

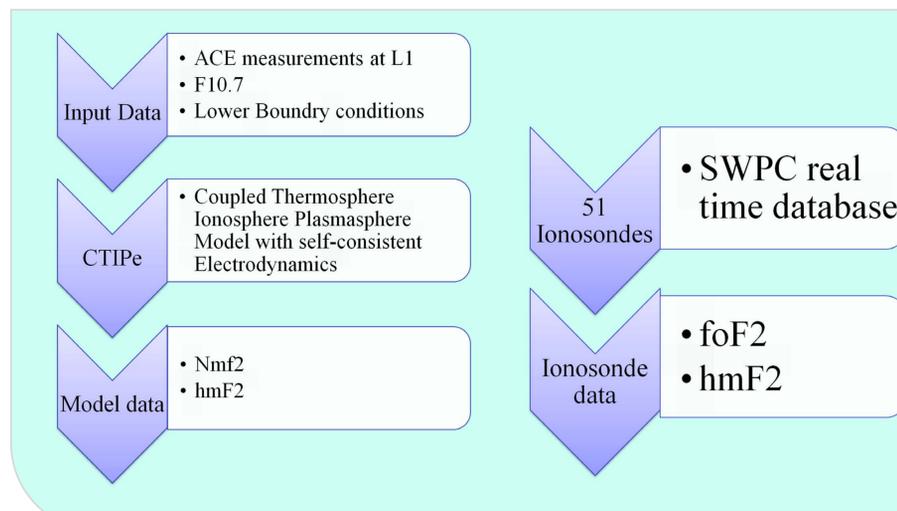
Catalin Negrea^{1,2}, Mihail Codrescu²

Abstract:

In today's society HF communications and the Global Positioning System have become so important that imagining the world without them is almost impossible. These technological wonders are however not as reliable as we may believe, as both depend on our understanding of the Ionosphere and more precisely on our ability to specify and predict the global electron density structure. One of the models that makes predictions on various aspects concerning the ionosphere is the Coupled Thermosphere, Ionosphere, Plasmasphere Model with self-consistent electrodynamics running at the Space Weather Prediction Center at NOAA. The goal of this project was to evaluate the overall performance of the model by comparing its results with data collected in real-time from about 51 ionosonde stations. For each individual ionosonde station, comparative plots for both nmF2 and hmF2 are drawn. Also, maps displaying normalized root mean squared deviations, for a specifiable time period, for the entire ionosonde network are drawn. The codes used for this were then integrated into a modular tool for on the fly comparison between model results and Ionosonde data.

Conclusions:

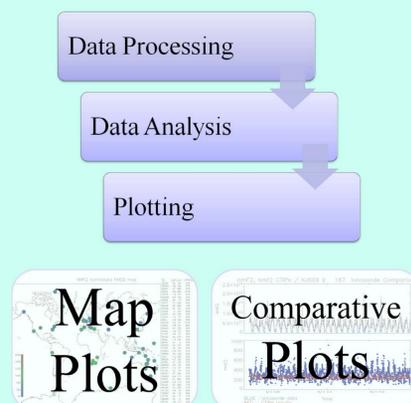
1. There are some problems with the data processing algorithms used by some ionosondes.
2. Ionosonde data is not necessarily good. We did find significant problems with the data in the SWPC database and some quality check is in order.
3. Model results are not necessarily bad, even if on a first glance there are problems especially with hmF2 values. Further research is necessary in order to determine what is actually happening.



The input data for the application were CTIPe results on one hand and Ionosonde Data on the other. The database foF2 were converted into nmF2 and then compared with nmF2 values obtained from CTIPe result files.

The first observation made was that there are considerably more valid foF2 values than hmF2 supplied by the Ionosondes. This is probably because hmF2 is more difficult to obtain as it is not measured directly.

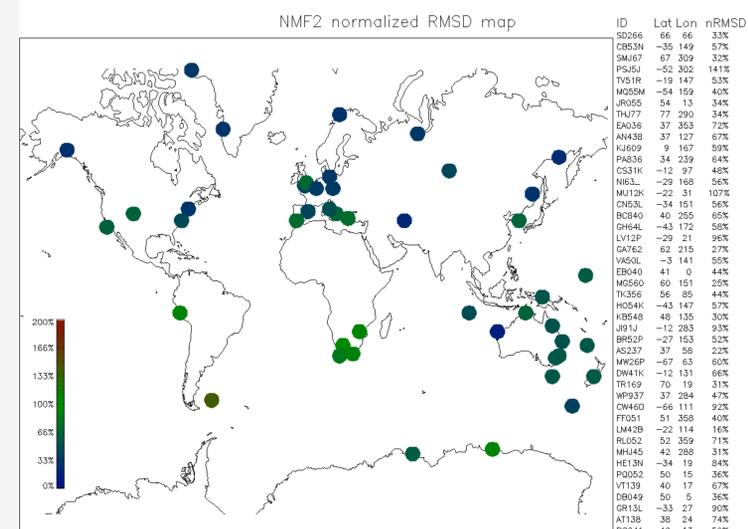
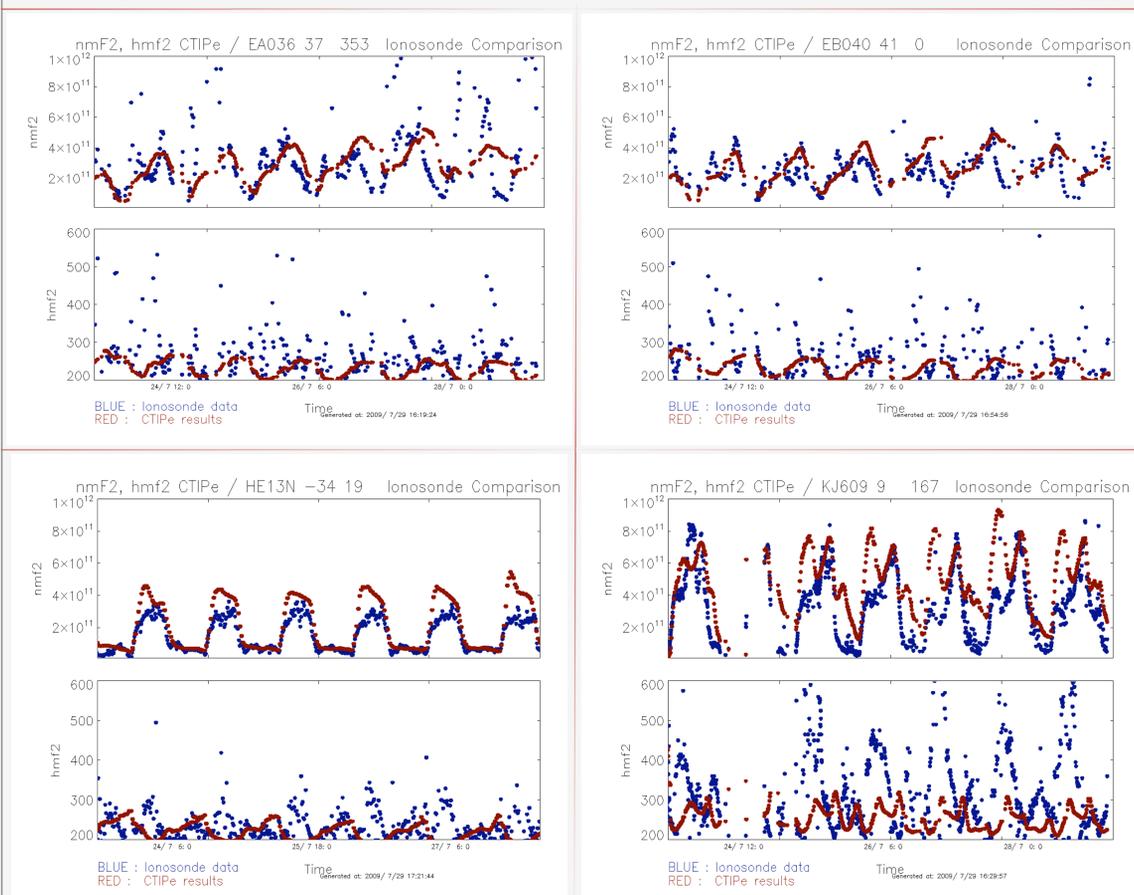
Modular tool for CTIPe results analysis



The processed data is used to obtain comparative plots for each point corresponding to an ionosonde station as well as map plots that give a measure of how well the model as a whole is doing. For this, normalized root mean squared differences are calculated for a certain period of time for each station.

The software was tested on CTIPe results for June 2009 and then integrated into a tool for on the fly comparison between CTIPe results and Ionosonde data.

Comparative plots for nmF2 and hmF2 obtained using the on the fly comparison tool. The plots cover 7 days beginning on the 22nd of June 2009



Map plot displaying the location of the Ionosonde stations and the normalized root mean squared deviation for each of them.

Plot displaying a comparison between CTIPe results and Ionosonde Data for both nmF2 and hmF2 values for June 2009. This plot as well as all the other displayed here have been obtained using IDL 7.0

