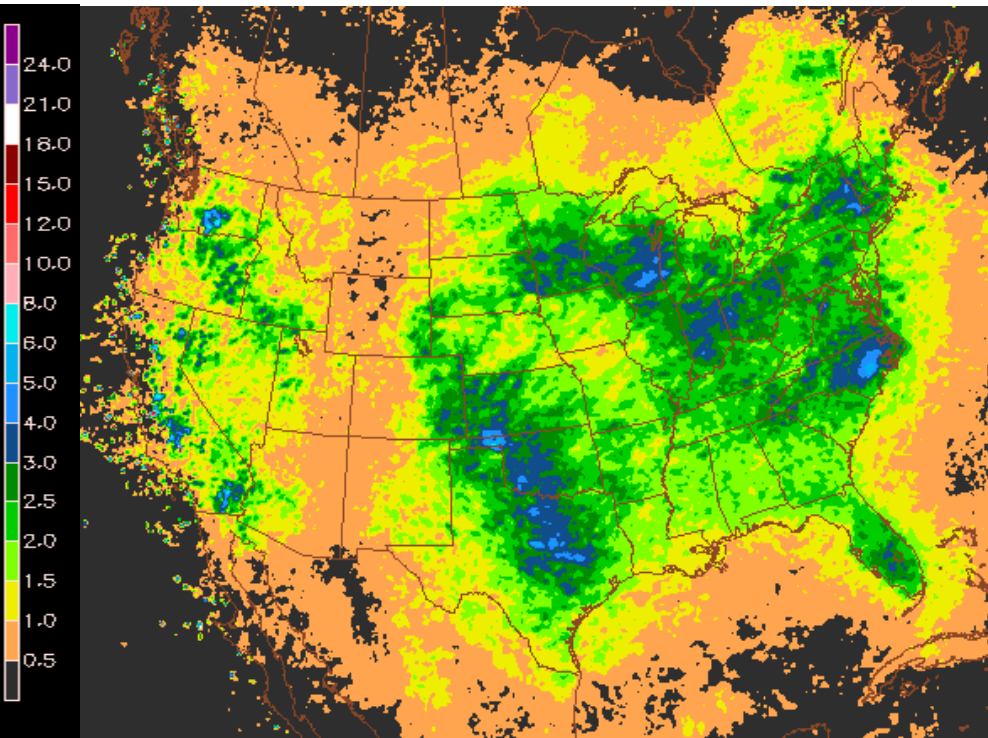




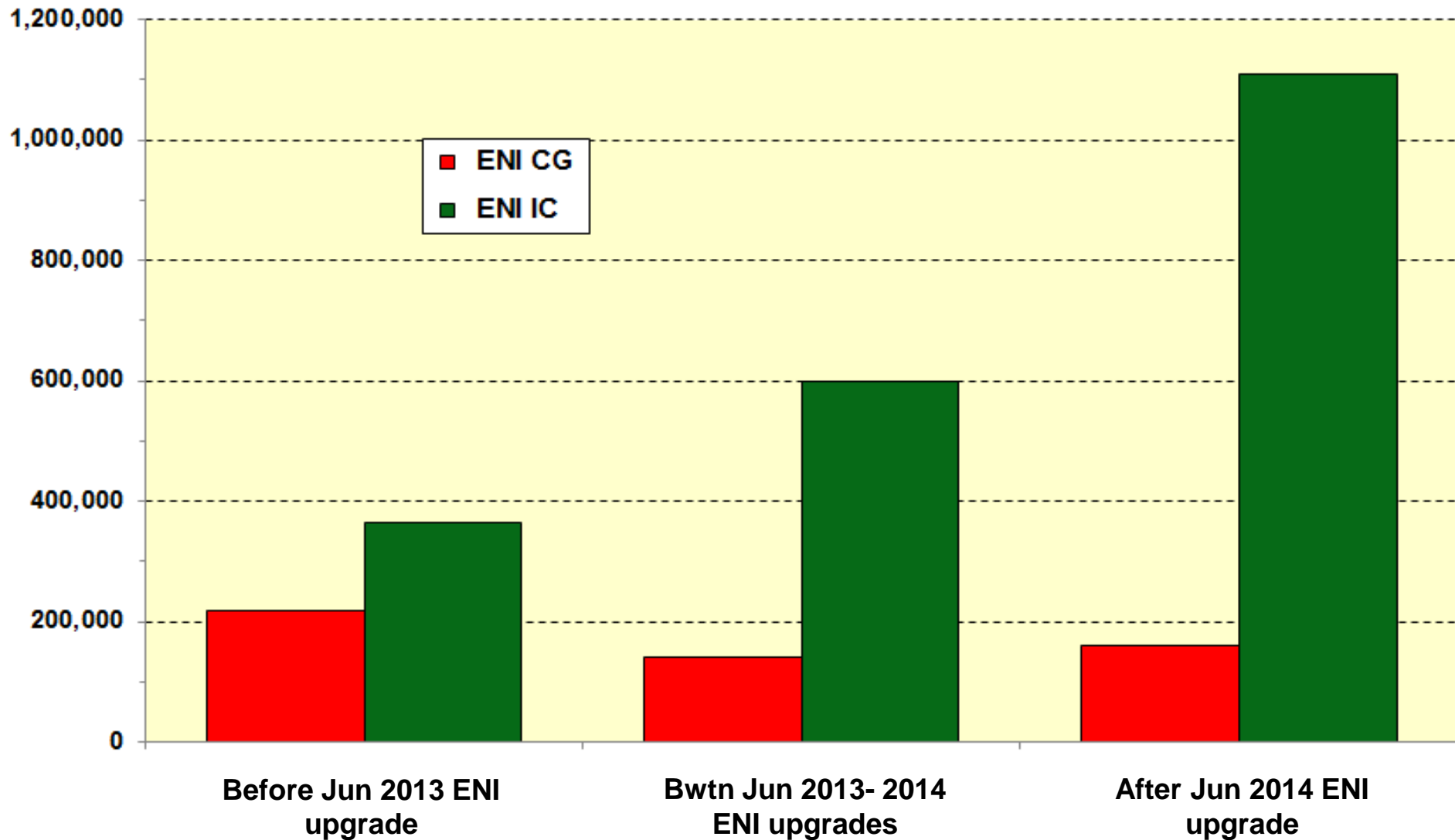
Mean of ENI Daily IC/CG

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 ?