WAAS Technical Report
William J. Hughes Technical Center
Atlantic City International Airport, New Jersey
April 15, 2014

Author(s): Bill Wanner

DR# 123: Effect on WAAS from Iono Activity on April 11-12, 2014
GPS Week/Day: Week 1787 Day 5 to Week 1787 Day 6 (April 11-12,2014)

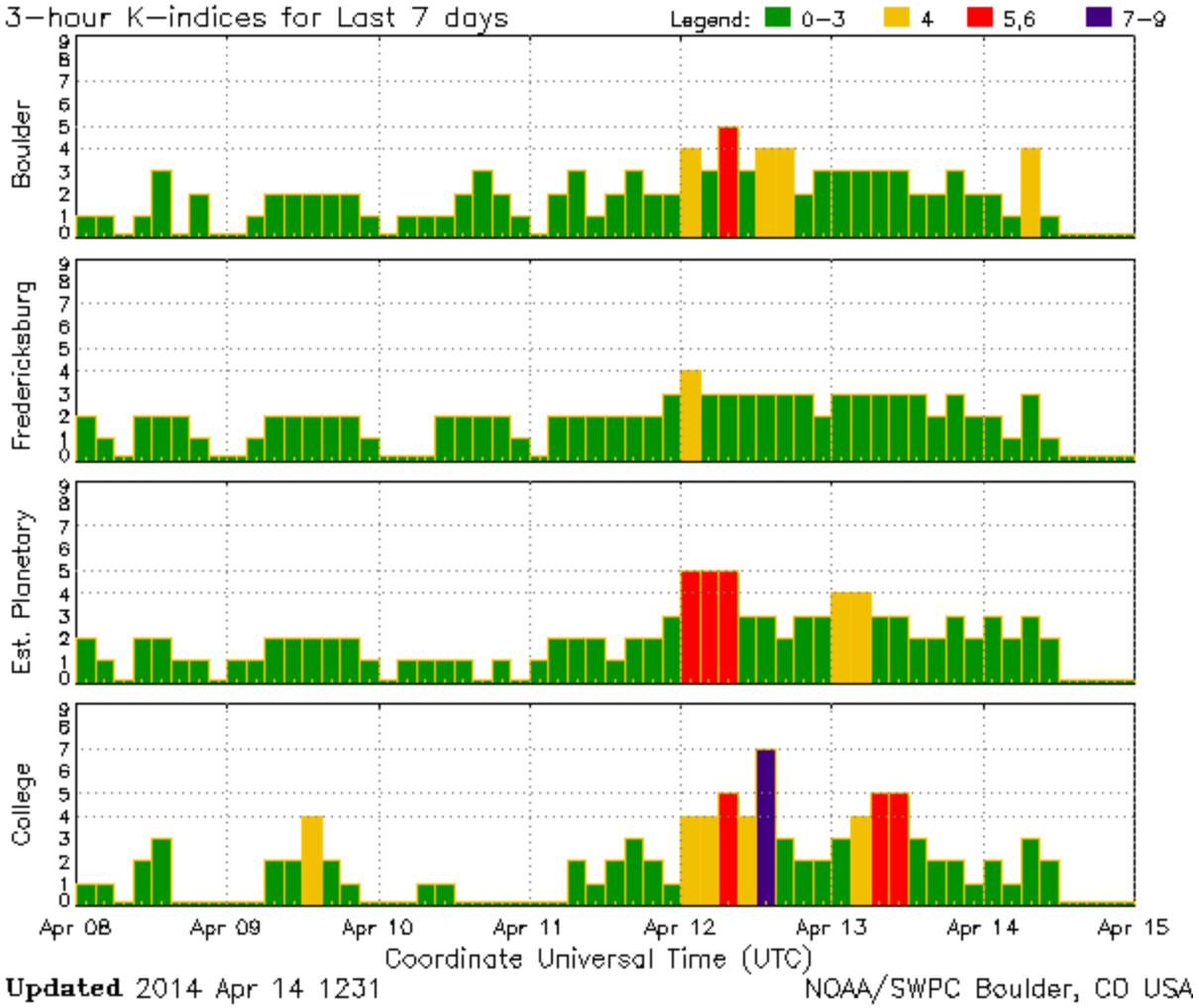
Background

- **This presentation shows the effects on WAAS aviation users from this solar event**

Kp Index

- **The Kp Index is a worldwide weighted average metric that is used to help define the magnitude of a geomagnetic storm**
  - The higher the value the more intense the storm
  - A value of 5 or more generally indicates a storm
- **The following chart shows the Kp index beginning on April 8, 2014**
  - The max Kp was 3 on April 11 and the max Kp was 5 on April 12
    - Note that the College site had a max Kp of 6
- **Canada, Alaska, and northern CONUS were affected late in the day on April 11 and early in the day on April 12**
  - Approximately April 11 2300 GMT to April 12 0300 GMT
- **Later on April 12, California and the Texas/Gulf Coast area were affected**
  - Unscheduled outages at various airports occurred intermittently between 1530 and 1900 GMT

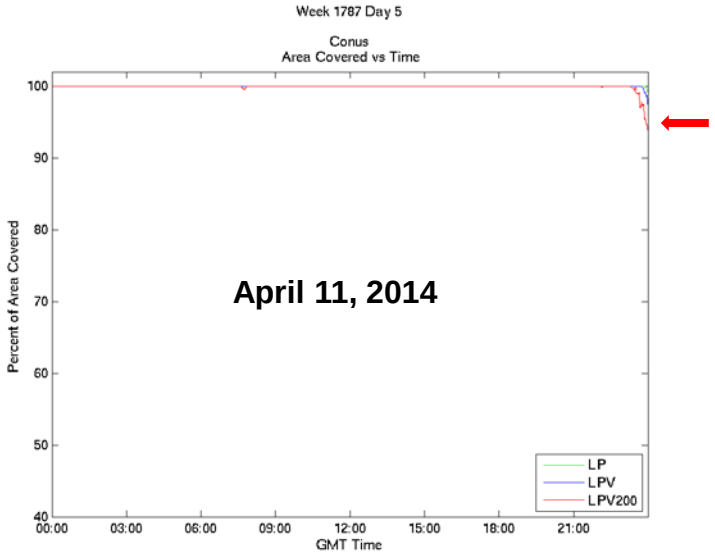
Kp Index Chart



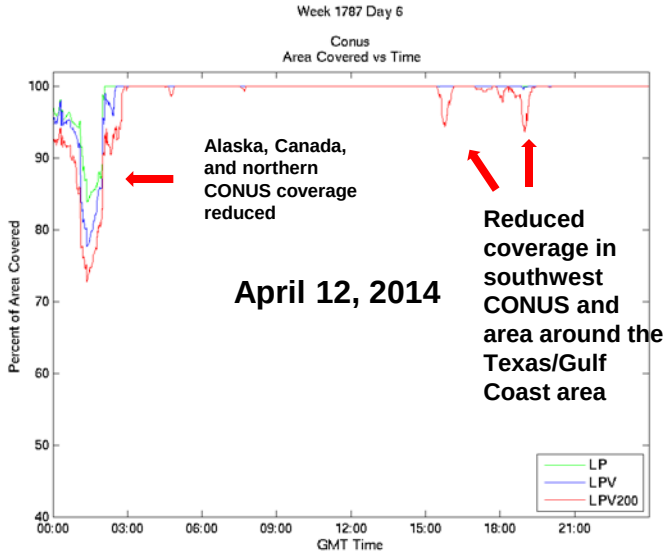
Coverage vs. Time Charts

- **This event affected WAAS in Alaska, Canada, and northern CONUS late in the day (GMT time) on April 11 and continued into the first part of the day on April 12. There was also an effect later in the day on April 12**
- **The following slide shows LPV coverage in CONUS vs. time for April 11 and April 12**

Coverage vs. Time - April 11 - 12, 2014



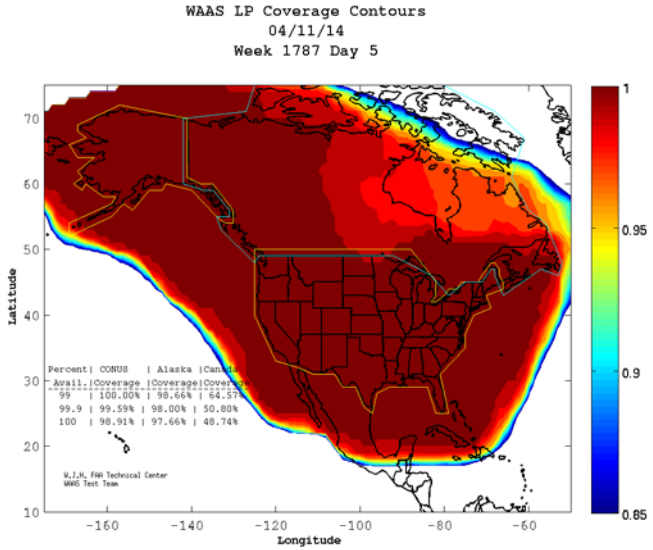
WAAS coverage affected late in the day

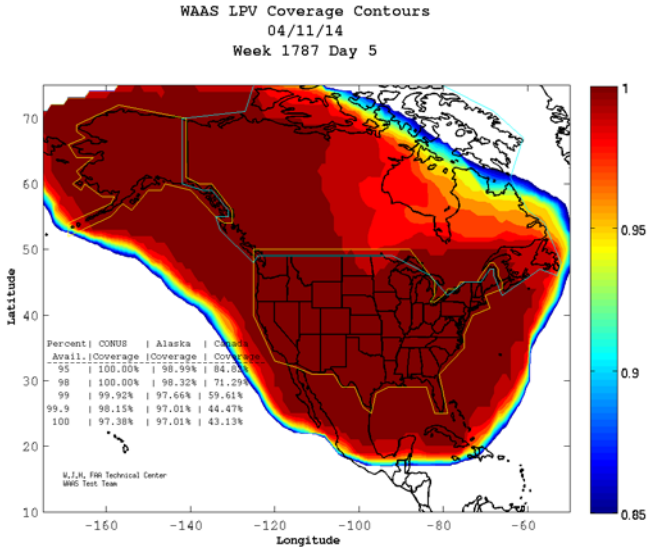


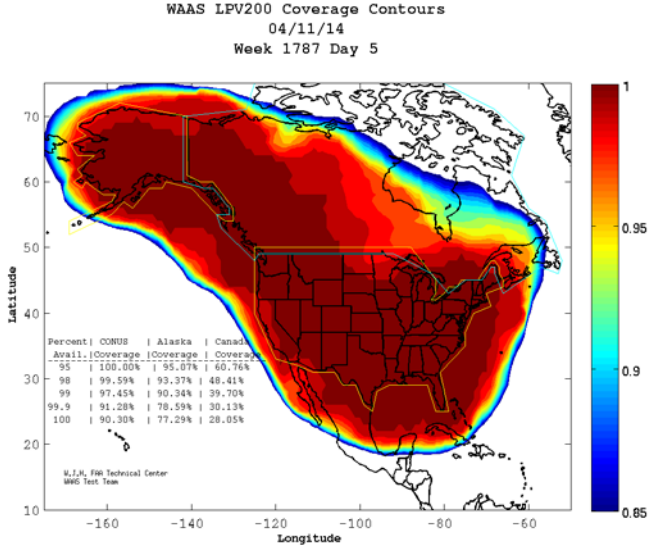
Coverage Charts

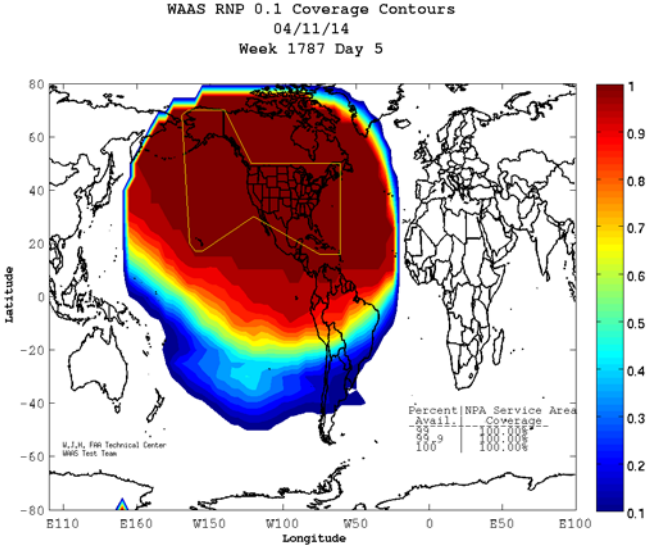
- **The next two slides show the LP, LPV, LPV-200, and RNP 0.1 coverage for April 11 - 12**
- **LP coverage is normally 100%**
    - Coverage lost in Alaska and Canada
- **RNP- 0.1 is also normally 100%**
    - Stayed at 100% for this event

Coverage Plots – April 12, 2014

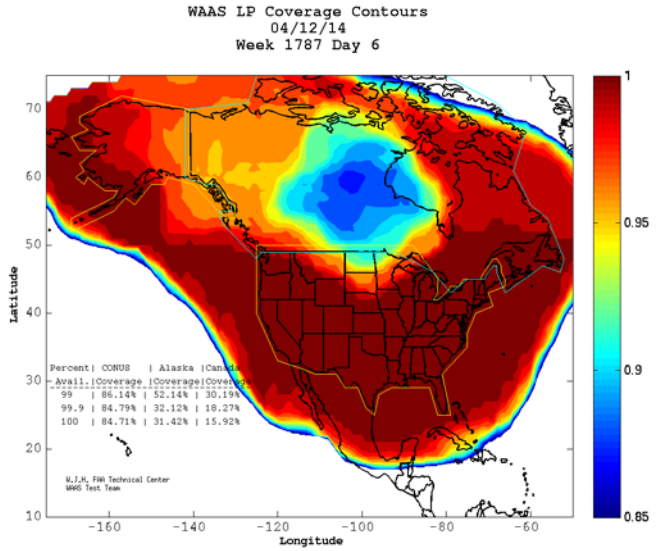


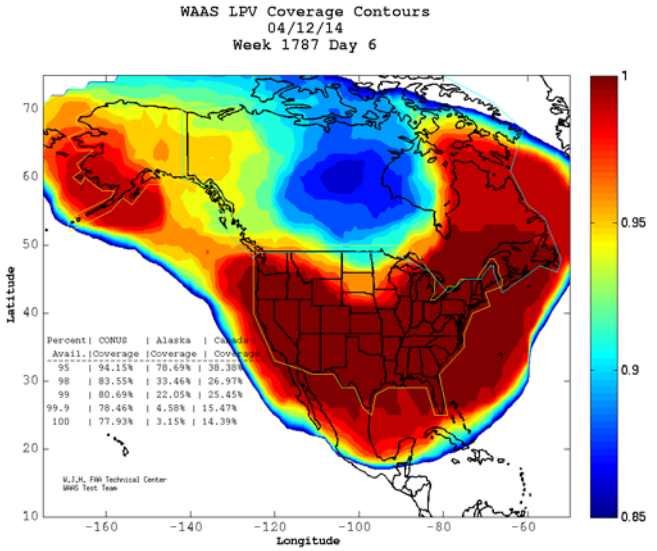


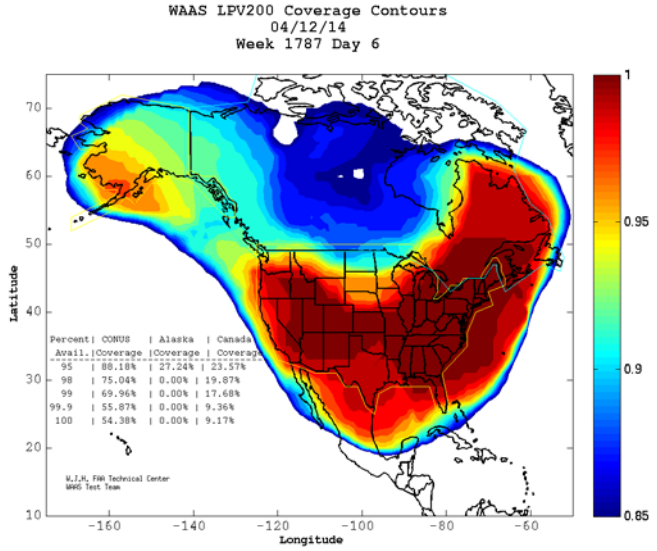


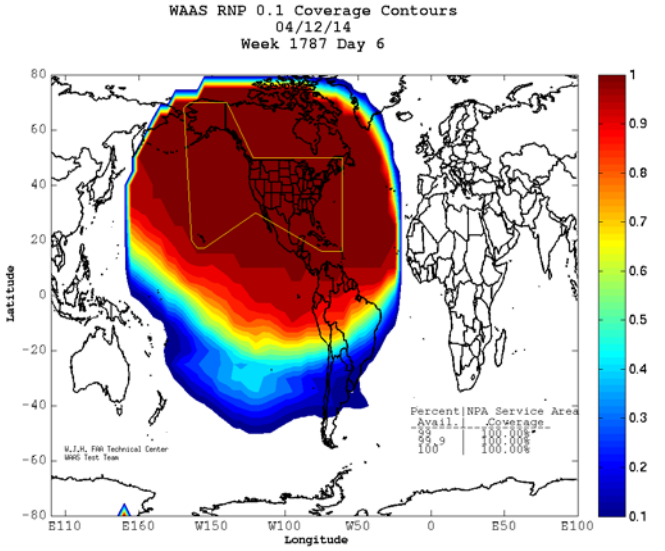


Coverage Plots – April 12, 2014





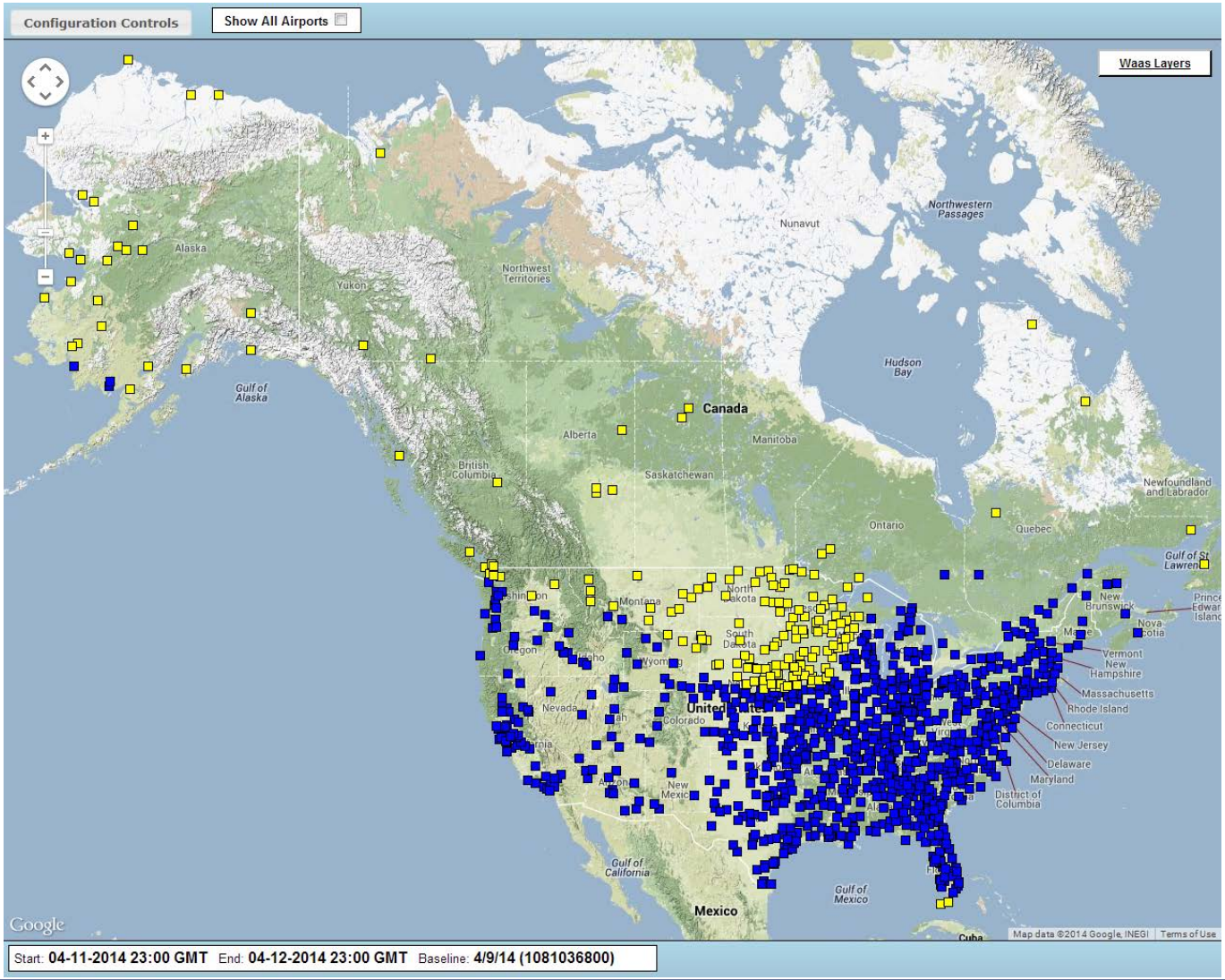




Airport Outages

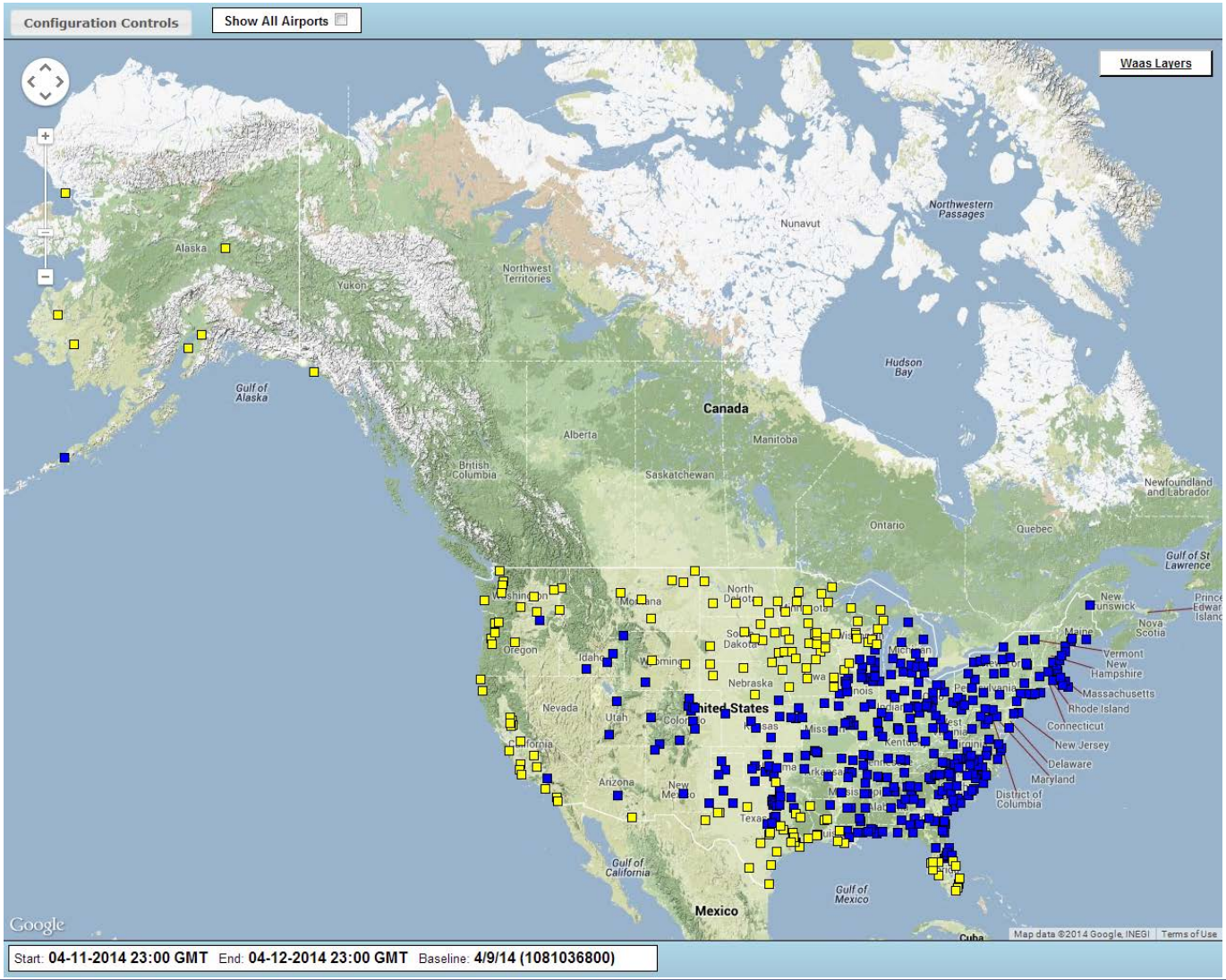
- **The next two charts show the airports that had an unpredicted outage due to this iono activity**
  - The predictions are based on a day in which WAAS performance is repeatable
    - I.e. no GPS satellite outages, no GUS switchovers, no WRS outages, no other anomalous condition
  - The first chart shows airports with published approaches to the LPV level (no lower than 250’ decision height)
  - The second chart shows airports with published approaches to the LPV-200 level (200’ decision height)
- **Each airport is represented by a square on the map**
  - A blue square means there was no loss of service at that airport
  - A yellow square means there was an unpredicted outage at that airport
    - The unpredicted outages are due to the iono activity

Airports with Unscheduled LPV Outages (Yellow Squares) on April 11-12



Federal Aviation Administration

Airports with Unscheduled LPV200 Outages (Yellow Squares) on April 11-12



Federal Aviation Administration

Conclusion

- **Iono activity affected WAAS coverage in Canada, Alaska, and several regions of CONUS**
  - RNP 0.1 service was unaffected by this event
- **Coverage affected on April 11 and April 12, 2014**
  - Affect included the first few hours on April 12 and later in the day on April 12