WAAS Technical Report
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Atlantic City International Airport, NJ
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DR #127: Effect on WAAS from Iono Activity on March 17-18, 2015

GPS Week/Day: Week 1836 Day 2 (03/17/2015)

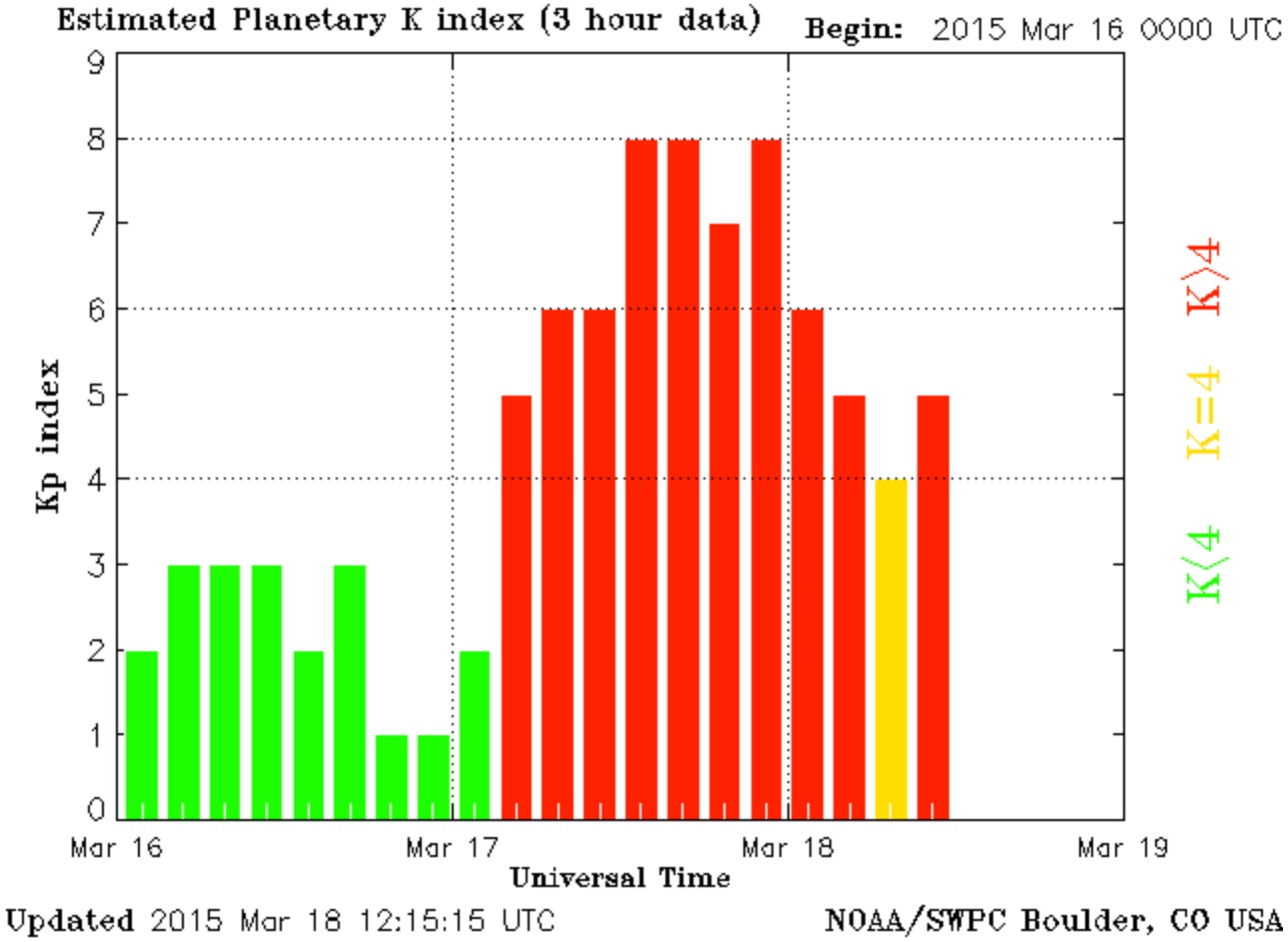
Background

- **This presentation shows the effects on some WAAS performance metrics from this solar event**
- **Canada, Alaska, and CONUS were affected at various times on March 17 and March 18**
  - Effect on March 18 ended by 0130 GMT
- **KP reached 8**

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 March 16, 2015**
  - The max Kp was 8 on March 17
    - Note that the College site had a max Kp of 6
- **The KP index is high during the on March 18**
  - There was effect on WAAS coverage only in the first couple hours of the day

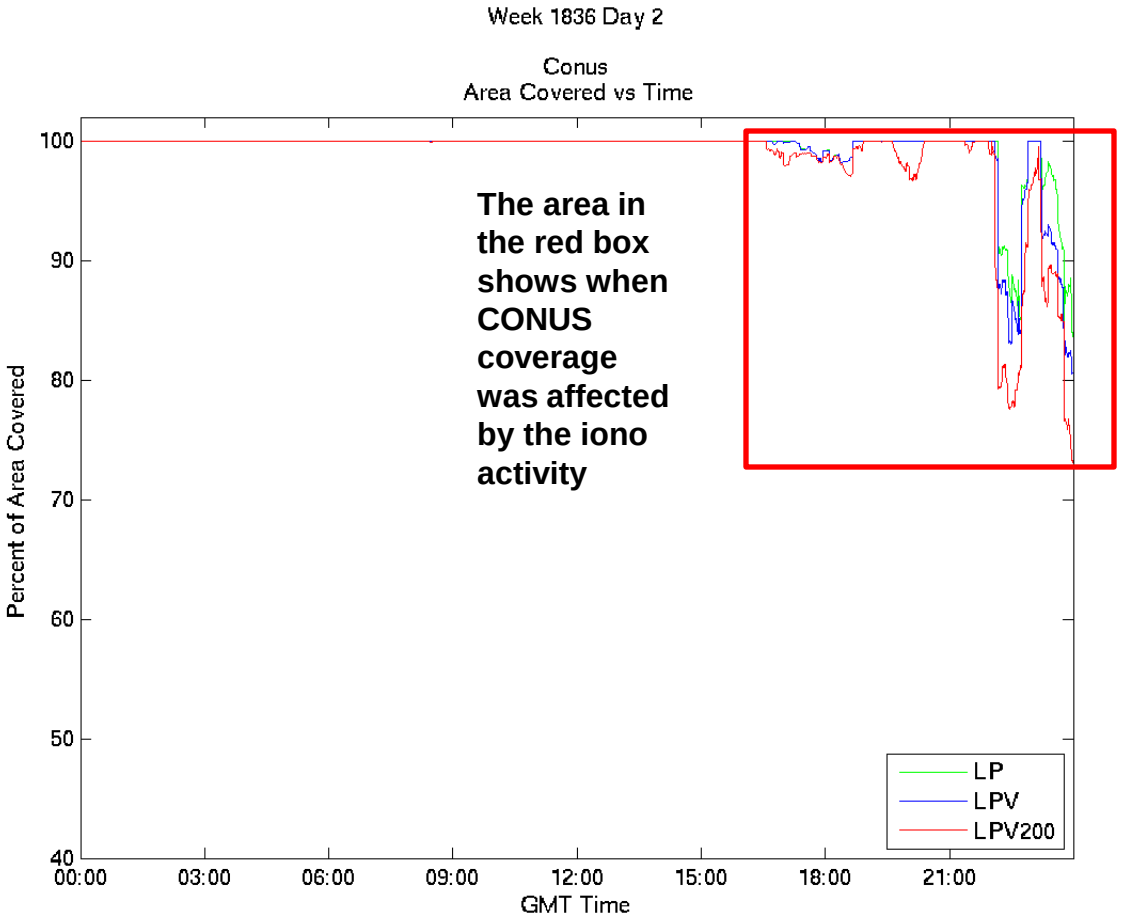
Kp Index Chart



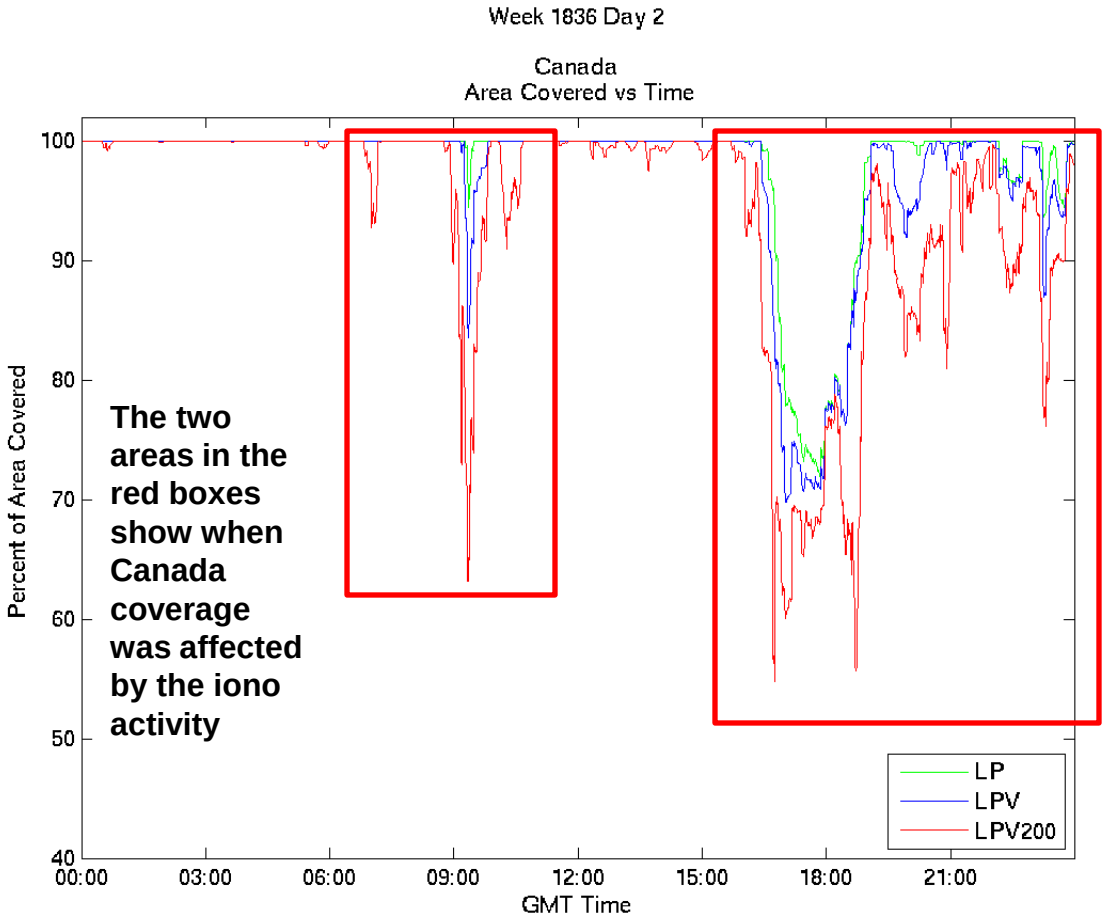
Coverage vs. Time Charts

- **This event affected WAAS LP, LPV, and LPV-200 coverage in Alaska, Canada, and eastern CONUS on March 17 and March 18**
  - RNP 0.3 and RNP 0.1 coverage unaffected
- **The next three slides show LP, LPV, and LPV-200 coverage vs. time for March 17, 2015**
  - CONUS
  - Canada
  - Alaska
- **Coverage vs. Time charts for March 18 are not shown**
  - Effect on March 18 ended by 0130 GMT

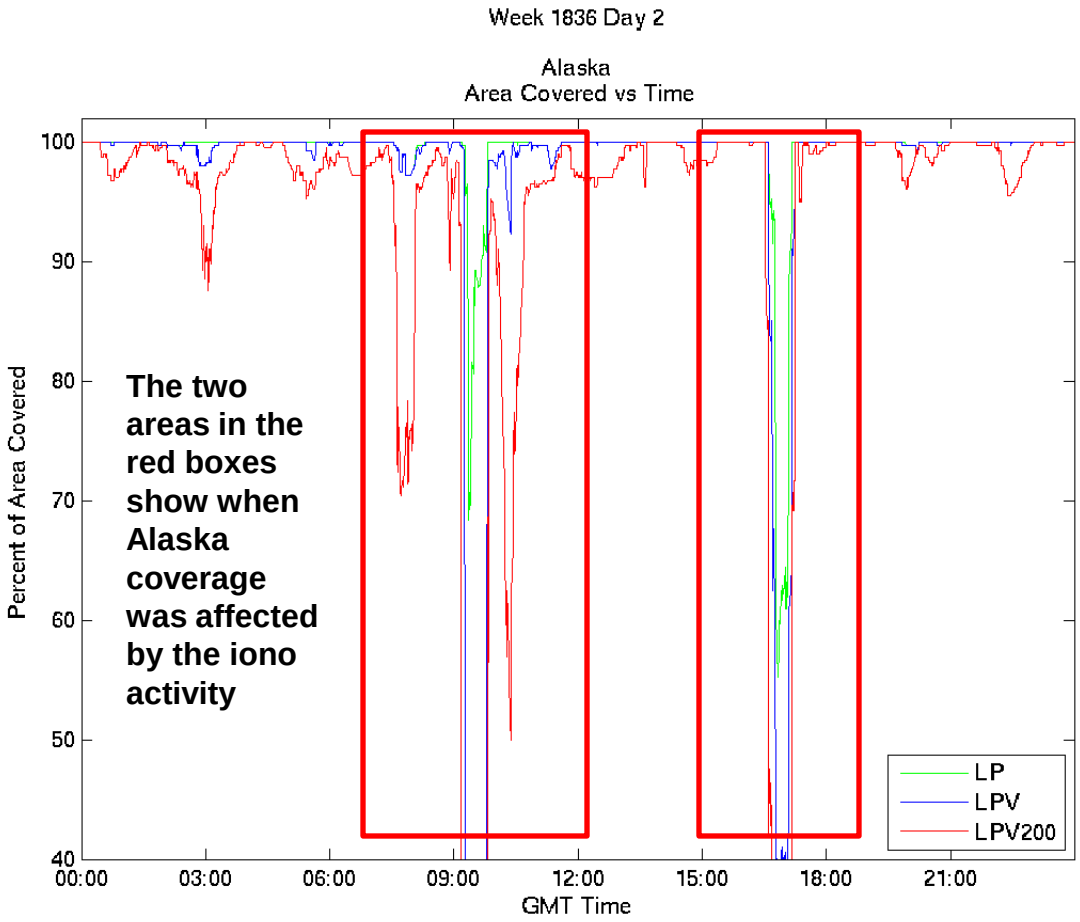
Coverage vs. Time in CONUS – March 17, 2015



Coverage vs. Time in Canada – March 17, 2015



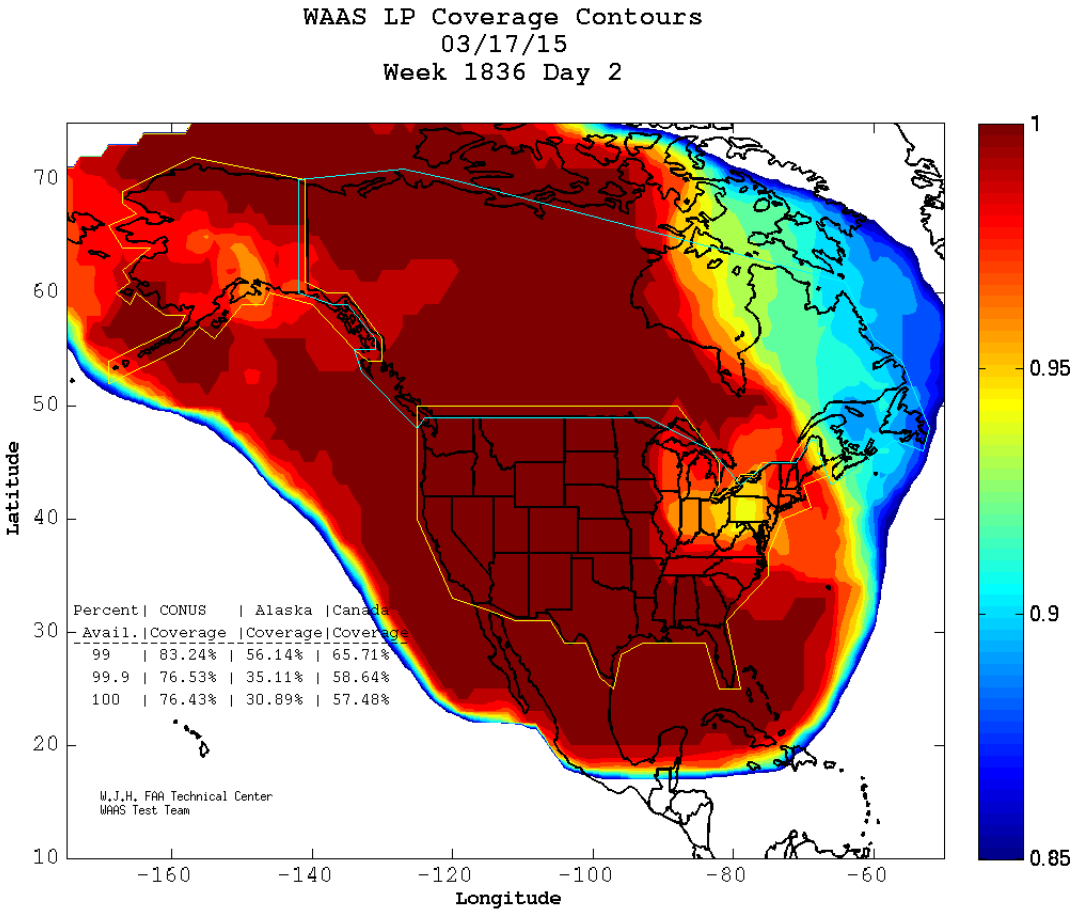
Coverage vs. Time in Alaska – March 17, 2015



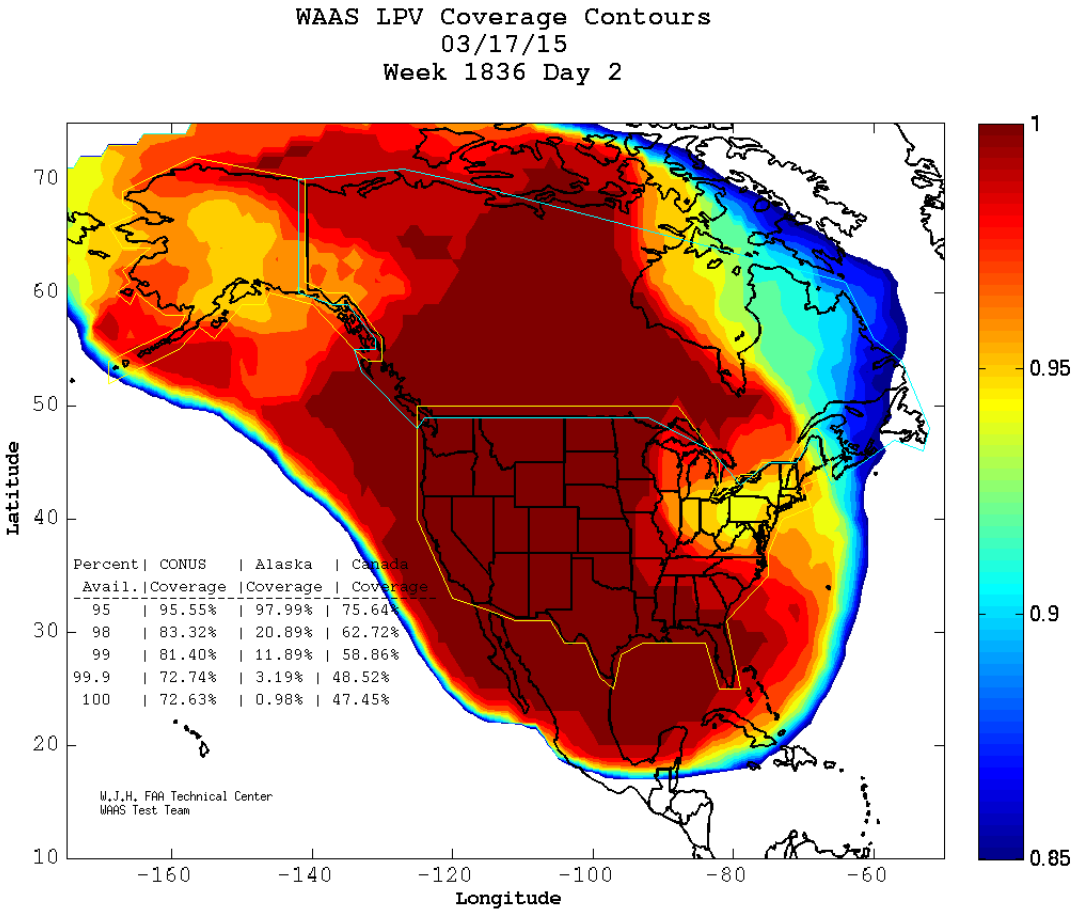
Coverage Charts

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

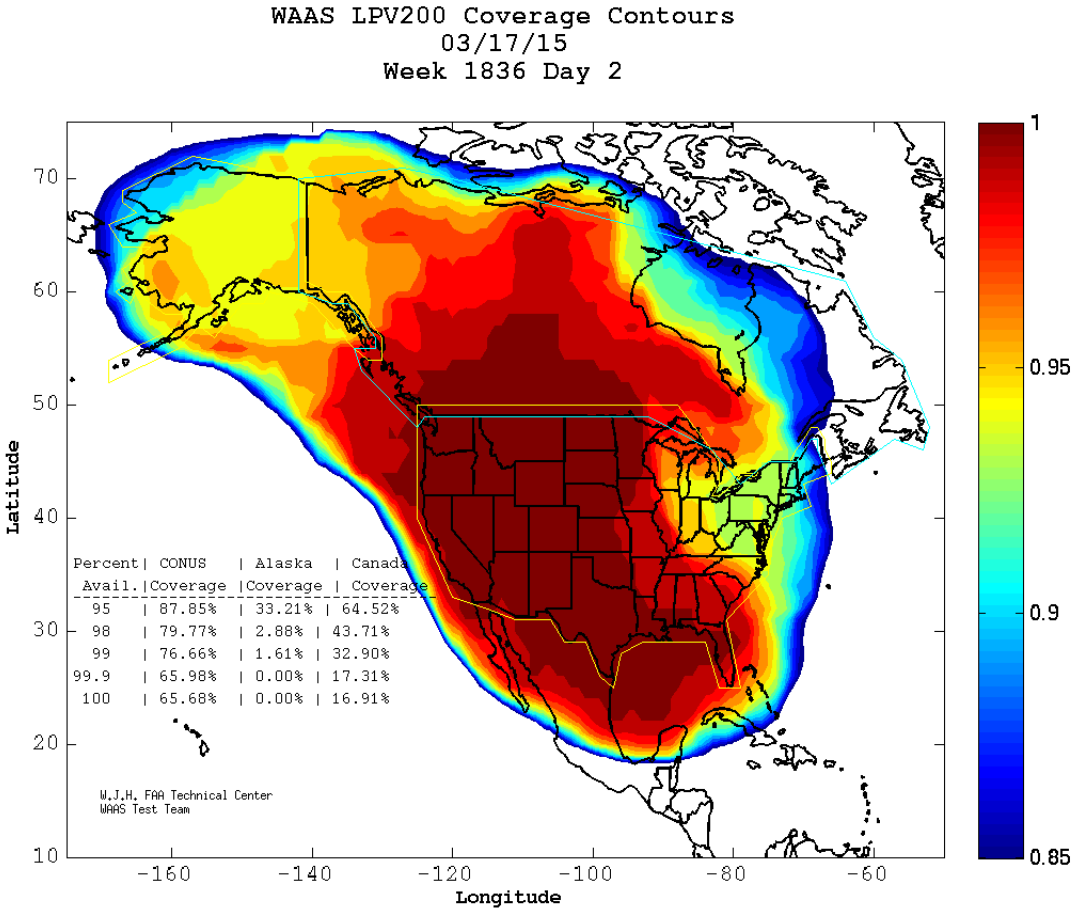
LP Coverage Plot – March 17, 2015



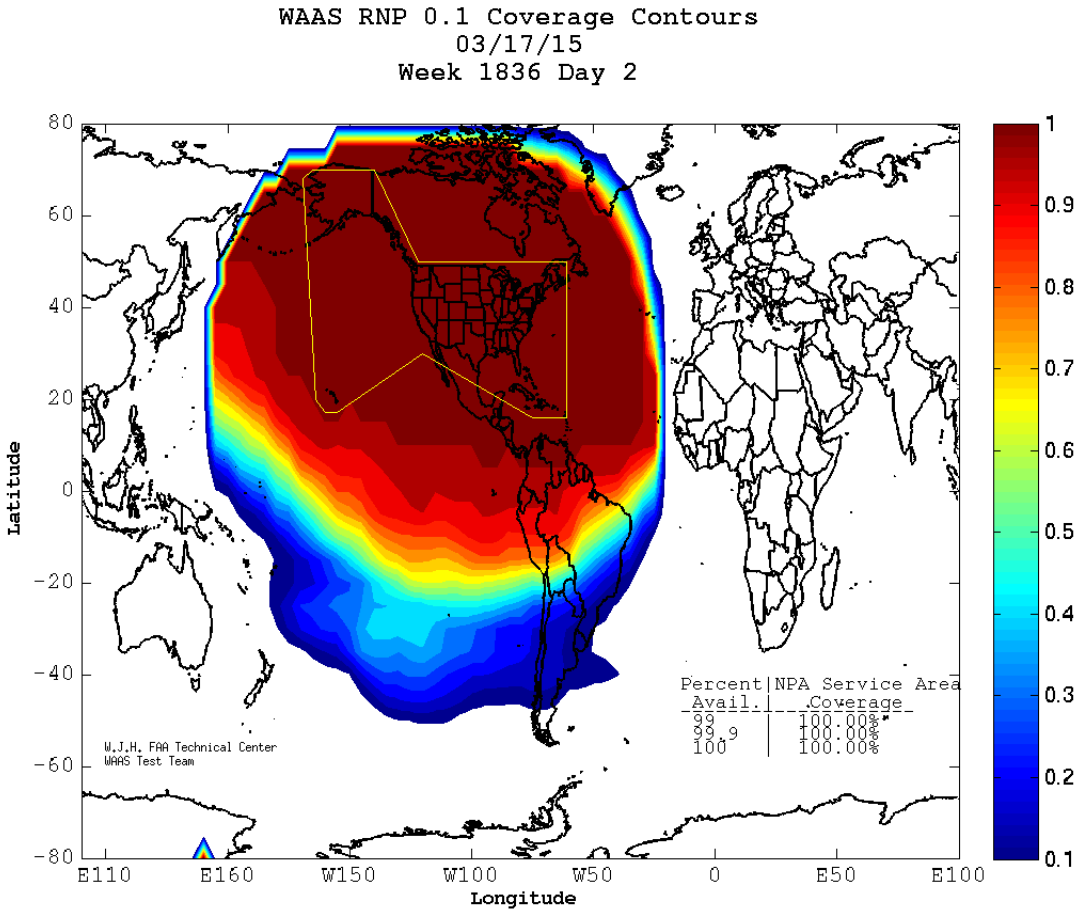
LPV Coverage Plot – March 17, 2015



LPV-200 Coverage Plot – March 17, 2015



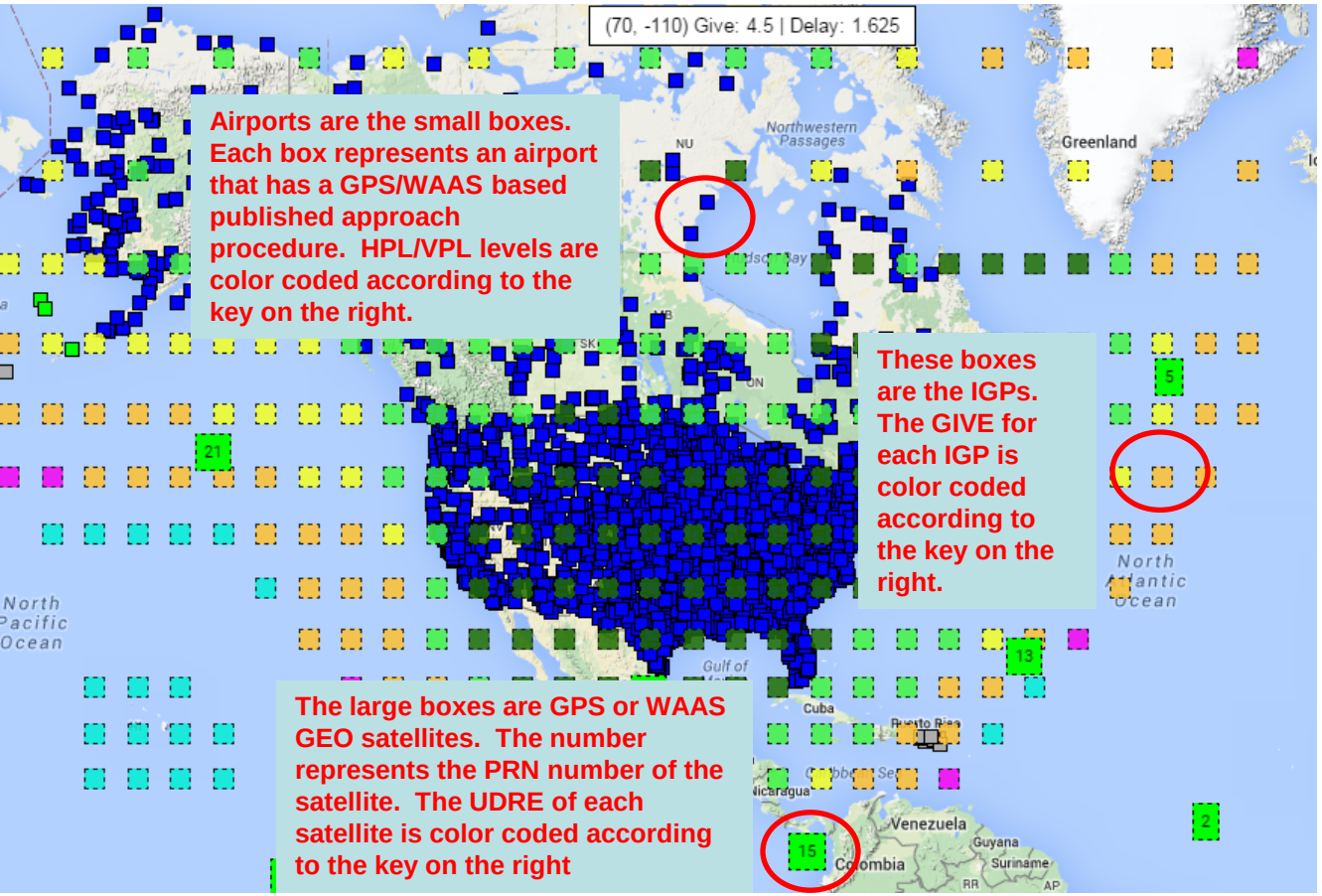
RNP 0.1 Coverage Plot – March 17, 2015



Videos

- **Two Google Maps videos that include airports, IGPs, and satellite positions have been split into separate time frames and are available as a zip file at this link**
  - Note that this zip file is a very large file, nearly 2GB
  - March 17-18 WAAS Video
- **As an alternative, the Google Map videos were generated from this website**
  - User guide is available here or you can contact me for how to use the animation tool
  - Next slide shows a key for the items in the video

Videos – Interpreting the Data



IGP GIVES

- 3.6 Meters
- 4.5 Meters
- 6 Meters
- 15 Meters
- Not Monitored
- 45 Meters

Airports

- HPL<40m & VPL<35M
- HPL<40m & VPL<50m
- HPL<556m& VPL<50m
- HPL<40m & VPL>50m
- HPL>40m & VPL>50m

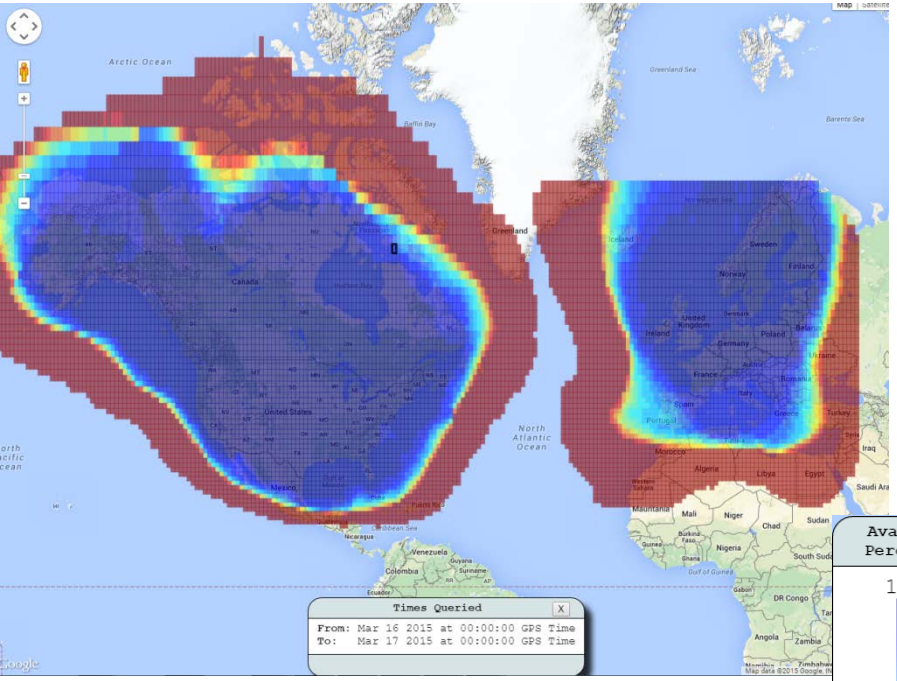
Satellites

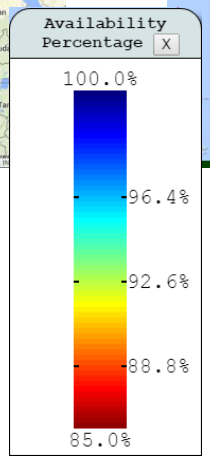
- UDRE = 15m or lower
- UDRE = 50m or 150m
- Satellite is Not Monitored
- Satellite is Do Not Use

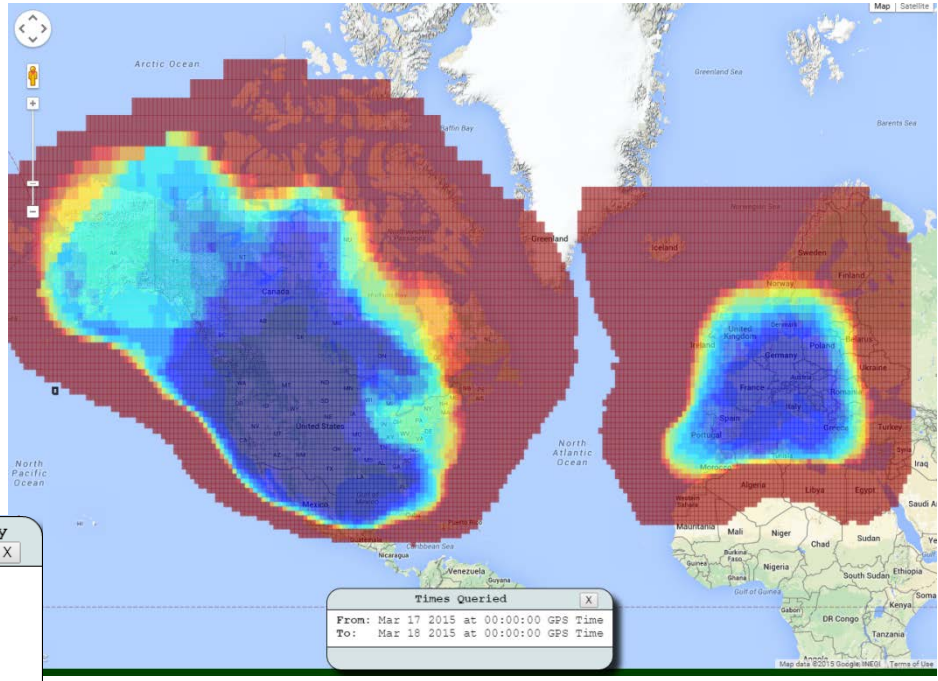
EGNOS

- **EGNOS was also affected by this iono activity**
- **Next chart shows WAAS and EGNOS coverage on March 16 and March 17**
  - March 16 is included for comparison so March 17 can be compared to a ‘typical’ day

WAAS/EGNOS Coverage March 16 and 17







March 16, 2015

March 17, 2015

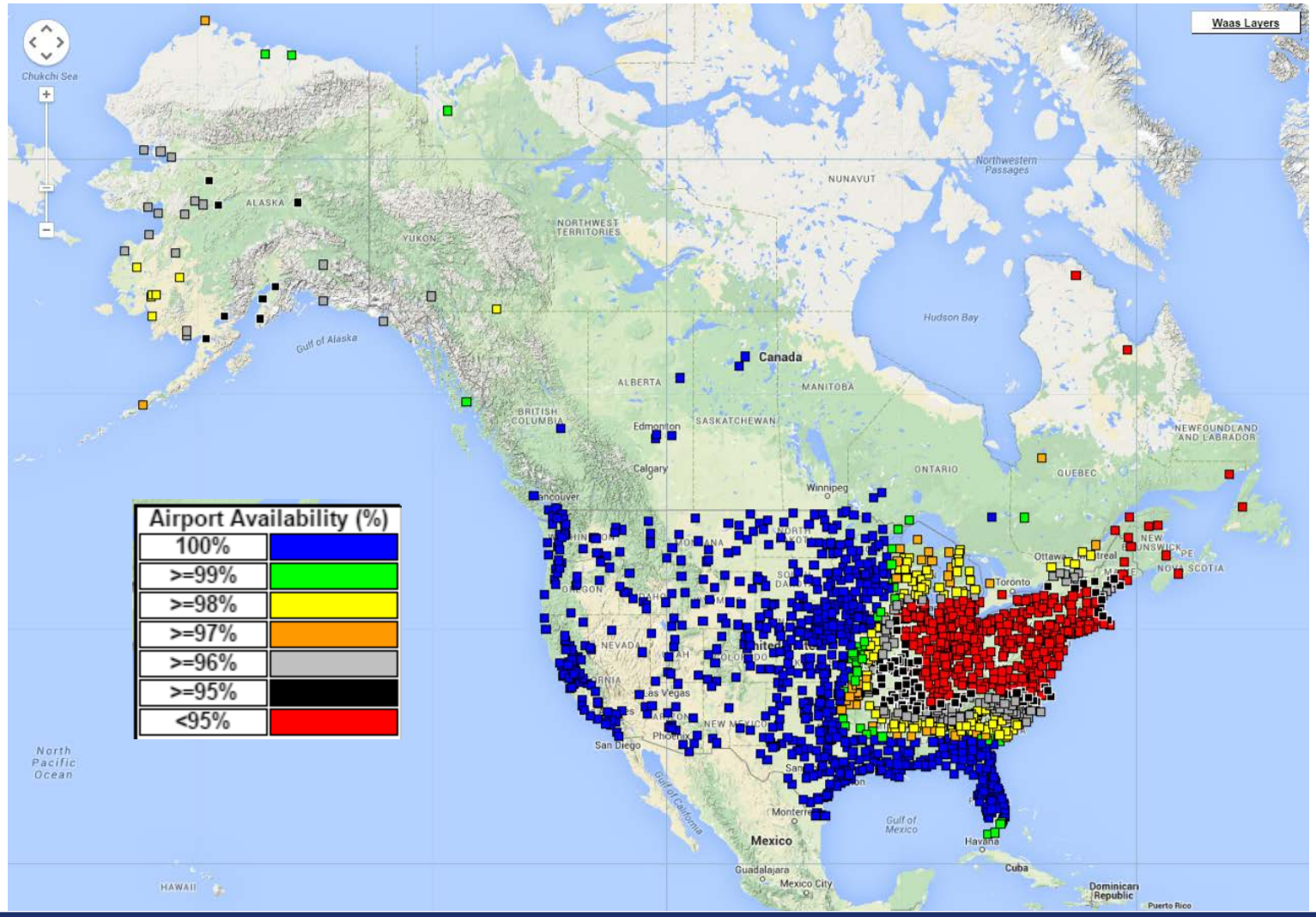
Accuracy

- Accuracy that was calculated at all Alaska and many CONUS WAAS reference stations was higher than usual
- The maximum vertical position error in CONUS while LPV was available occurred at Atlanta on March 18 at 6.1 meters (VPL = 48.8 meters)
- The maximum horizontal position error in CONUS while LPV was available occurred at Boston on March 17 at 4.7 meters (HPL = 28 meters)
- The maximum vertical position error in CONUS at any VPL level occurred at Cleveland on March 17 at 8.5 meters (VPL = 104.3 meters)
- The maximum horizontal position error in CONUS at any HPL level occurred at Chicago on March 18 at 6.5 meters (HPL = 53 meters)

Rollup of IGPs and Airports

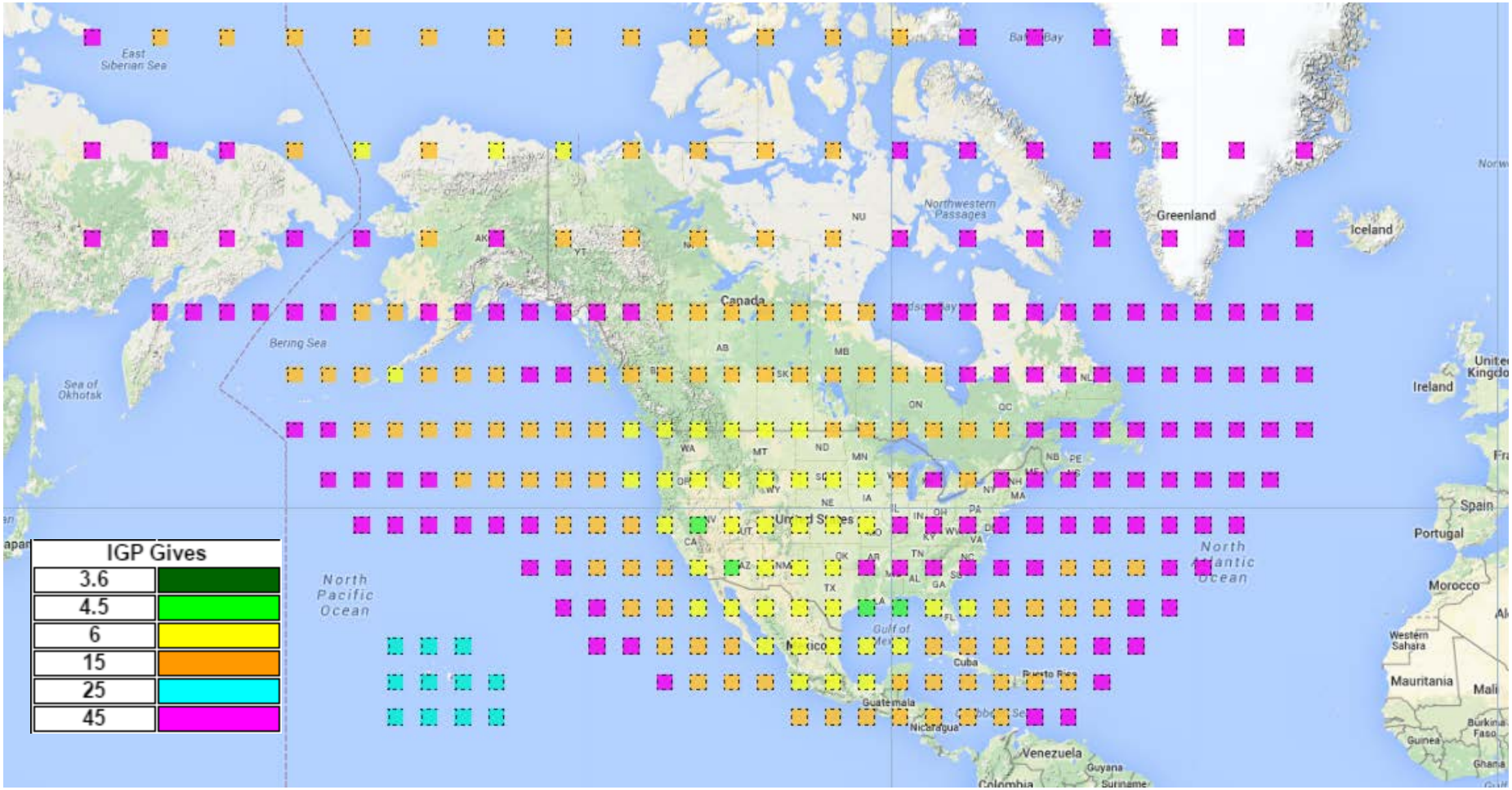
- **The next two slides show:**
  - Maximum GIVE value for each IGP
  - Airport availability for airports with a GPS/WAAS published approach procedure
  - Time period is from March 17 at 0600 to March 18 at 0600 GMT

Airport Availability from March 17 at 0600 to March 18 at 0600 GMT



Federal Aviation Administration

Maximum Value for IGP GIVEs from March 17 at 0600 to March 18 at 0600 GMT



Conclusion

- **Iono activity affected WAAS performance in Canada, Alaska, and CONUS on March 17 and March 18**
  - RNP 0.1 service was unaffected by this event
- **Planetary KP reached 8 on March 17**