Measurements and IRI Model Predictions during the Recent Solar Minimum

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Extended Abstract

Cycle 23 was exceptional in that it lasted almost two years longer than its predecessors and in that it ended in an extended minimum period that proofed all predictions wrong. We will discuss the effect that these prediction uncertainties had on the IRI electron density profiles and point out the importance of using the latest IRI indices file.

Comparisons of CHAMP and GRACE electron density measurements with the International Reference Ionosphere (IRI) predictions have shown significant differences during this extended minimum [1] while ionosonde data do not seem to show differences of similar magnitude [2]. We have further evaluated the performance of IRI during this solar minimum period using C/NOFS PLP data and ionosonde data from middle and low latitude stations. C/NOFS provides measurements in the altitude range from 400km to 850km but our primary focus in this study will be on the F-region because it is the region where the discrepancies with the CHAMP and GRACE data were found. IRI is based on a large volume of ground and space data covering several solar cycles but none of the data sets was recorded during conditions similar to those during the cycle 23 minimum. IRI uses solar, magnetic, and ionosonde indices to describe the dependence of ionospheric parameters on solar and magnetic forcing. Our investigation will show how well these relationships found for earlier solar cycles hold true for the most recent solar cycle minimum that was so different from its predecessors. Figure 1 shows the percentage difference between IRI and the Boulder ionosonde measurement from 1980 to 2011 covering two solar cycles. IRI agrees well with the data and this includes the time of the recent solar minimum.

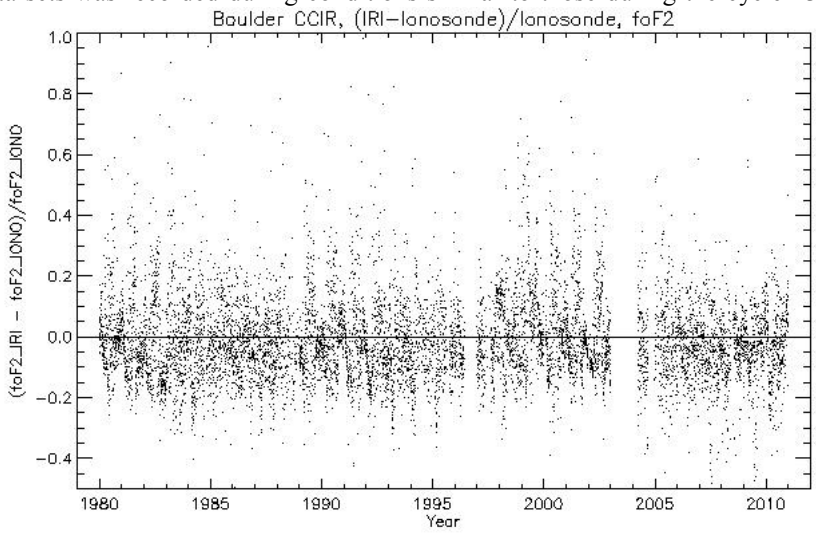

Fig. 1. Percentage difference between noon-time foF2 measured by the Boulder ionosonde and predicted by IRI-CCIR over the time period from 1980 to 2011.

References

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978-1-4244-6051-9/11/$26.00 ©2011 IEEE