1. Introduction

Electron density (Ne) can be retrieved from radio occultation (RO) observations by Abel inversion under some assumptions.

Beyond spherical symmetry assumption, first order estimation of orbit altitude electron density is another significant retrieval error source.

2. Evaluating the orbit altitude electron density estimation method using the CHAMP RO and PLP data

3. Evaluating the effect of the orbit altitude electron density estimation on the Abel inversion using the simulation

The COSMIC RO observations during 2007.090-120, when is the transitional time of COSMIC satellite altitudes, are chosen to do the simulation. There are 81297 occultation events selected. The following picture shows the orbit altitude range of the six COSMIC satellites and the distribution of the number of the occultations versus the orbit altitude.

The NeQuick model is used to simulate the occultation slant TEC first. Then the retrieval error can be obtained by comparing the Abel retrieved Ne from the simulated TEC with the NeQuick model Ne along the tangent points.

The simulation is done for both low (F10.7=80) and high (F10.7=200) solar activities.

4. The effect of different orbit altitude electron density derivation on the Abel inversion

For every simulated occultation event, three Abel inversions with different orbit altitude Ne derivations listed in the following table are implemented.

Also shown in the table are the corresponding correlation coefficients with the simulated truth and the mean value of the absolute value of the relative deviation from the simulated truth for NmF2, hmF2, TEC, and the topmost point, respectively.

5. Conclusion

The RO estimation tends to overestimate the true orbit electron density by 10% averagely, which can be explained by the constant electron density approximation around the orbit. The average relative deviation of the RO estimated orbit electron density from that of PLP observed is ~20% and decreases slightly with the increase of the peak height and the satellite orbit altitude. The orbit electron density estimation method performs better in middle latitude than low and high latitude regions. The relative error of the current orbit altitude electron density estimation method is larger at nighttime than daytime and peaks around sunrise time.

The changes in solar activity and orbit altitude does not influence the relative Abel retrieval error of electron density from the simulation.

Different orbit electron density derivation methods will have no essential influence on the Abel retrieved electron density. Adding an on orbit observation even has a negative effect on the Abel retrieved electron density especially around the orbit altitude, which is contrary to our imagination.

Acknowledgement: Thanks the ISDC of GFZ for providing the CHAMP data.