Plasmasphere Contribution to GNSS TEC

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Challenge #1: How much the plasmasphere contribute to the topside LEO TEC?
Challenge #2: Does the plasmasphere contribute to the SED plume?

Yizengaw et al., JGR, 2008
Challenge #3: How much the plasmasphere contribute to GNSS TEC at different latitudes?
Challenge #3: How much the plasmasphere contribute to GNSS TEC at different latitudes?
Complementary challenge: How accurate are the GNSS and/or Altimeter TECs?

- Ground-based GPS TEC (GTEC)
- JASON Topside GPS TEC (JTEC)
- Topex ALTEC (TATEC)
- JASON ALT-TEC (JATEC)

GPS & Altimeter TEC

Altimeter TEC errors

Altimeter TEC percentage errors

Range errors

GPS - JSN = ALT
Complementary challenge: How accurate are the GNSS and/or Altimeter TECs?
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Conclusion

The general conclusion from the current global investigation is that the plasmasphere contributes significantly to total TEC, especially at night where its contribution can reach up to 60% at low latitudes.

The plasmaspheric contribution appears to be higher at low latitudes where the GPS raypath traverse longer distance through the plasmasphere compared to its distance in the mid- and high-latitude region.
Thank you!

Courtesy of NASA
Altitude variability of Electrodynamics

Altitude variation of the EEJ magnitude estimated from the Polar Orbiting Geophysical Observatory (POGO) satellite

DMSP 16 at ~ 870km altitude
Suitable Local time coverage
16:00 – 17:00 LT

SWARM B at ~ 530km altitude
Suitable Local time coverage
10:30 – 11:30 LT

SWARM A at ~ 460km altitude
Suitable Local time coverage
10:30 – 11:30 LT

Onwumechili, JGG, 1985
Electrodynamics at different altitudes

**SWARM A @ 11:00 LT**

EEJ from SWARM-A for October 2015 from 10:30 to 11:30 LT

**SWARM B @ 11:00 LT**

EEJ from SWARM-B for October 2015 from 10:30 to 11:30 LT

**DMSP 16 @ 16:30 LT**

EEJ from DMSP 16 for October 2015 From 16:00 to 17:00 LT