Improved ISIS-1 topside ionogram cdf files

Three improvements were made to the original ISIS-1 cdf files while making the improved files, namely, improved (1) frame-sync identification, (2) frequency-marker identification, and (3) frequency interpolation.

(1) During the original analog-to-digital (A/D) conversion process of the Alouette/ISIS topside-sounder ionograms there were many cases where the ionogram frame sync pulse was not properly identified. The resulting digital file could start part way into the ionospheric reflection trace and was not suitable for either automatic or manual processing to produce topside vertical electron-density profiles. A digital splicing routine was developed to correct this problem.

(2) During the above A/D process the full set of frequency markers were often not properly identified. This improper identification was most often due to the frame-sync identification problem discussed in (1) above. It could also be caused by interference, or strong sounder-stimulated plasma resonances. A software routine was written to assist in the manual identification of these markers once the proper frame sync was identified.

(3) The ISIS-1 sounder had nonlinearities in the frequency sweep between 2.0 and 3.0 MHz and also between 5.0 and 6.0 MHz. The John Jackson true-height inversion program (used to produce topside vertical electron-density profiles) corrected for these nonlinearities assuming that an individual scaling a 35-mm film ionogram used linear interpolation in these frequency ranges. The original ISIS-1 digital ionograms used linear interpolation in these frequency ranges so as to be compatible with processing using the Jackson program. The improved digital ISIS-1 files incorporates these corrections into the ionogram files so that the most accurate frequencies are obtained in the improved files over the entire frequency sweep range (from 0.1 – 20 MHz) and the resulting ionograms are not constrained to processing by the Jackson program.

For more information please see: Appendix A of the following paper:

Benson, R. F., and D. Bilitza (2009), New satellite mission with old data: Rescuing a unique data set, *Radio Sci.*, *44*, RS0A04, doi:10.1029/2008RS004036.

and Section 3 of:

Benson, R. F., V. Truhlik, X. Huang, Y. Wang, and D. Bilitza (2012), Improving the automatic inversion of digital Alouette/ISIS ionogram-reflection traces into topside electron-density profiles, *Radio Sci.*, *47*, RS0L04, doi:10.1029/2011RS004963.