Autoscala applied at the Ionospheric Station of Warsaw

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A new ionosonde VISRC2, built at the Space Research Center of Warsaw, Poland, was installed at Warsaw (52.2 N, 21.1 E) in march 2007. The main characteristics of this ionosonde are: transmitted power 10 kW, pulse duration 100 μs, sampling period 5 μs, frequency resolution 25 kHz, and capability to distinguish ordinary and extraordinary reflections.
This ionosonde, able to record the sounding only as a binary file, was not equipped with a tool to perform an automatic scaling of the recorded trace.
From October 2008 Autoscala (*Pezzopane and Scotto*, 2005, 2007, 2008; *Scotto and Pezzopane*, 2007) is routinely applied to the ionograms recorded by this ionosonde.

Application of Autoscala to the ionograms recorded by the VISRC2 Ionosonde

To apply Autoscala to the ionograms recorded by the VISRC2 ionosonde firstly it was necessary to perform a format transformation from PIX format (the raw ionogram file produced by the ionosonde) to RDF format (*Pezzopane*, 2004), which is the file format used by Autoscala and that lets Autoscala give as output autoscaled parameters along with the electron density profile (*Scotto*, in press). To have an idea of the correspondent output see Figure 1.

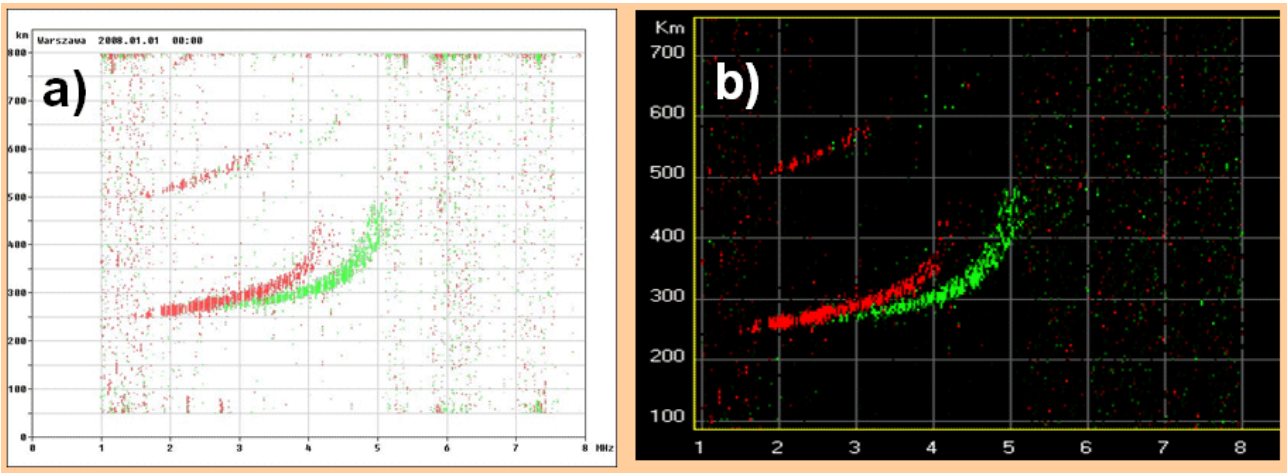

Figure 1. Images correspondent to a) PIX file format and b) RDF file format.

The Autoscala algorithm was then modified to consider also the additional information on the echo polarization contained in the PIX (and hence in the RDF) file. A test phase was then necessary to set properly all the thresholds that Autoscala considers to identify the ionogram traces associated with the different ionospheric layers and to give as output an electron density profile associated with the identified trace. Examples of elaboration are given in Figures 2, 3, and 4.

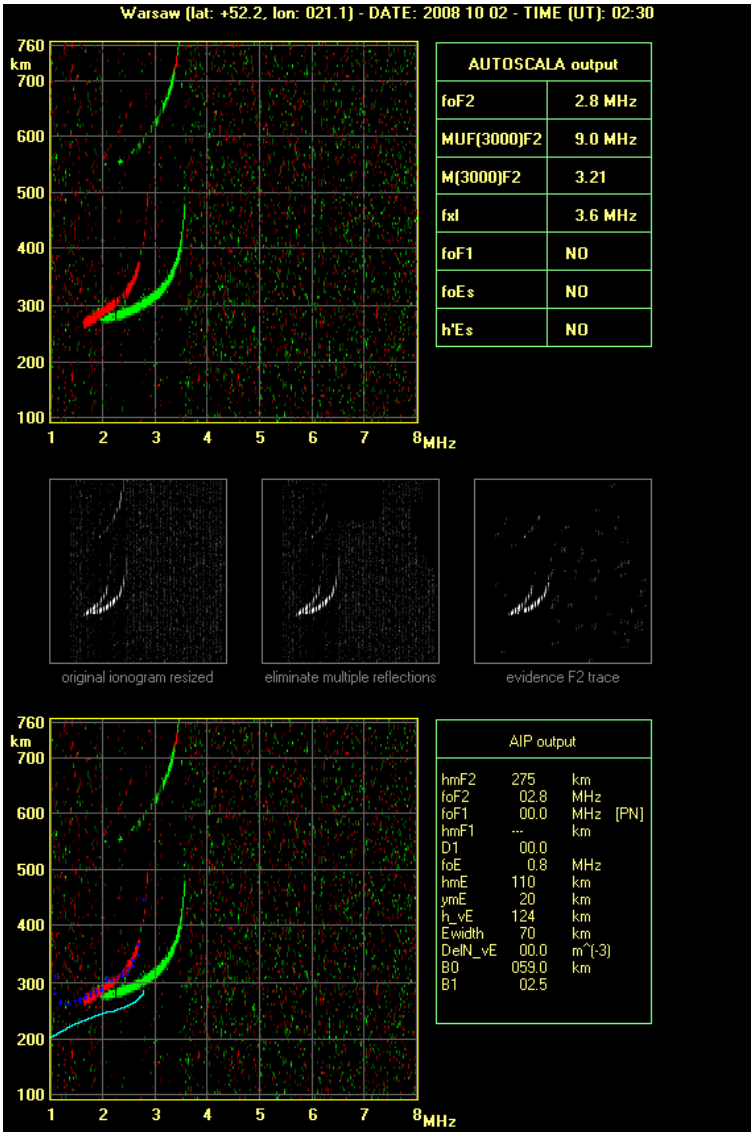

Figure 2. An example of a nocturnal ionogram recorded on 2 October 2008 at 02:30 UT by the VISRC2 ionosonde installed at Warsaw, and autoscaled by Autoscala.

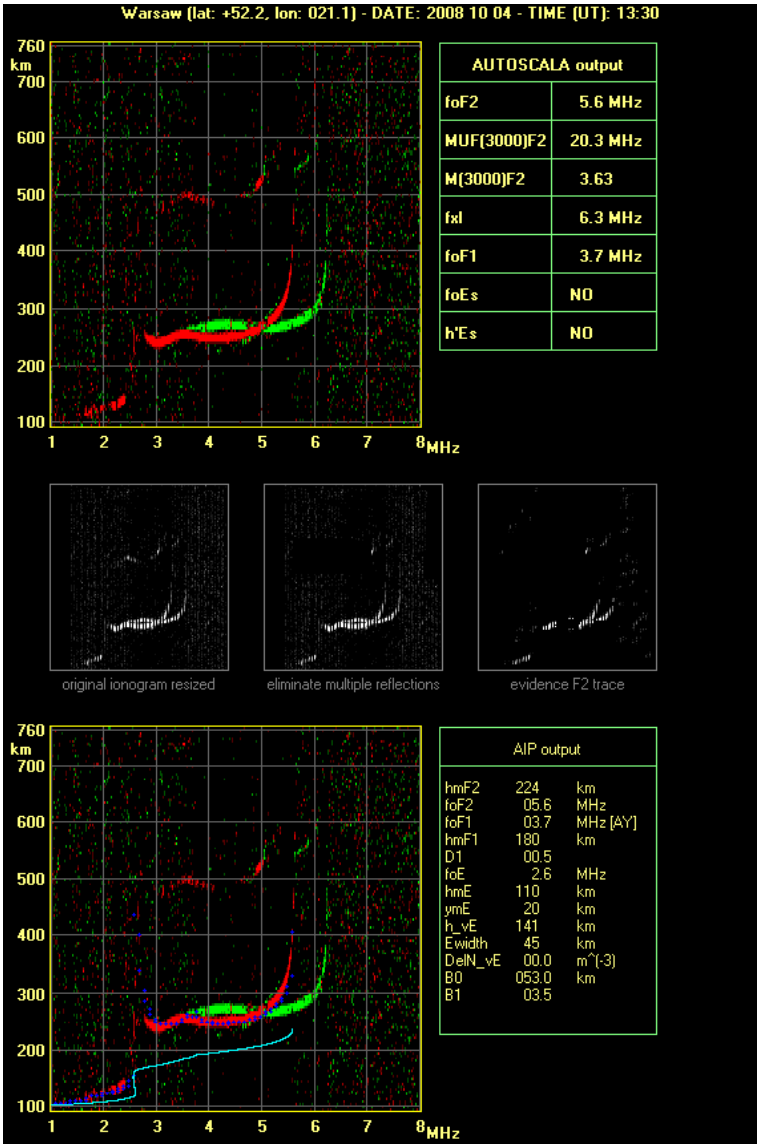

Figure 3. An example of a diurnal ionogram recorded on 4 October 2008 at 13:30 UT by the VISRC2 ionosonde installed at Warsaw, and autoscaled by Autoscala.

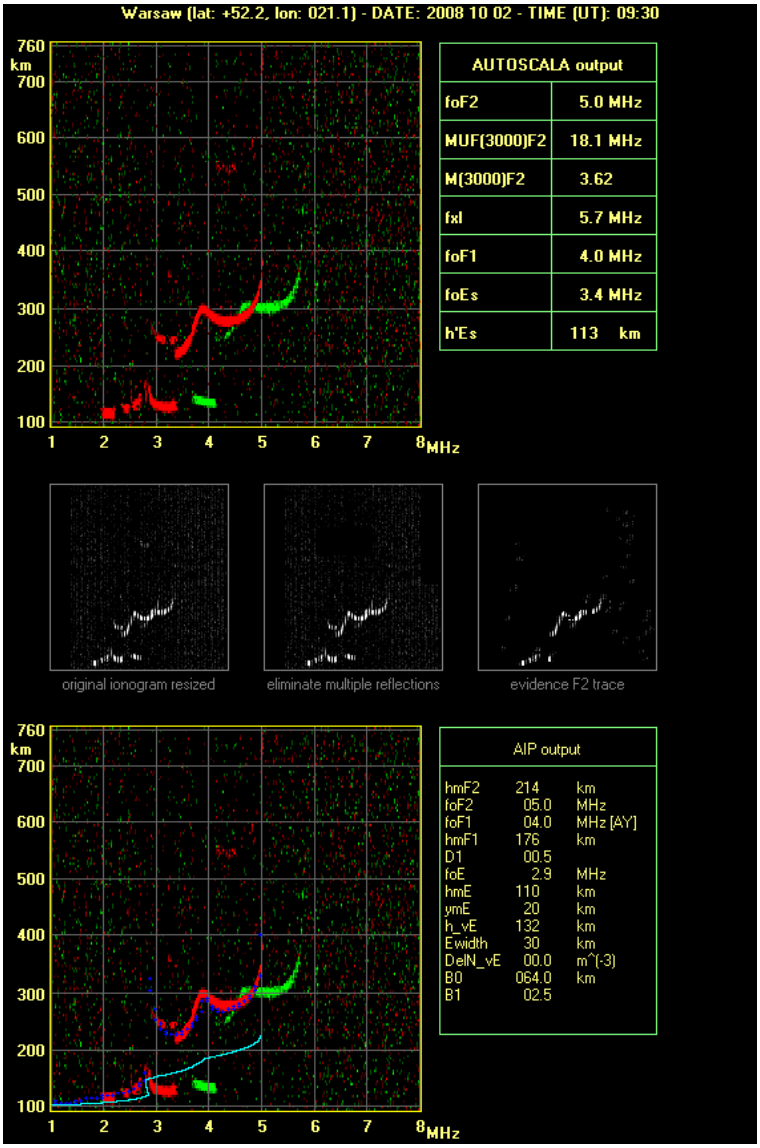

Figure 4. An example of a diurnal ionogram recorded on 2 October 2008 at 09:30 UT by the VISRC2 ionosonde installed at Warsaw, and autoscaled by Autoscala.

Reliability of the *foF*2 autoscaling

As for the reliability of the autoscaling performed by Autoscala, an histogram showing the comparison between the *foF*2 autoscaled values by Autoscala and the hand-scaled values for a dataset of about 469 ionograms of April and December 2007 is depicted in Figure 5.

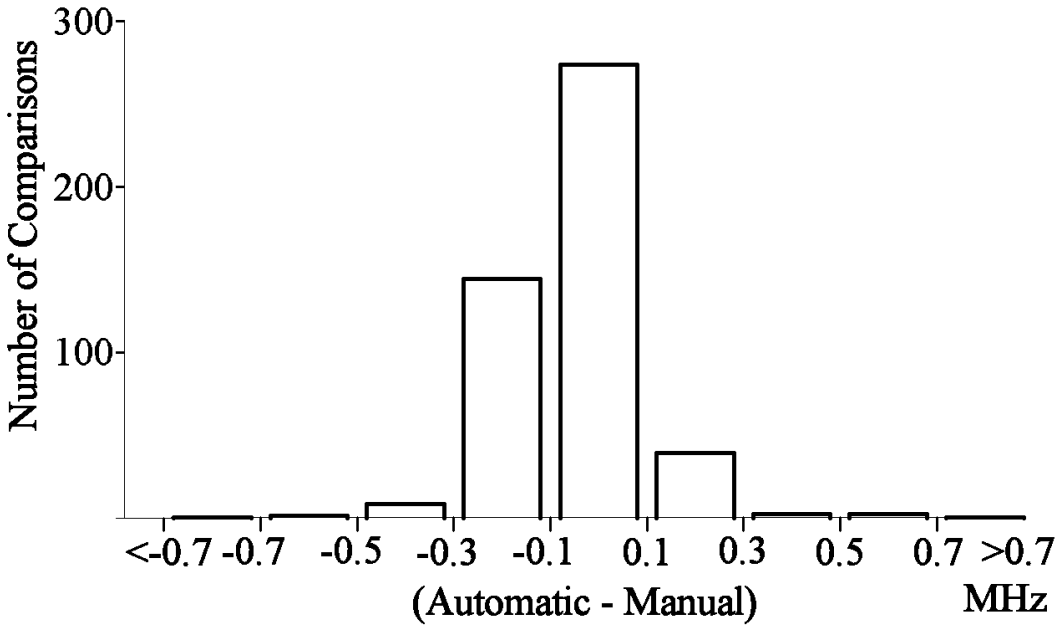

Figure 5. Differences (δ) between the *foF*2 values autoscaled by Autoscala and hand-scaled. Out of 469 cases it results: for 273 cases (−0.1 MHz ≤δ ≤ 0.1 MHz); for 39 cases (0.1 MHz<δ ≤ 0.3 MHz); for 144 cases (−0.3 MHz ≤δ <−0.1 MHz); for 2 cases (0.3 MHz <δ ≤ 0.5 MHz); for 8 cases (−0.5 MHz ≤δ <−0.3 MHz); for 2 cases (δ > 0.5 MHz); for 1 cases (δ <−0.5 MHz).

Results accessible on the web

At the moment Autoscala receives the ionograms from the Space Research Center of Warsaw by FTP and then elaborates them at the Istituto Nazionale di Geofisica e Vulcanologia, Rome, giving as output the following ionospheric characteristics: *foF*2, *MUF*(*3000*)*F*2, *M*(*3000*)*F*2, *fxI*, *foF1*, *foEs*, and *h'Es*, along with the electron density profile. The outputs of Autoscala are then sent to the internet and are accessible through the site http://ionos.ingv.it/warsaw/latest.html (Figure 6).

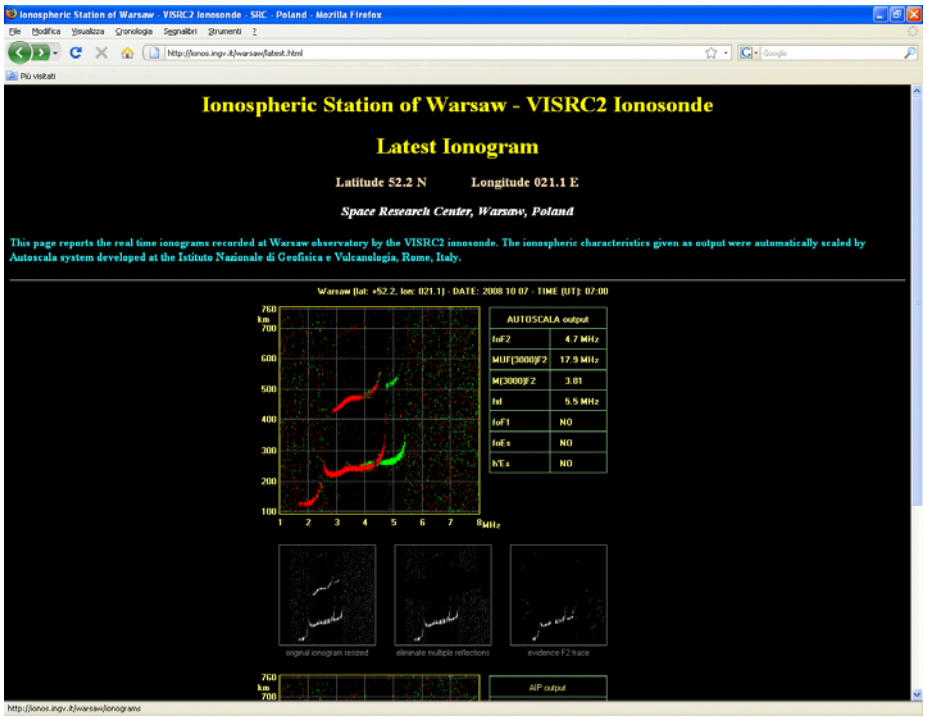

Figure 6. The home page of the ionospheric station of Warsaw showing the latest ionogram recorded by the station and elaborated by Autoscala.

Summary: a new ionospheric station was installed at Warsaw. The station was equipped with Autoscala system, able to give as output autoscaled ionospheric values. For this reason the station can contribute to the ionospheric database and can be a part of a possible net for space weather purposes.

References:

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