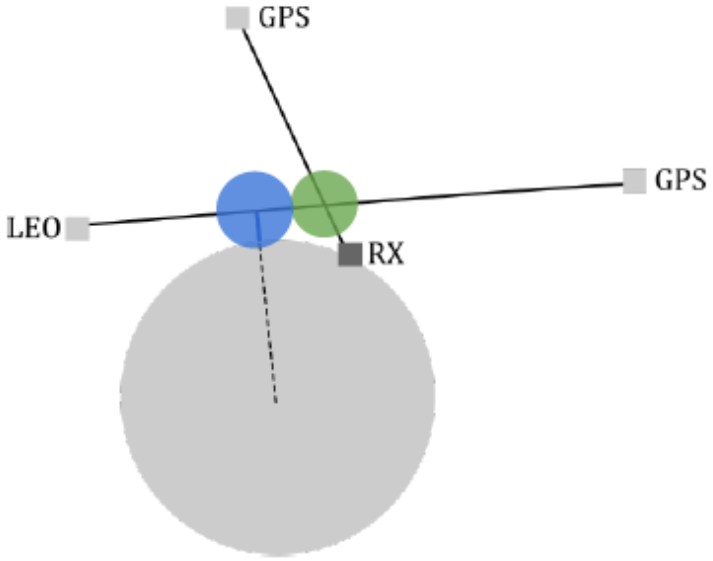
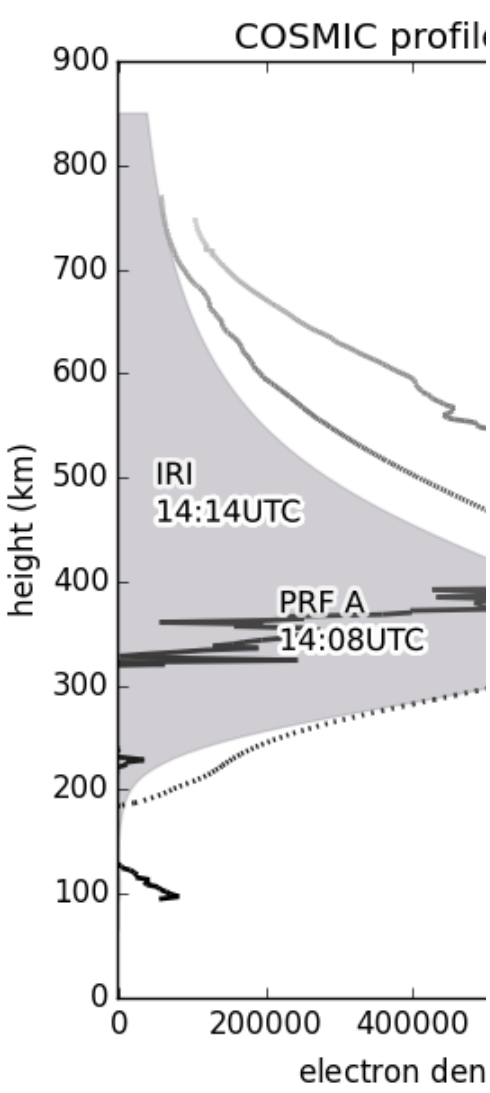
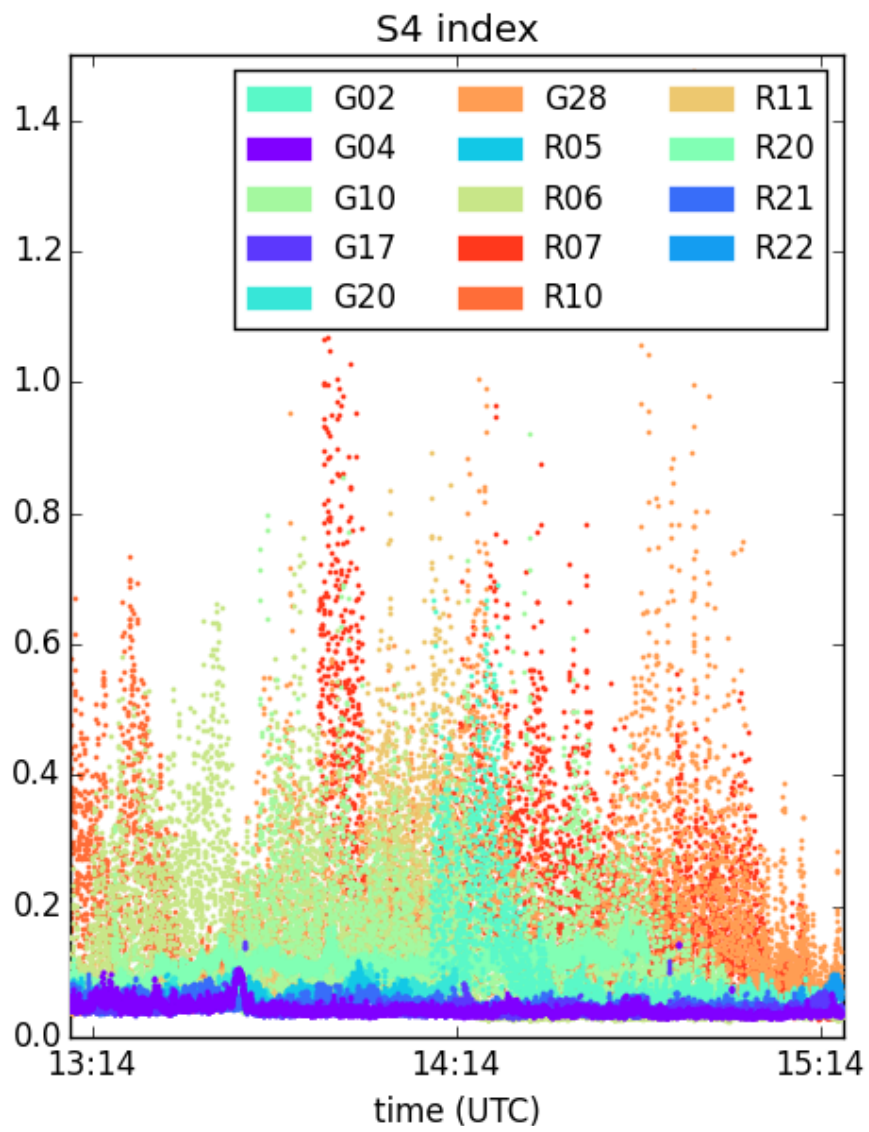
Common Volume Observations at Jicamarca Using a Multi-GNSS Receiver and COSMIC RO Measurements to Study Ionospheric Irregularities

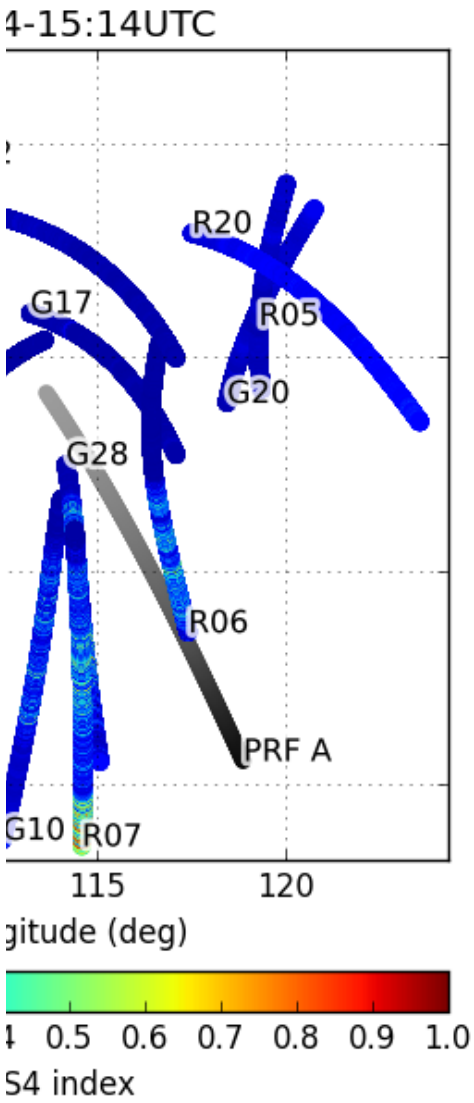


Brian Breitsch, Jade Morton
Colorado State University

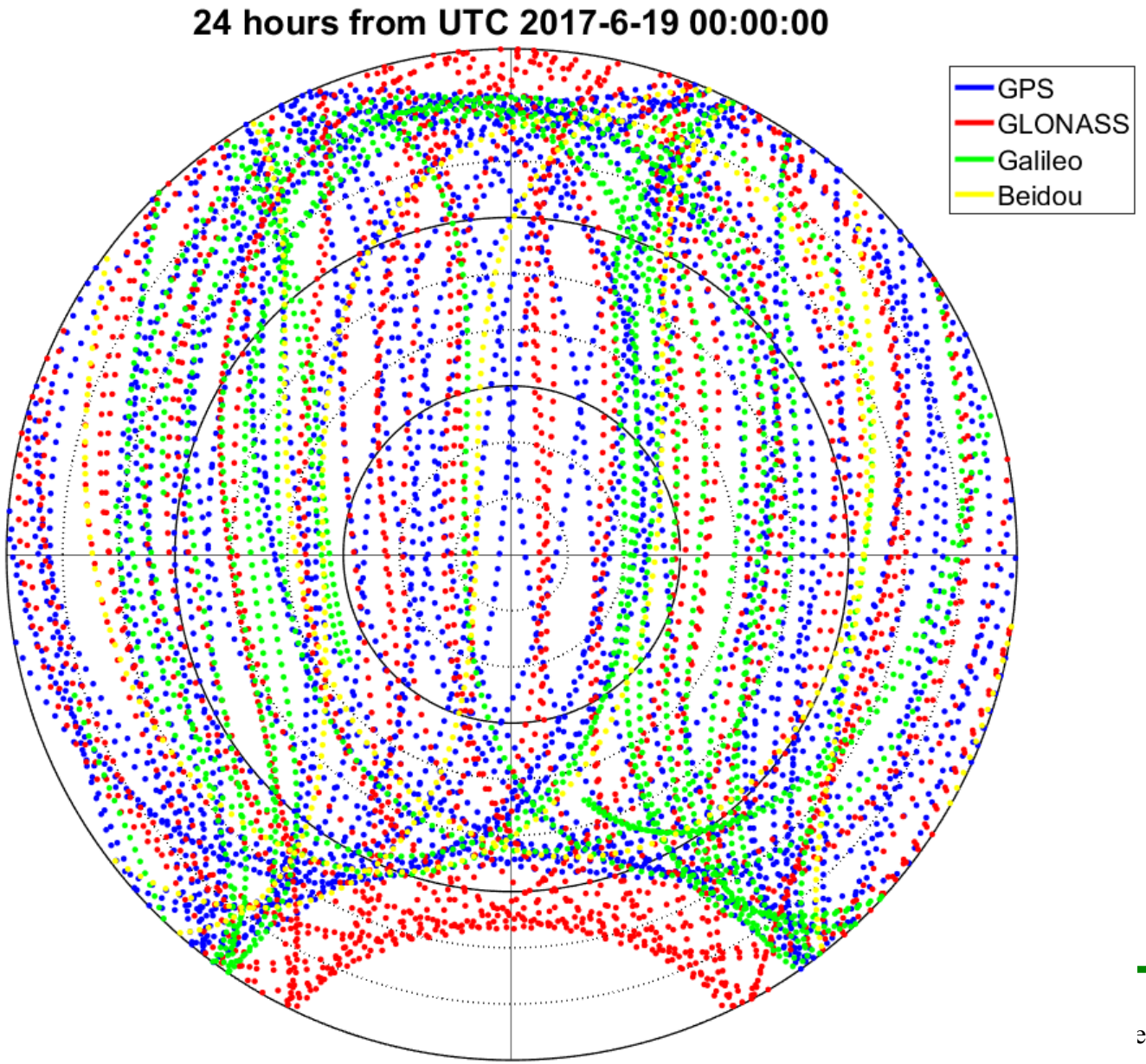
Motivation and Problem Statement



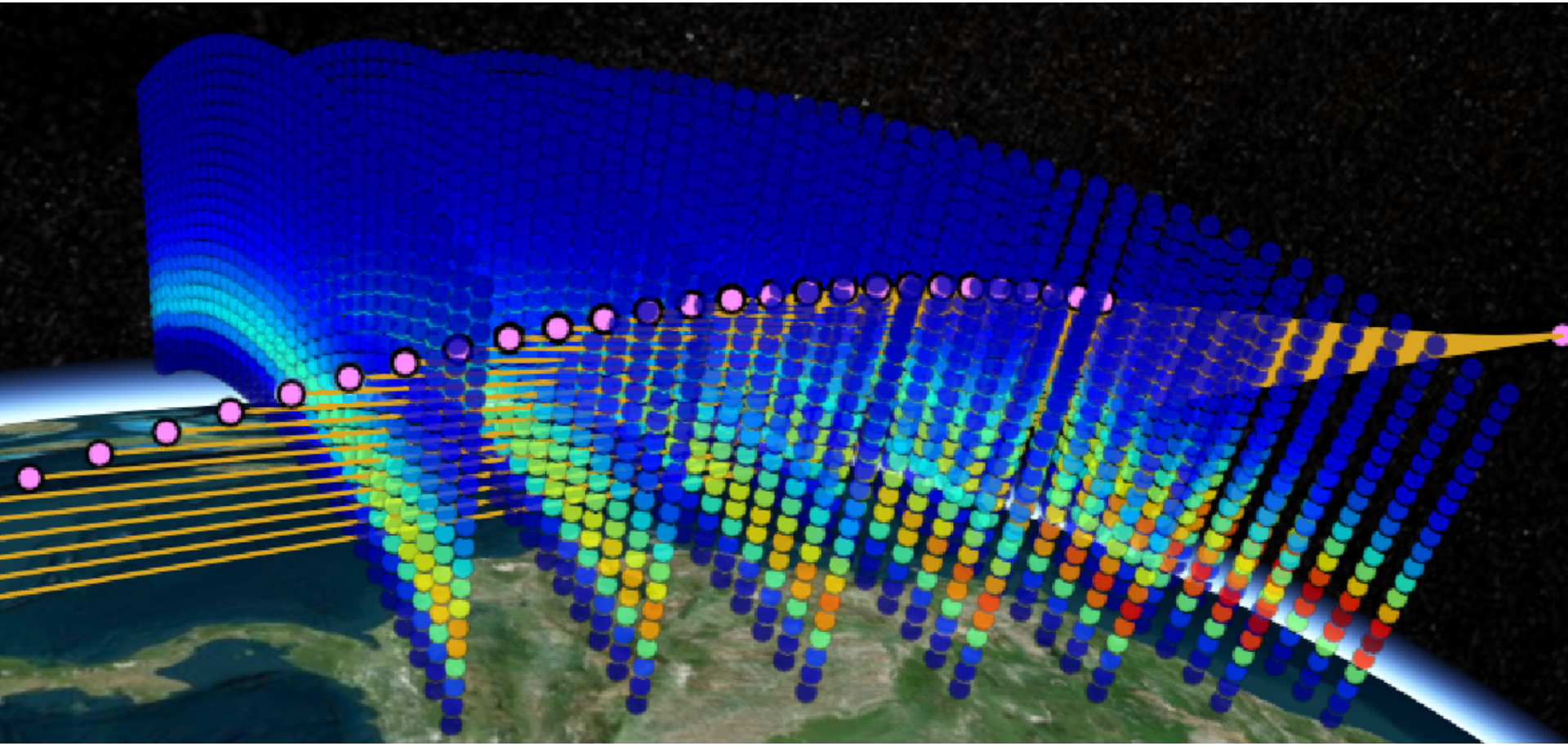




Ground GNSS Tracks at Jicamarca

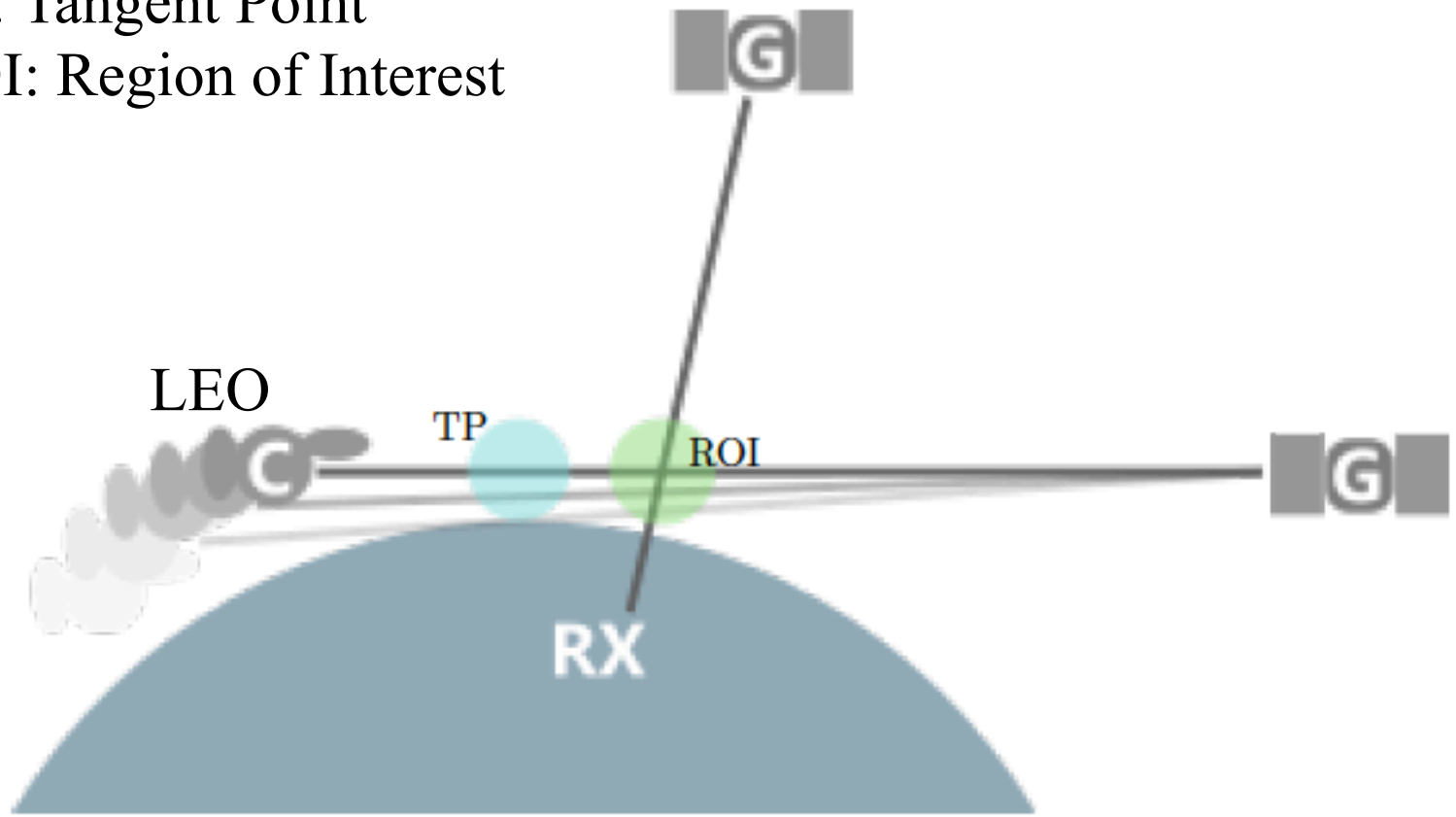


COSMIC Track

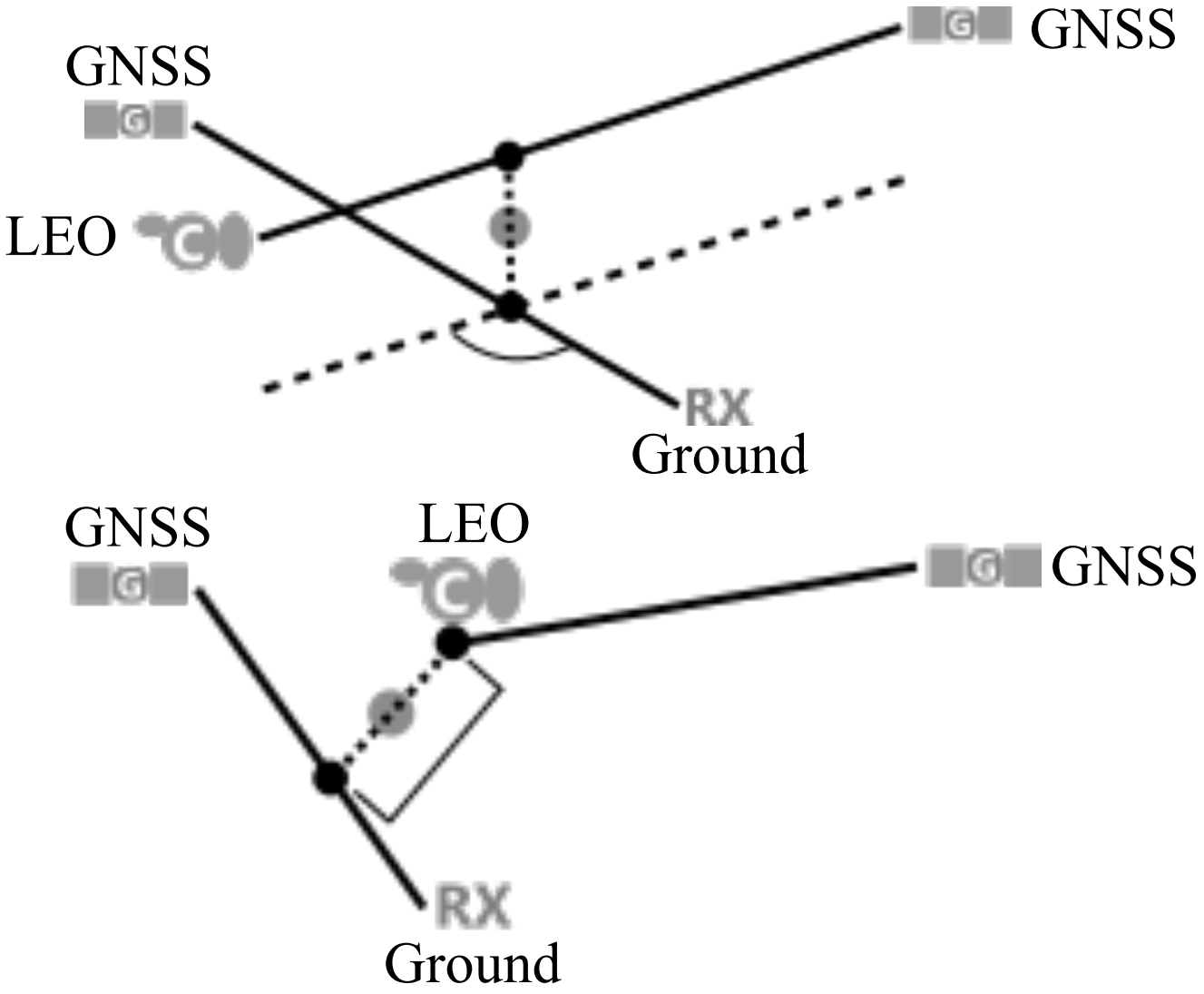


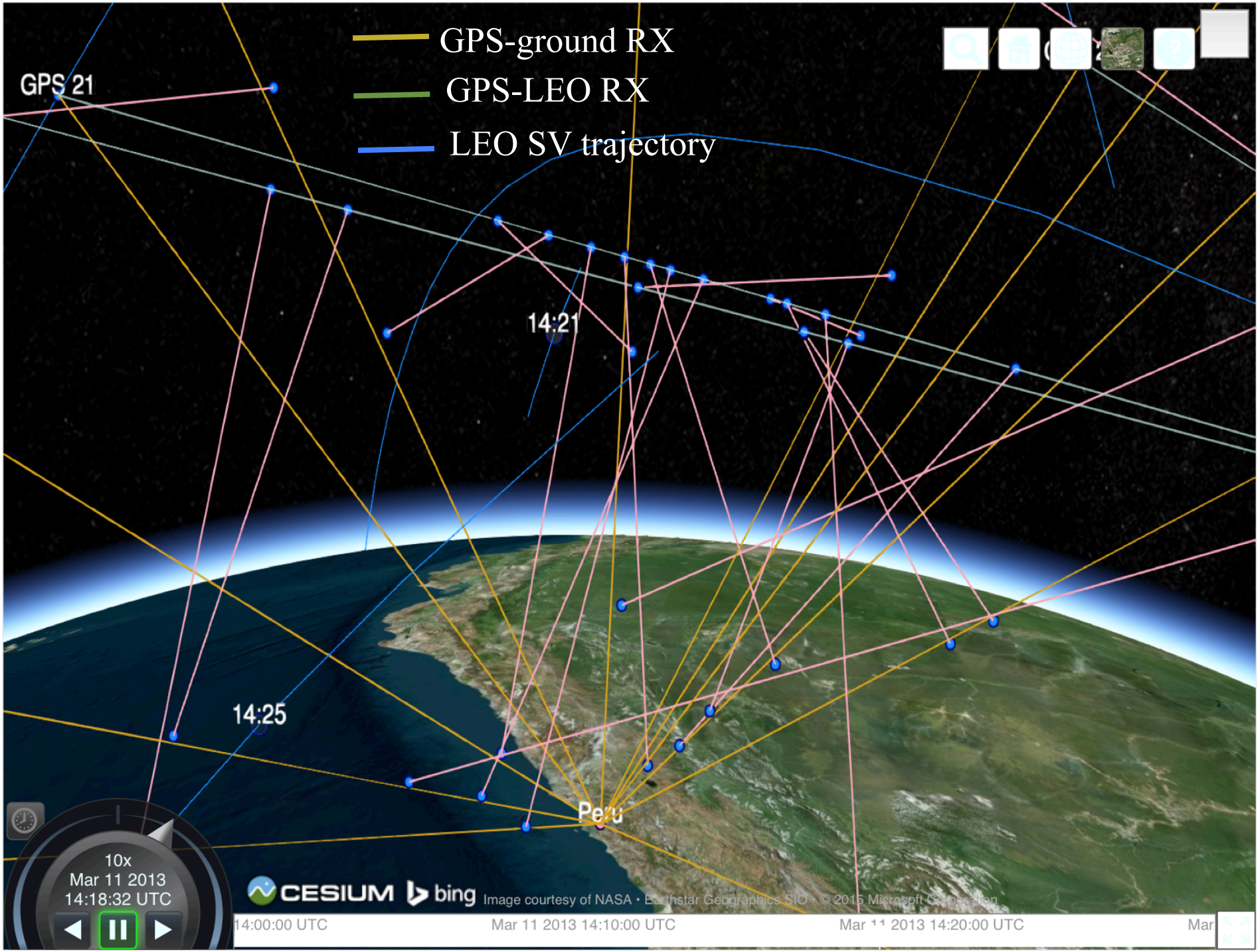
Common Volume Geometry

TP: Tangent Point
ROI: Region of Interest

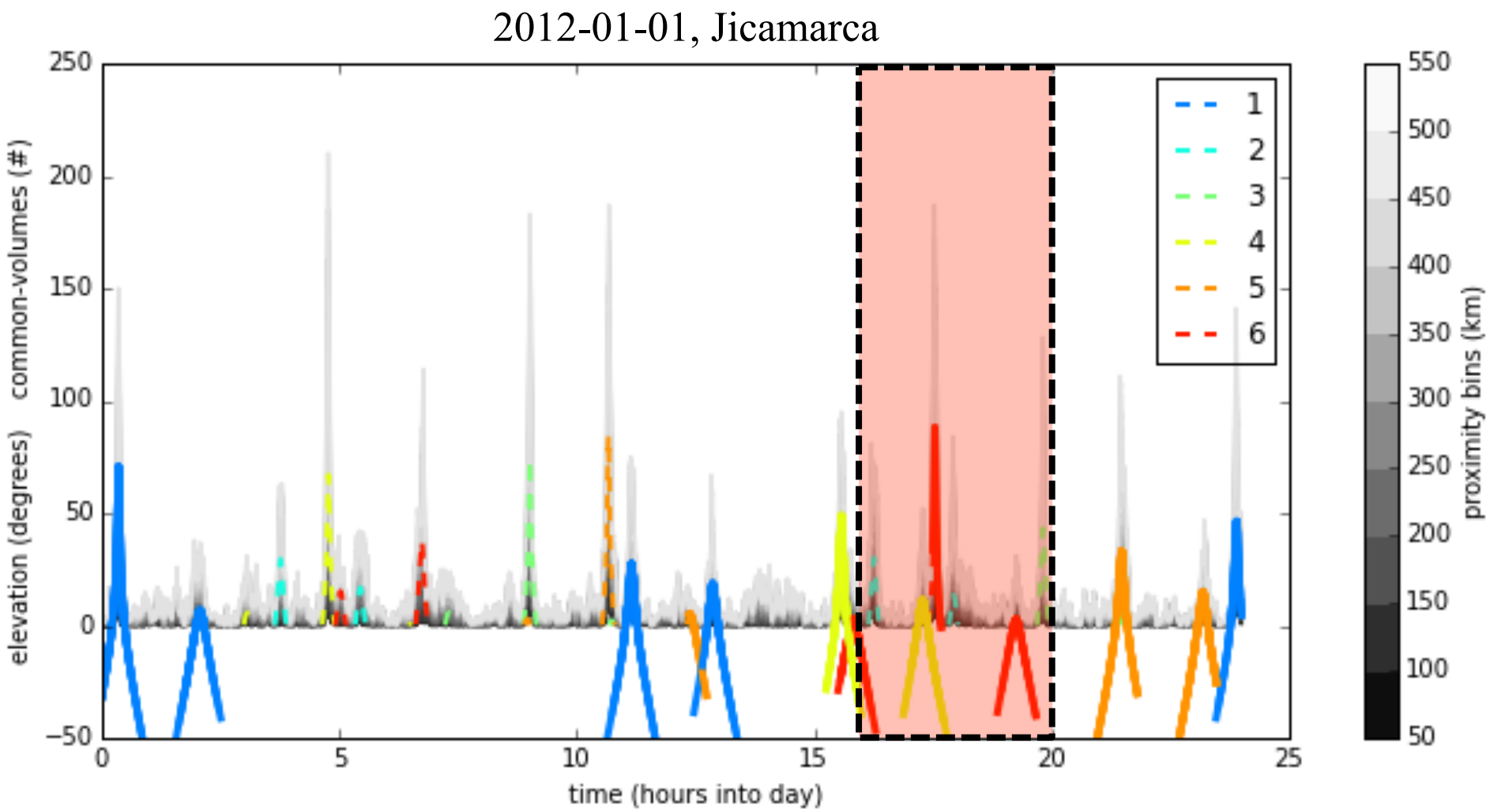


Common Volume Point of Interest

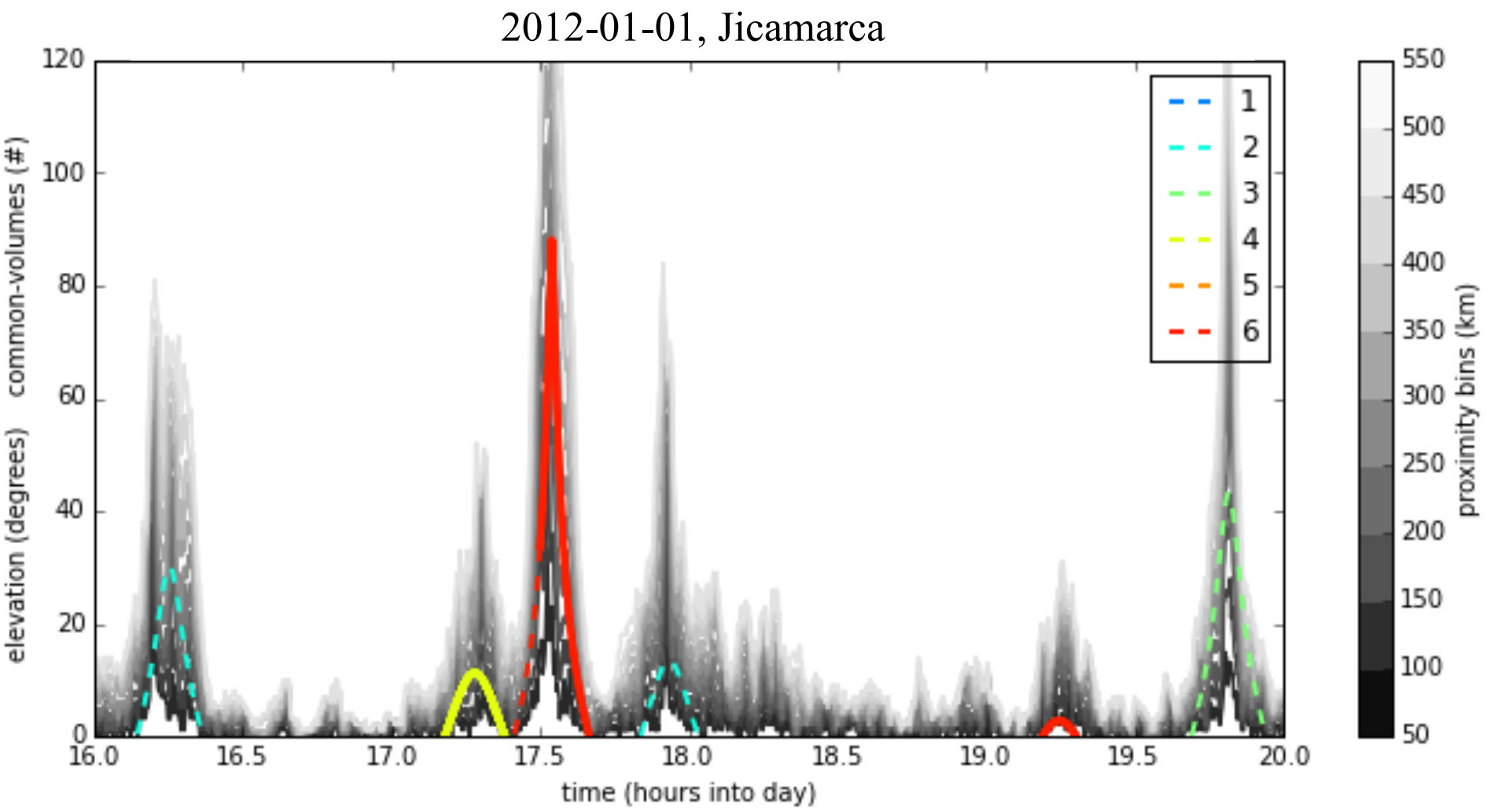



GPS-ground RX
GPS-LEO RX
LEO SV trajectory
GPS 21
14:21
14:25
10x
Mar 11 2013
14:18:32 UTC
CESIUM
bing
Image courtesy of NASA · Earthstar Geographics SIO · © 2015 Microsoft Corporation
14:00:00 UTC
Mar 11 2013 14:10:00 UTC
Mar 11 2013 14:20:00 UTC

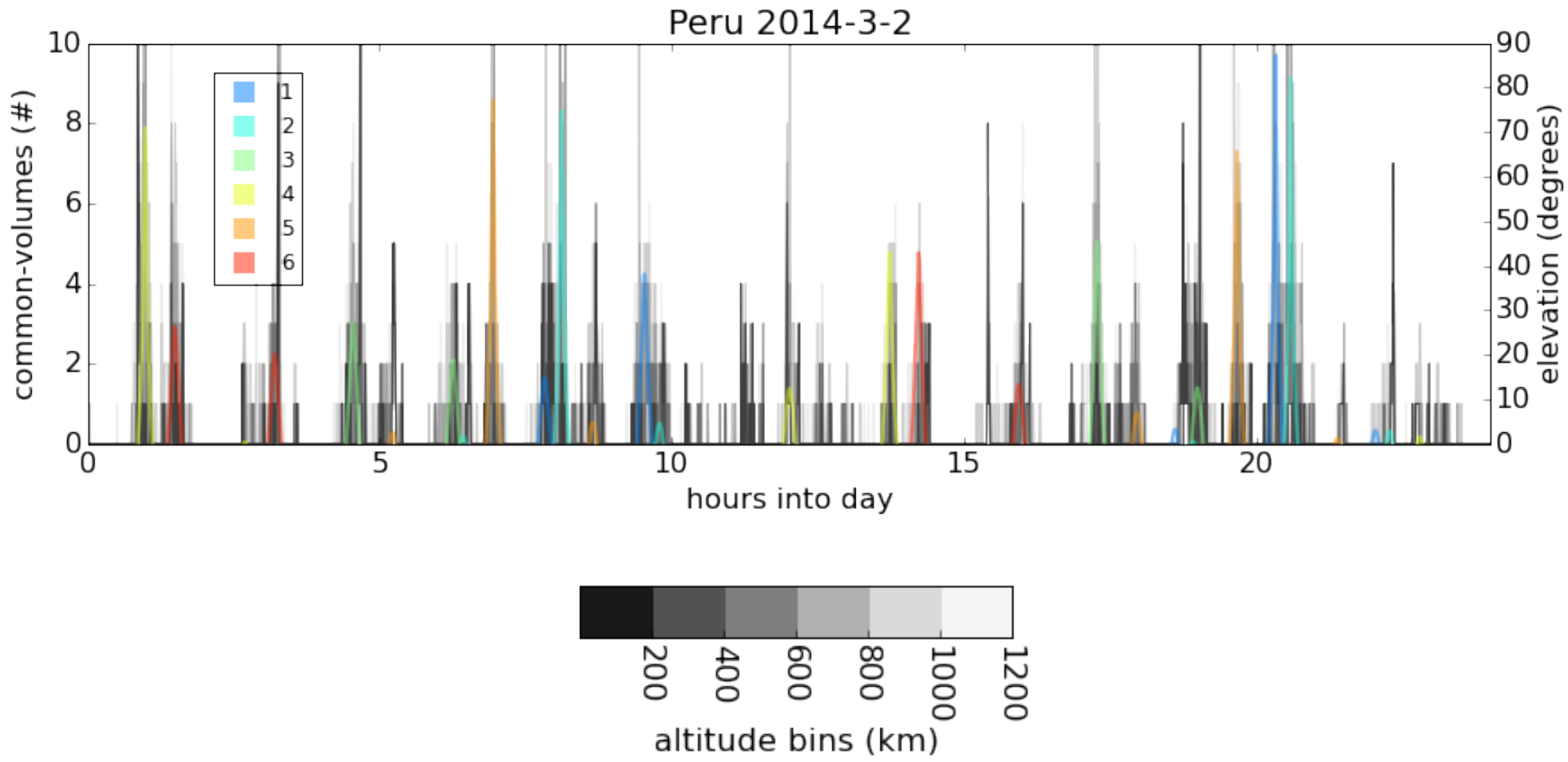
Example Common Volume Observations and Data Availability



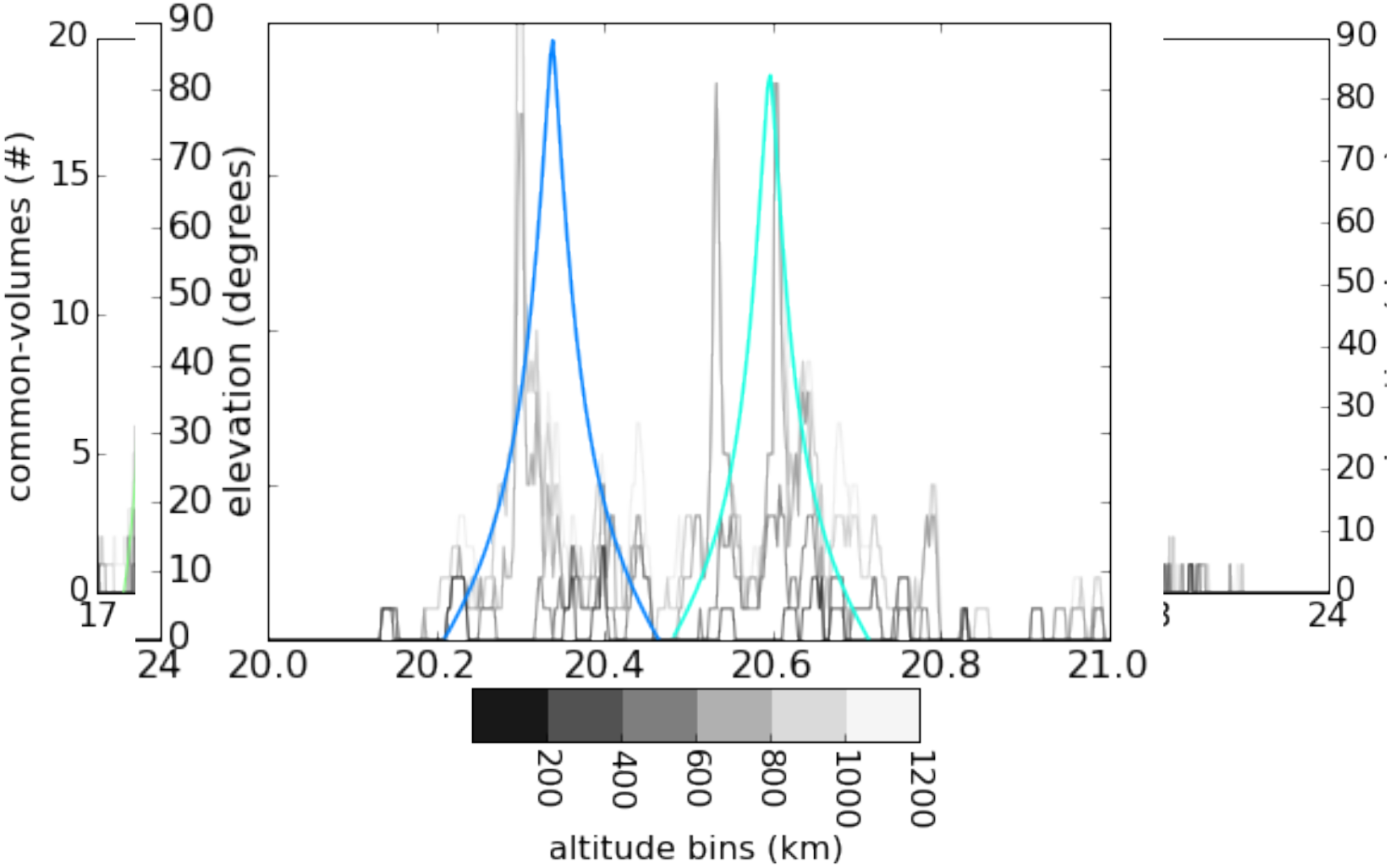
Example: A Closer Look (Peru Station)

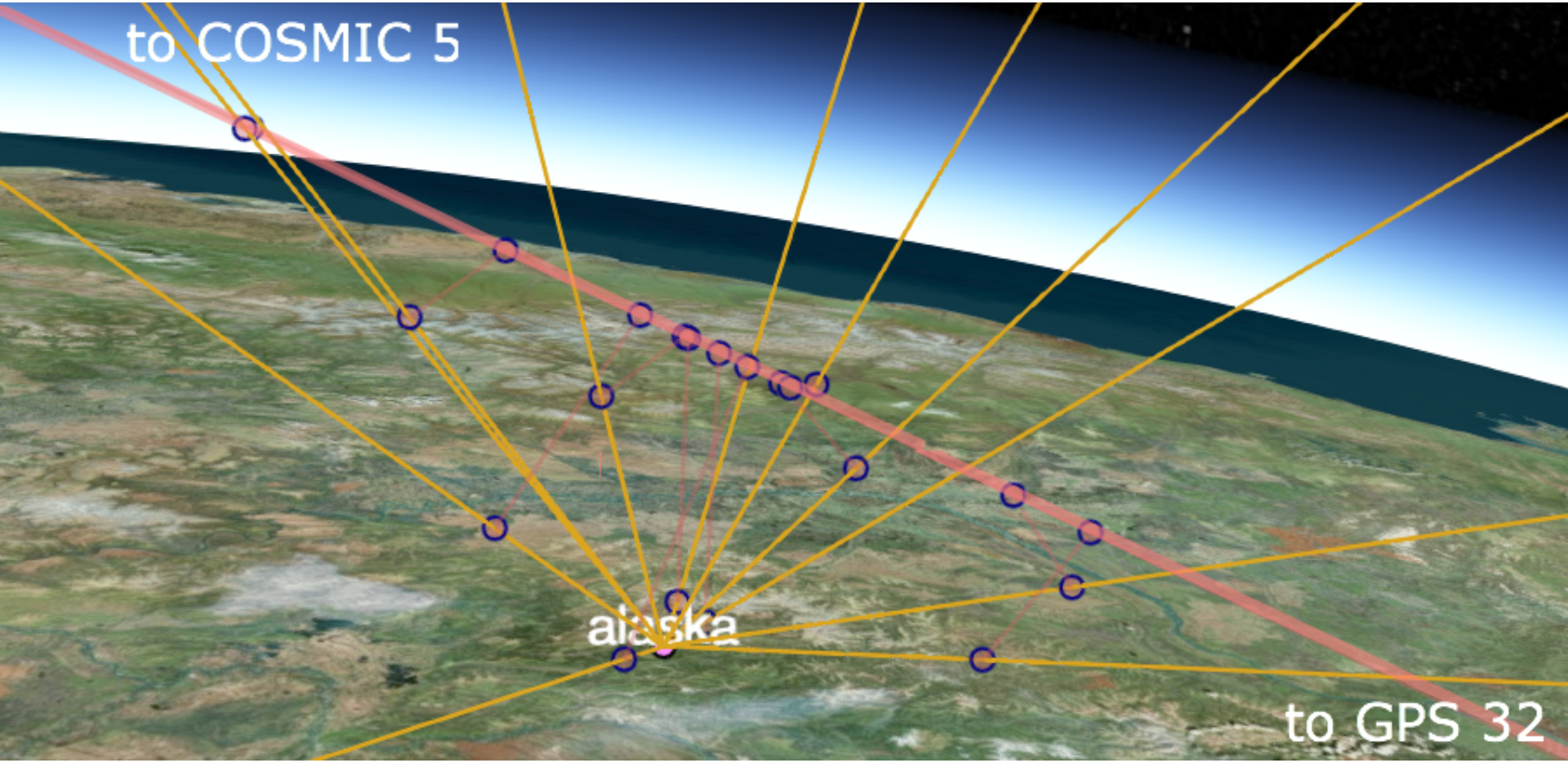


Number of Common Volume Observations Below Certain Altitudes

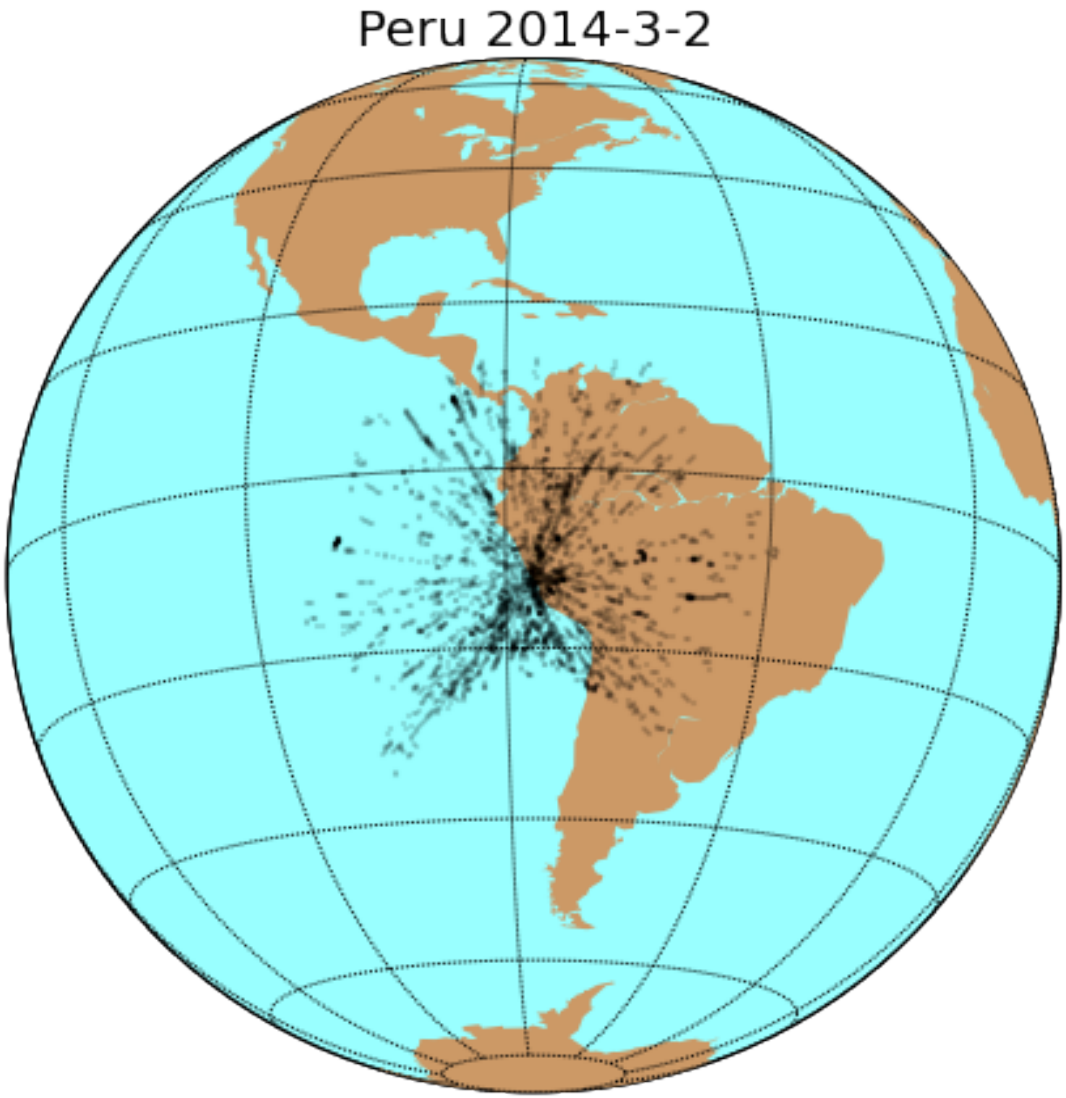


Number of Common Volume Observations Below Certain Altitudes: Close-Up




to COSMIC 5
alaska
to GPS 32

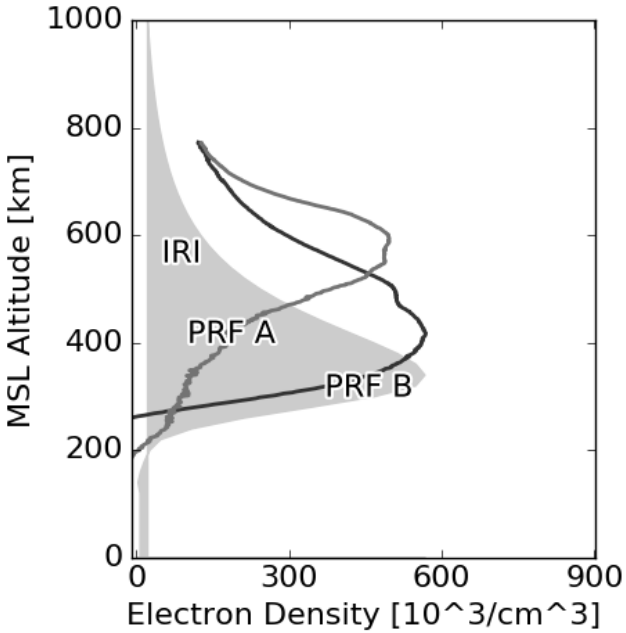
Common Volume POI Projection

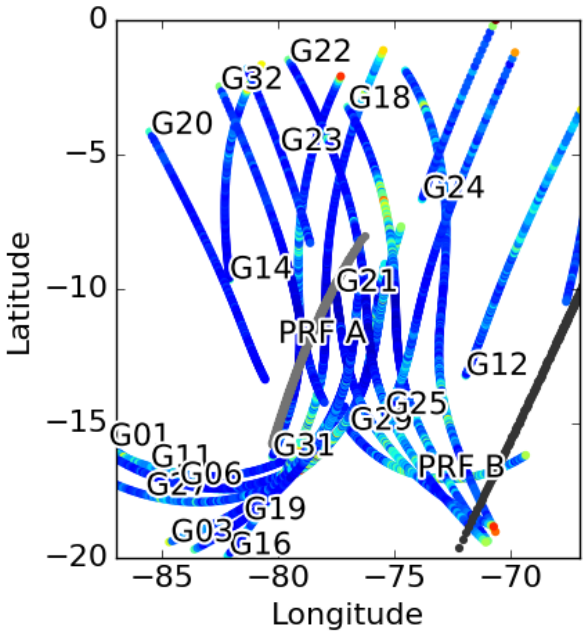


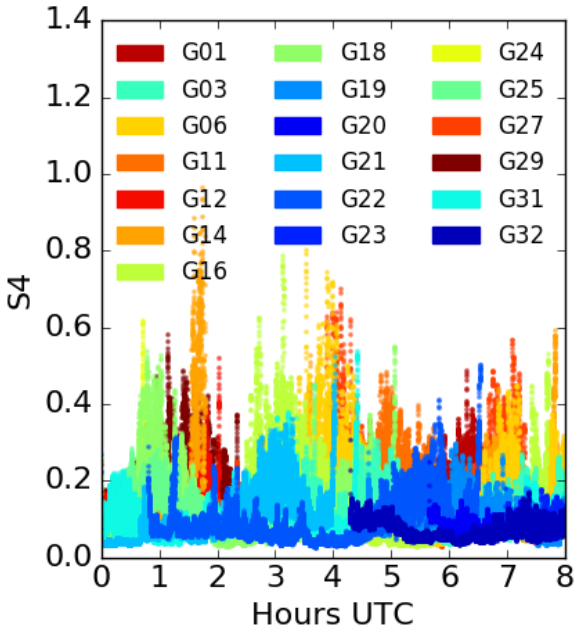
Conclusions and Future Work

- Developed software to identify common volume measurements between ground-based GNSS receivers and COSMIC RO satellites.
- Common volume occurrence frequency analysis
- How to synergistically utilize common volume measurements to improve ionosphere profiling?
- Sponsor: AFRL and NASA

Backup Slide


MSL Altitude [km]
Electron Density [10^3/cm^3]
IRI
PRF A
PRF B


Latitude
Longitude
G22
G32
G18
G20
G23
G24
G14
G21
PRF A
G12
G25
G29
G01
G11
G31
PRF B
G06
G19
G03
G16


S4
Hours UTC
G01
G03
G06
G11
G12
G14
G16
G18
G19
G20
G21
G22
G23
G24
G25
G27
G29
G31
G32