WAAS Technical Report
William J. Hughes Technical Center
Atlantic city International Airport, NJ
September 29, 2015

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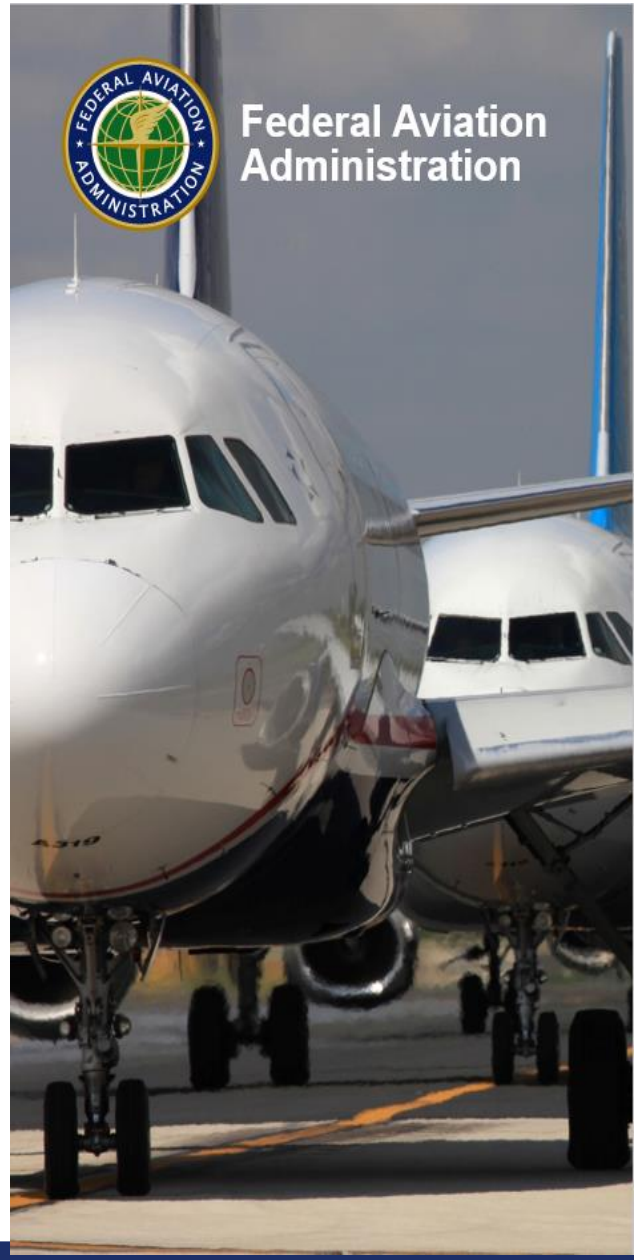
DR #128: Effect on WAAS from Iono Activity on September 9, 2015

GPS Week/Day: Week 1861 Day 3 (09/09/2015)



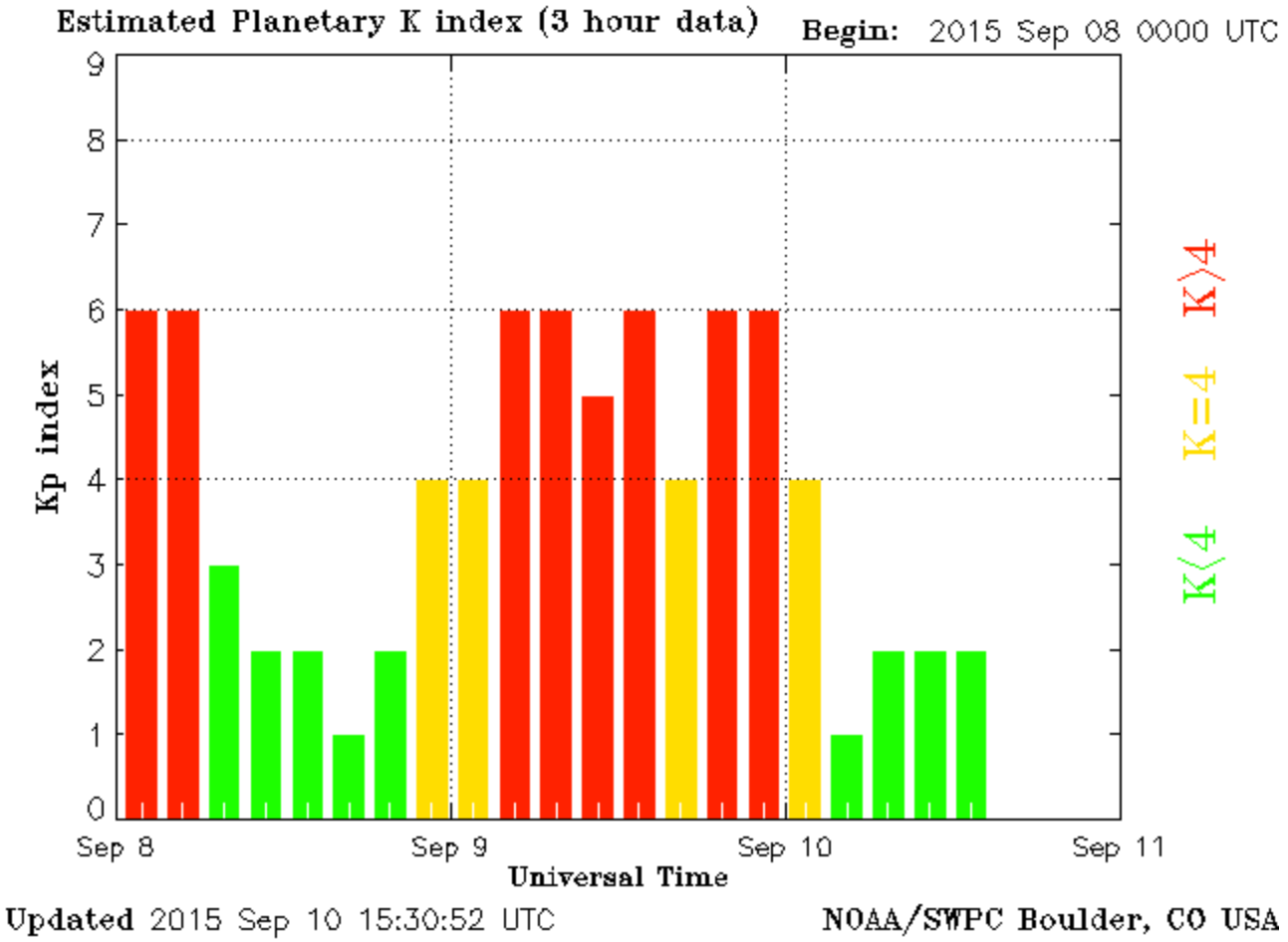
Background

- **This presentation shows the effects on WAAS performance from this solar event**
- **Alaska and Canada were affected on September 9, 2015**
- **KP reached 6**

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 September 8, 2015**
  - The max Kp was 6 on September 8 and September 9
- **There was no effect on WAAS coverage from the high Kp on September 8**

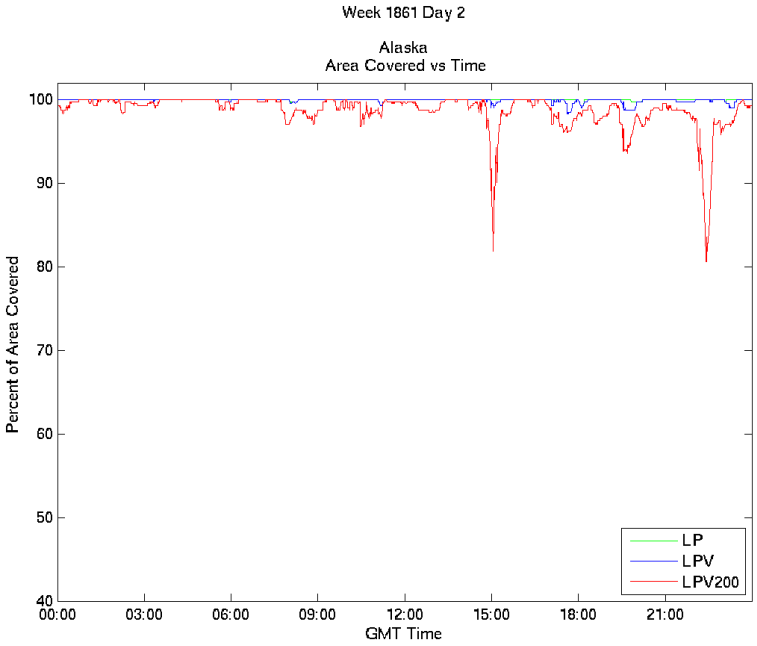
Kp Index Chart



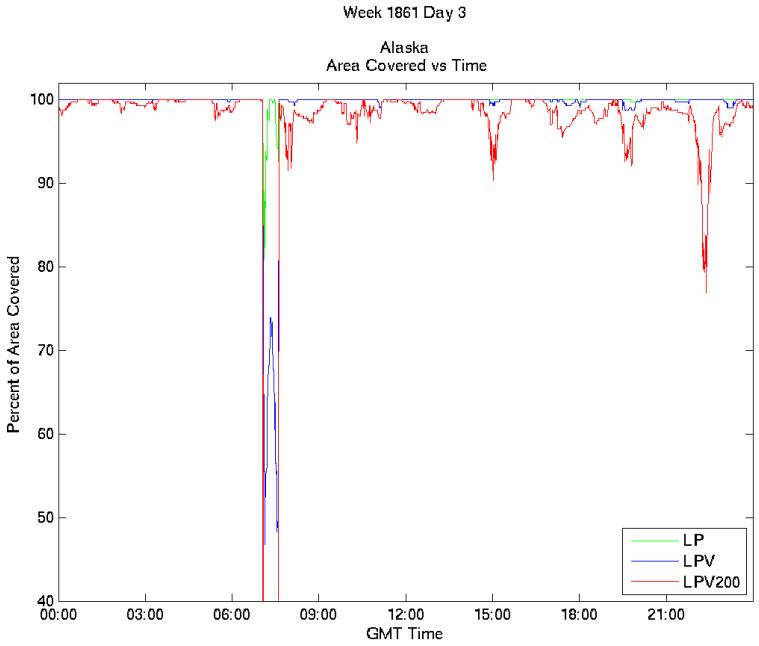
Coverage vs. Time Charts

- **This event affected WAAS LP, LPV, and LPV-200 coverage in Alaska and Canada on September 9, 2015**
  - RNP 0.3 and RNP 0.1 coverage unaffected
- **Airports in Alaska were first affected at 07:03 GMT and ended at 7:36 GMT**
- **Airports in Canada were first affected at 9:38 GMT and ended at 10:05 GMT**
- **The next two slides show LP, LPV, and LPV-200 coverage vs. time for September 8 and 9, 2015**
  - September 8 is shown for comparison
  - Canada
  - Alaska

Coverage vs. Time in Alaska – September 8 and 9, 2015

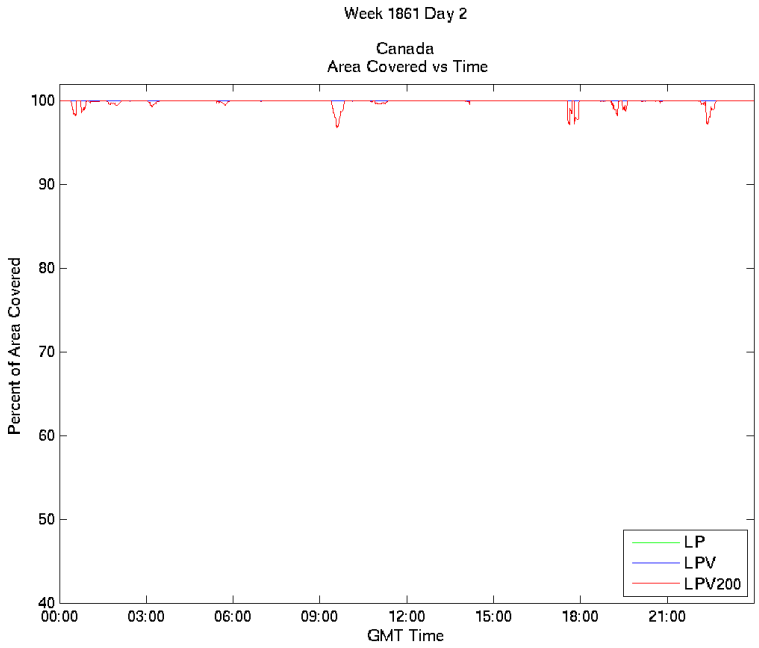


September 8, 2015

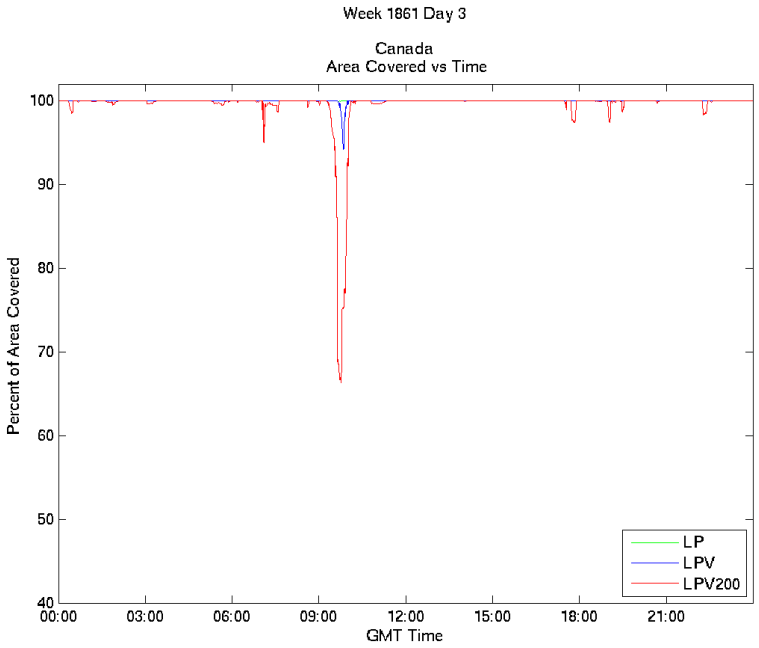


September 9, 2015

Coverage vs. Time in Canada – September 8 and 9, 2015



September 8, 2015

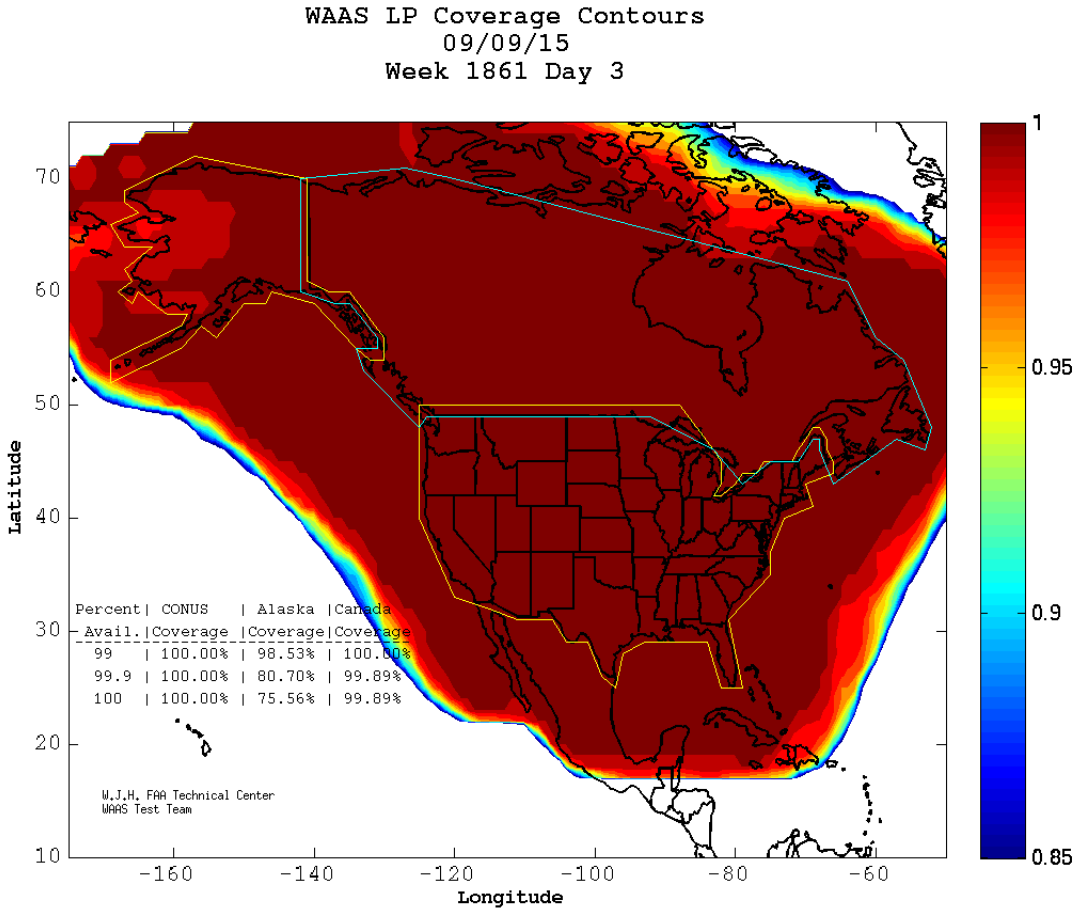


September 9, 2015

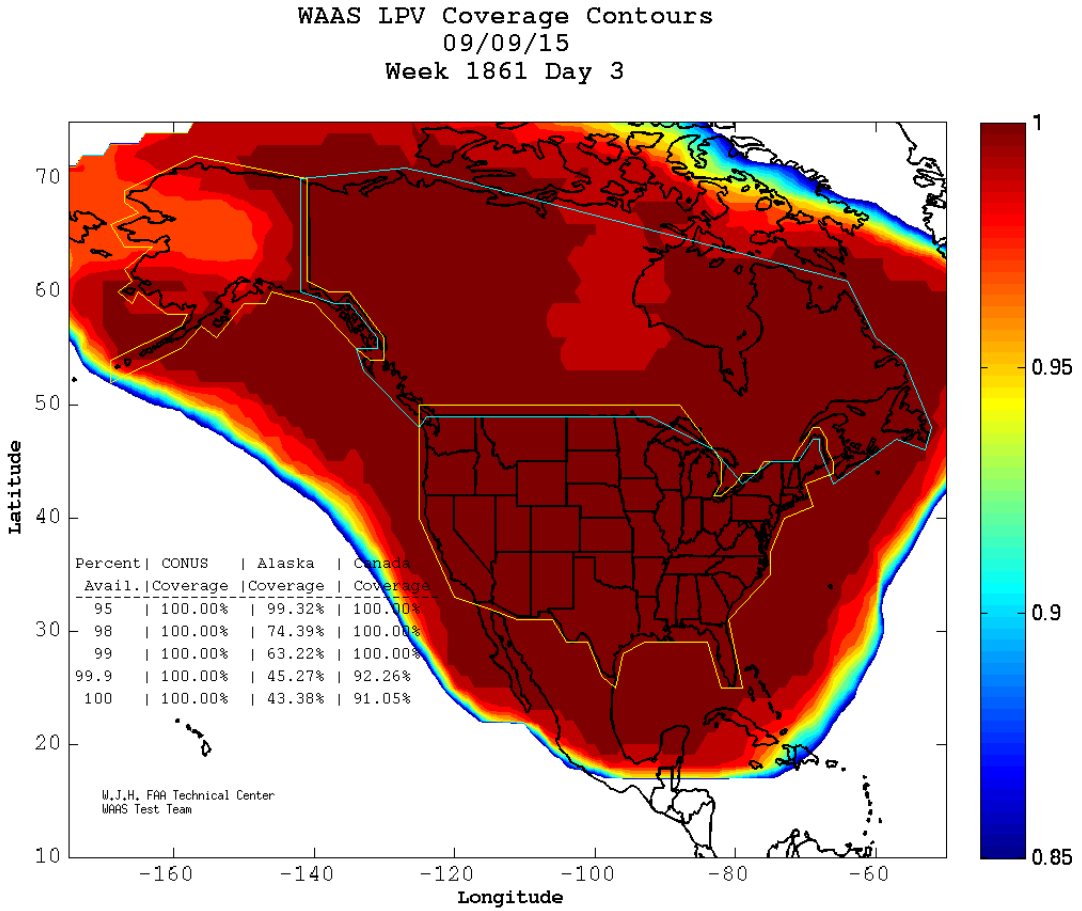
Coverage Charts

- **The next four slides show (in order) the LP, LPV, LPV-200, and RNP 0.1 coverage for March 18**

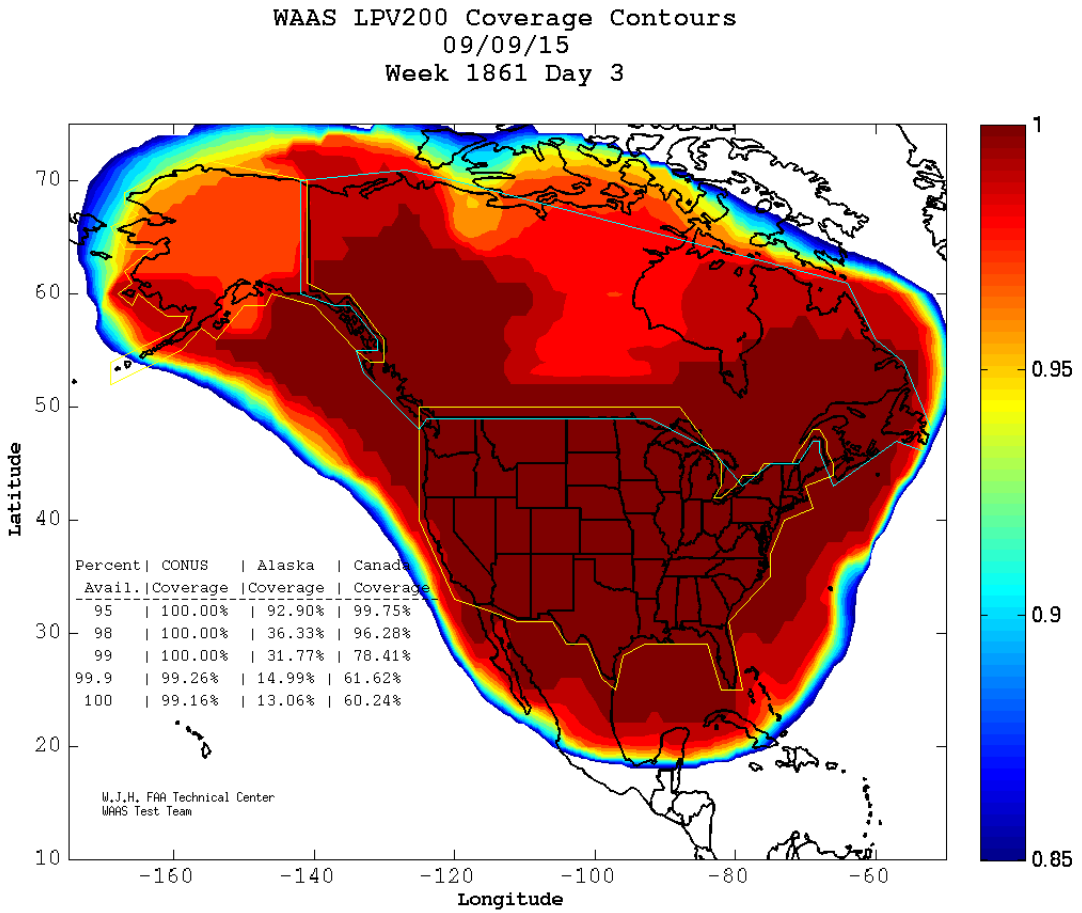
LP Coverage Plot – September 9, 2015



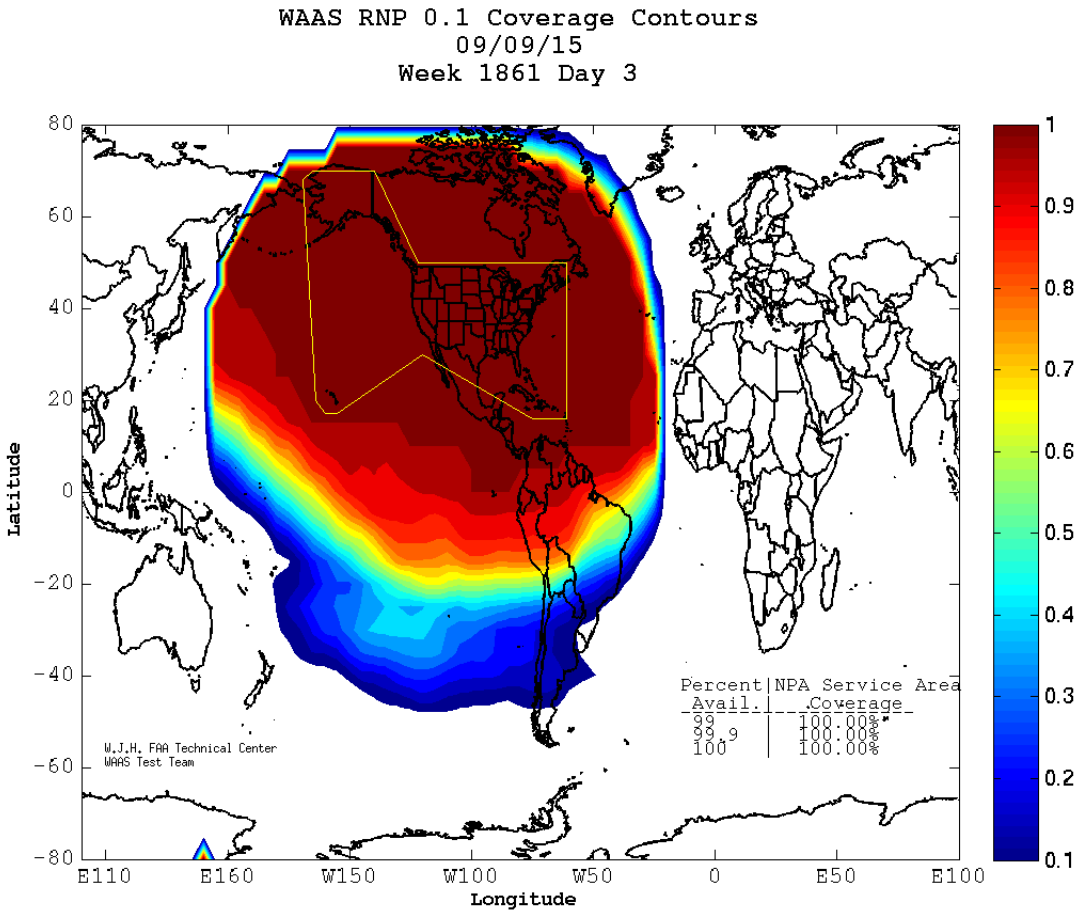
LPV Coverage Plot – September 9, 2015



LPV-200 Coverage Plot – September 9, 2015



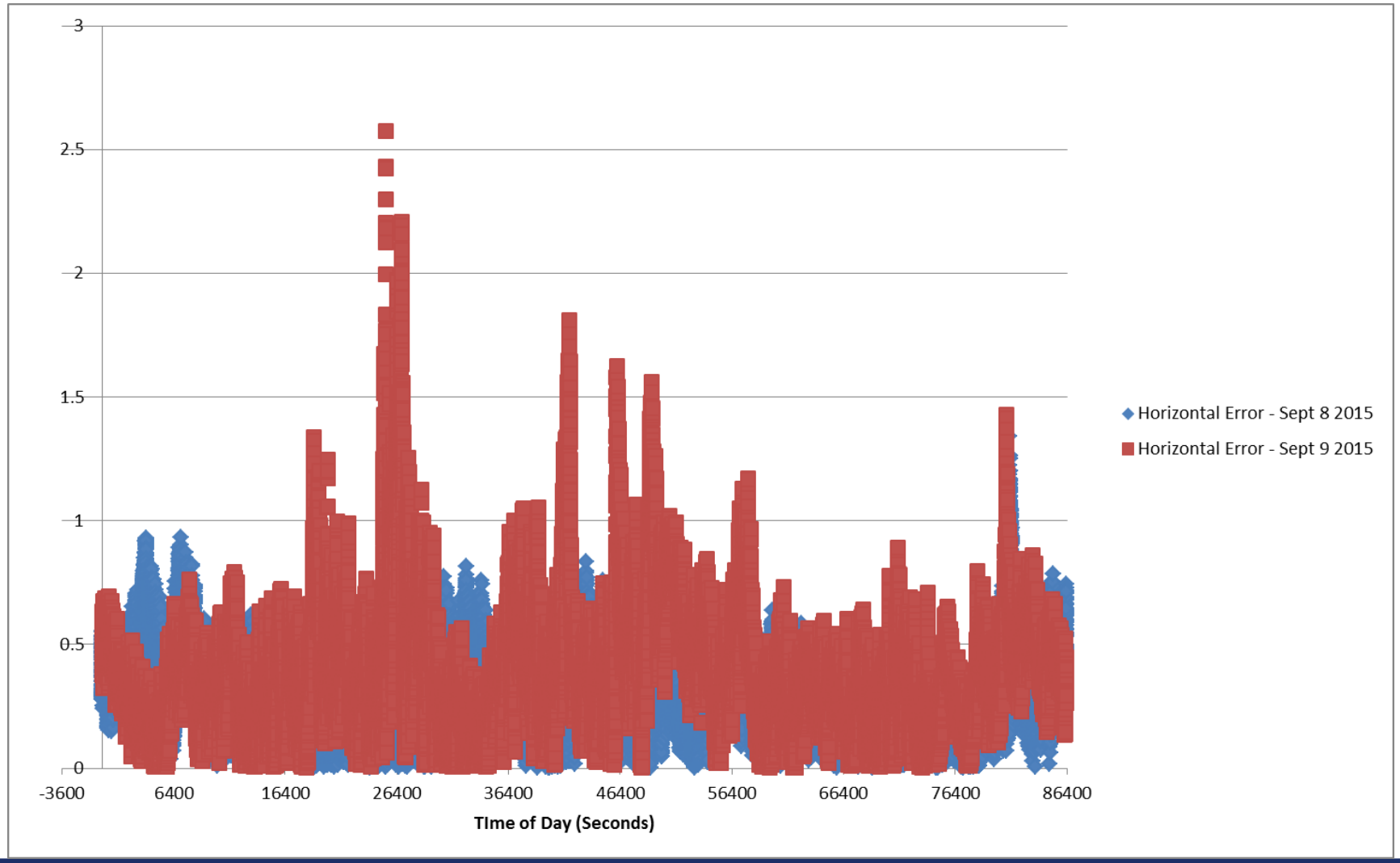
RNP 0.1 Coverage Plot – September 9, 2015



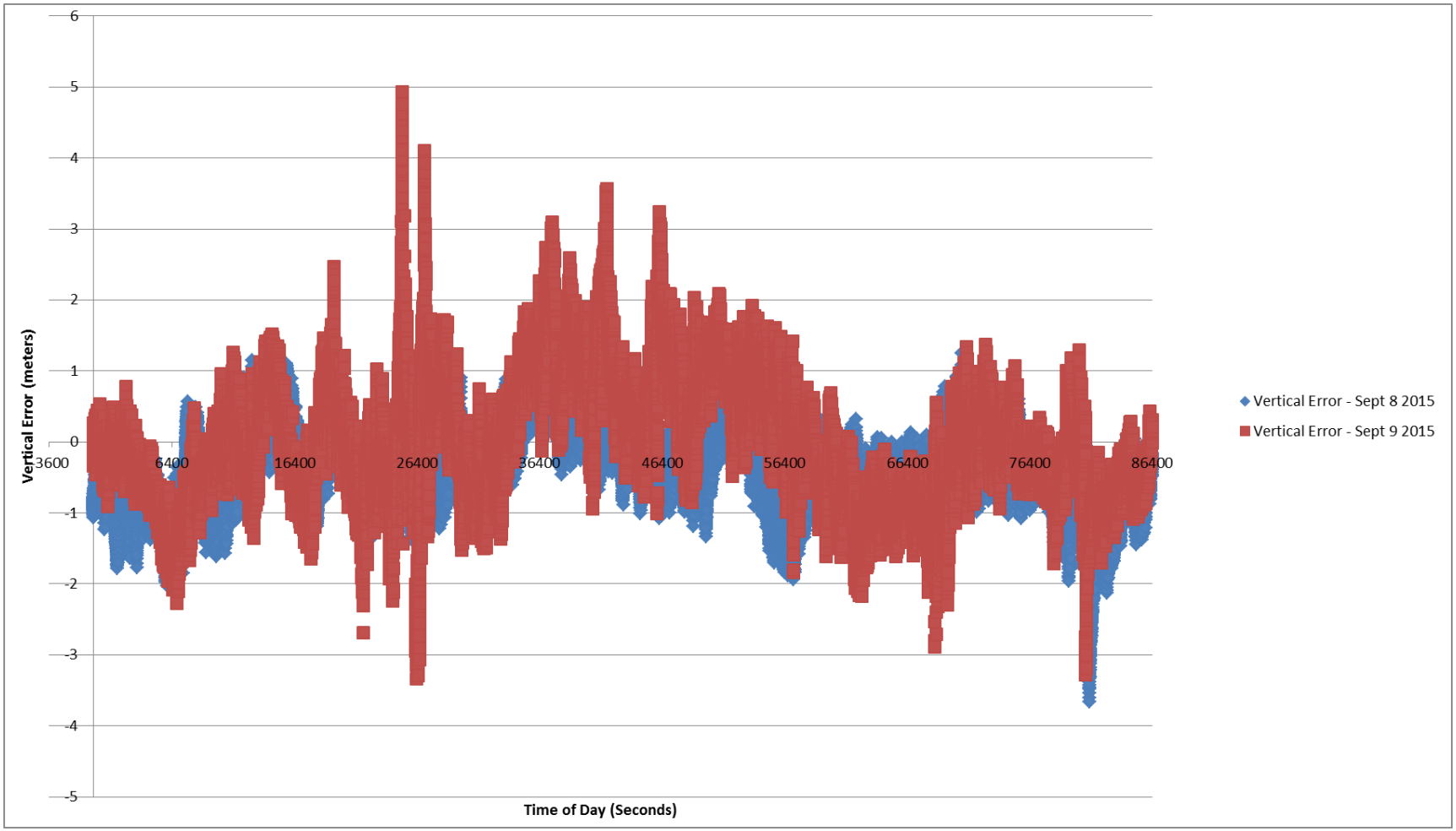
Accuracy

- **Accuracy that was calculated at all Alaska WAAS reference stations was higher than usual**
- **The maximum vertical position error while LPV was available occurred at Kotzebue at 4.9 meters (VPL = 27.7meters)**
- **The next slide shows the horizontal and vertical position errors at Kotzebue (thread C) on September 8 and September 9**

Kotzebue-C Horizontal Accuracy September 8 and September 9



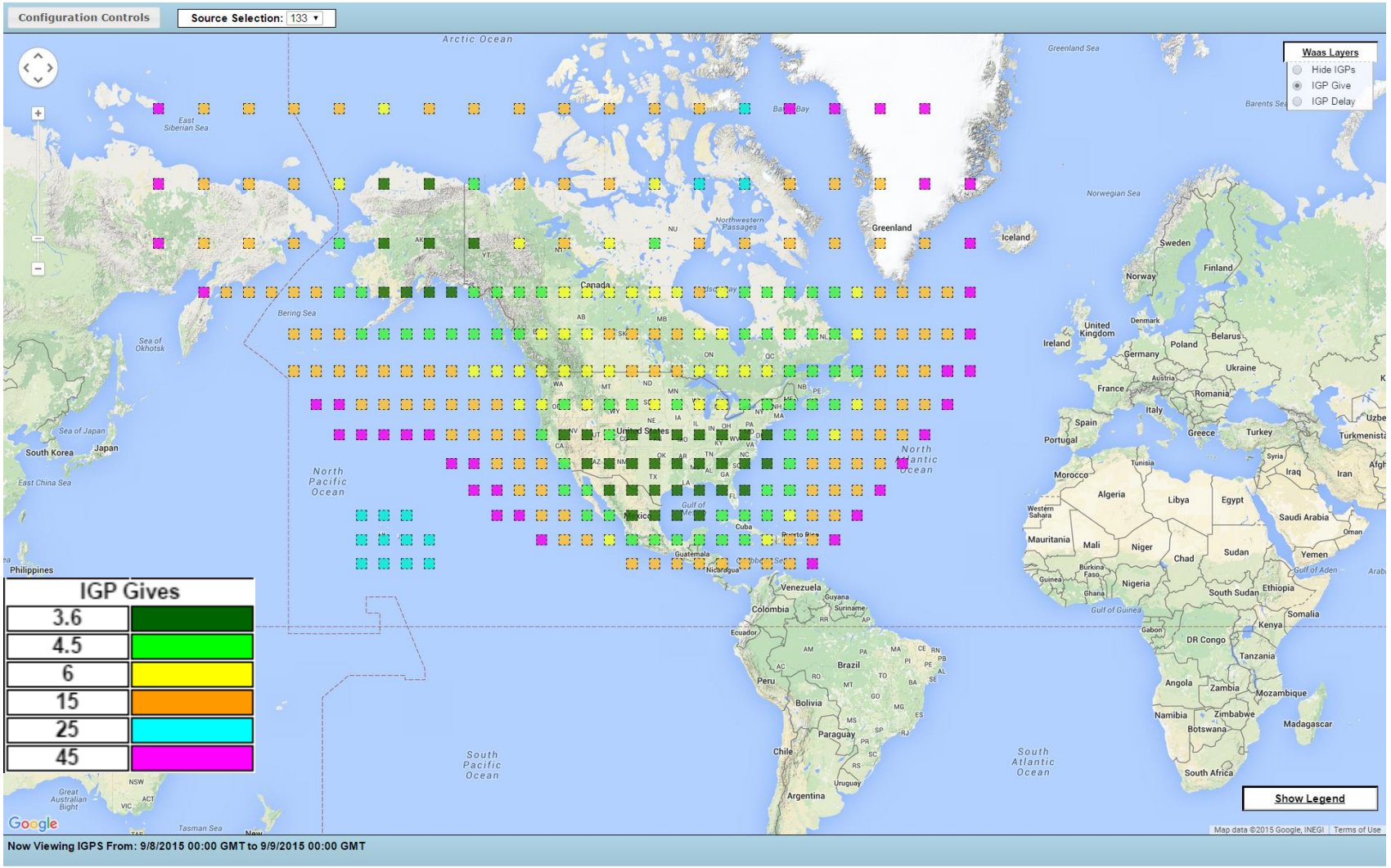
Kotzebue-C Vertical Accuracy September 8 and September 9



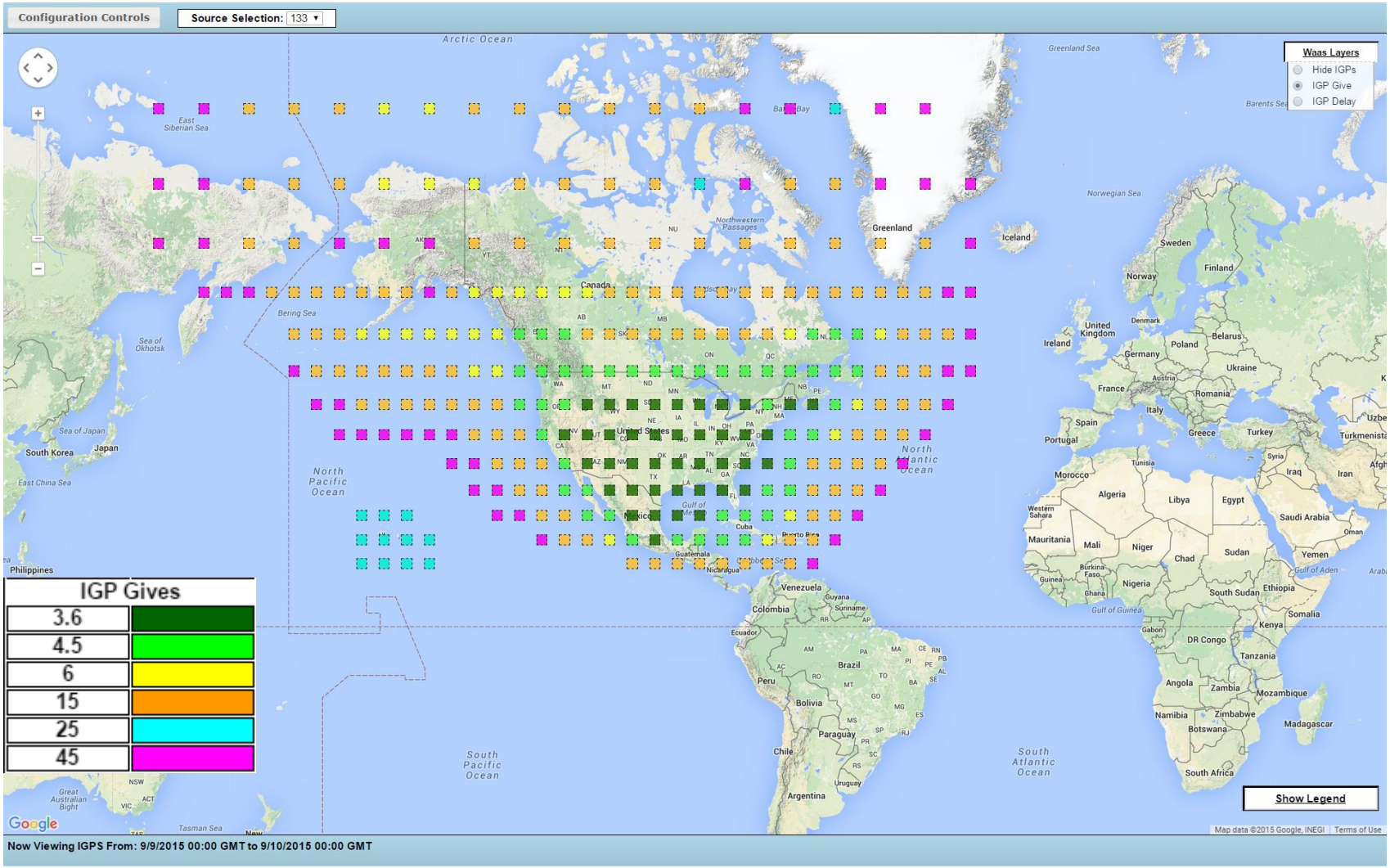
Rollup of IGPs and Airports

- **The next few slides show:**
  - Maximum GIVE value for each IGP
  - Airport availability for airports with a GPS/WAAS published approach procedure
  - September 8 and September 9, 2015 are shown for comparison

Maximum Value for IGP GIVEs on September 8, 2015

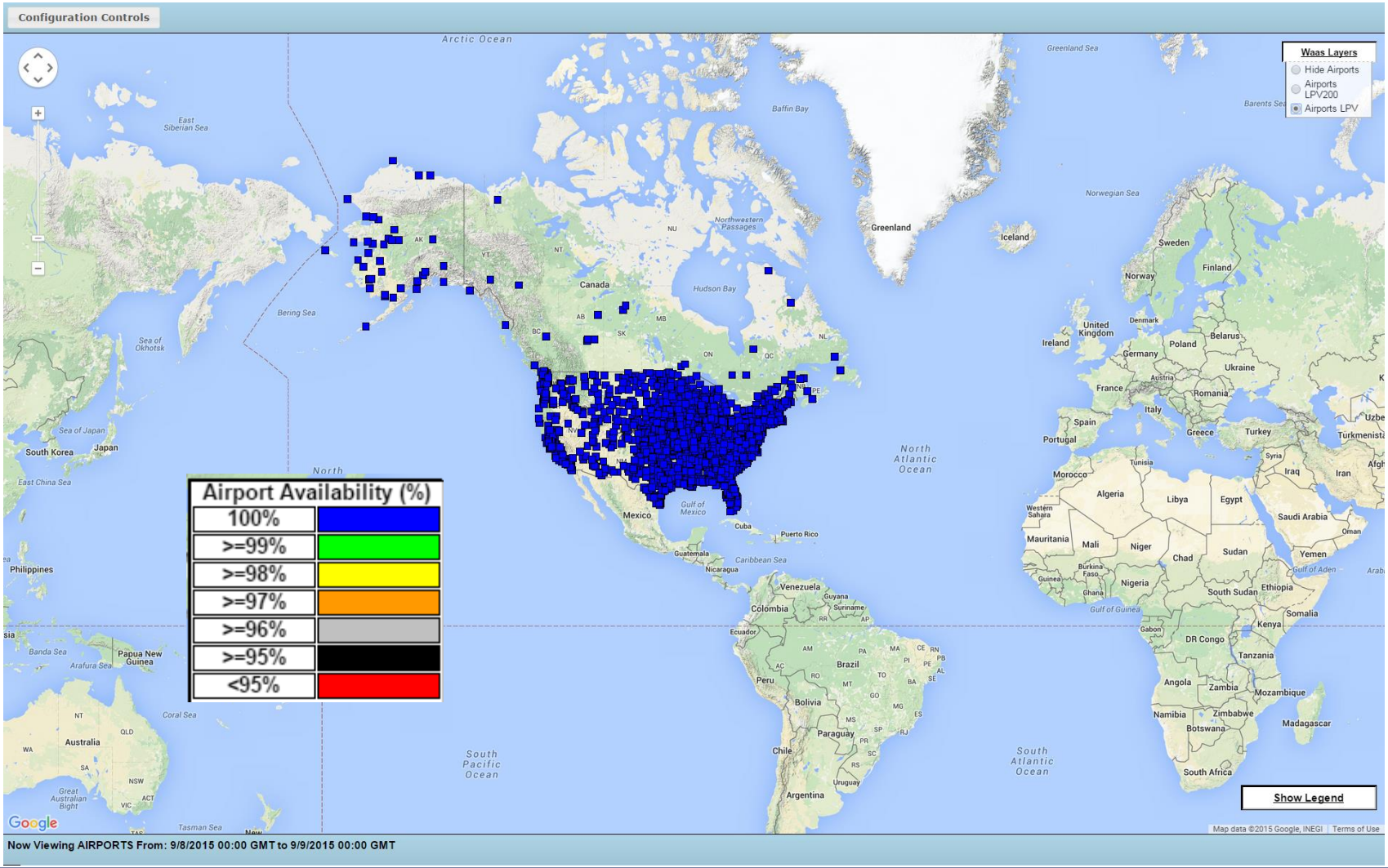


Maximum Value for IGP GIVEs on September 9, 2015



Federal Aviation Administration

Airport Availability on September 8, 2015



Federal Aviation Administration

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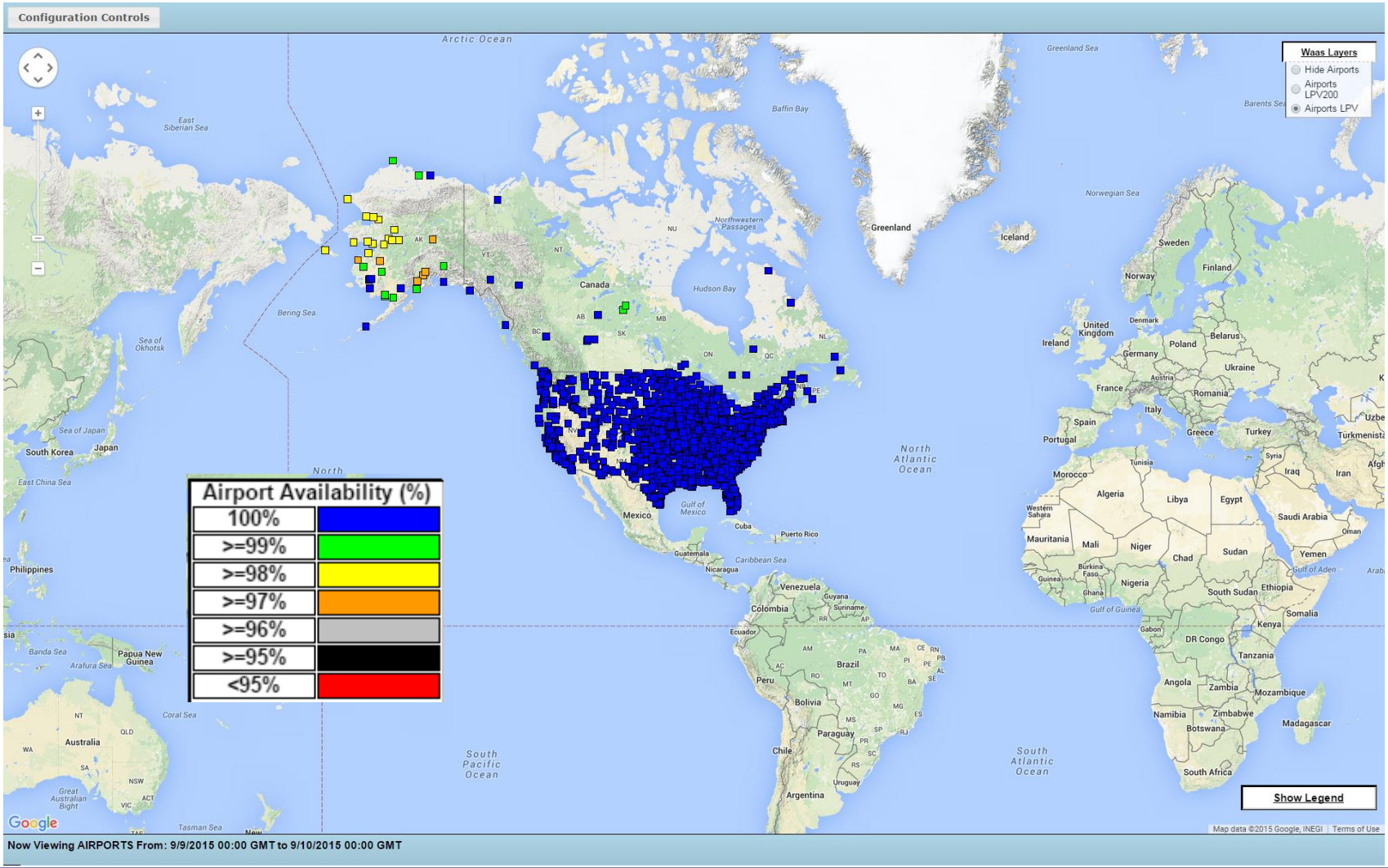

Federal Aviation Administration

Conclusion

- **Iono activity affected WAAS performance in Alaska and Canada on September 8, 2015**
  - RNP 0.1 service was unaffected by this event
- **Planetary KP reached 6 on September 8 and 9**