# Getting New Science from Old Topside Sounder Data with New Analysis Technique

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The Alouette and ISIS topside sounder satellites recorded a great wealth of information about the topside ionosphere during their long period of operations from 1962 to 1990. So much though that only a small percentage was analyzed during the mission life time. A data restoration effort first digitized the analog data and then developed the TOPIST software for automated inversion of the ionograms to electron density profiles [1,2]. We present the data base established with the help of this data restoration project and discuss some of the science results obtained with these data.

We will present results from a comparison of electron density profiles obtained from TOPIST auto-scaling with those obtained from hand-scaling. The Figure on the left shows an example of good agreement. On the right the same auto-scaled profile is compared with the International Reference Ionosphere (IRI) showing large discrepancies at high altitudes. The Alouette/ISIS data have proven to be a valuable data source for renewed efforts to accurately represent the topside electron density in the International Reference Ionosphere (IRI). A systematic analysis of the Alouette and ISIS data base has resulted in two new options for the representation of the topside electron density that were included in IRI-2007 [3].
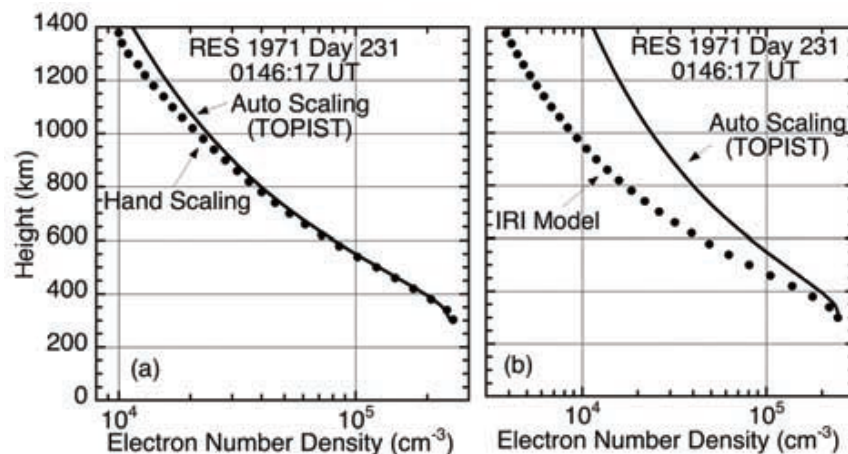


Fig.1a,b (a) Ne(h) profiles determined from an ISIS-2 topside ionogram by hand scaling and TOPIST auto-scaling from the ISIS 2 digital ionogram; (b) the auto-scaled profile compare with the IRI prediction.

1. D. Bilitza, X. Huang, B. W. Reinisch, R. F. Benson, H. K. Hills, and W. B. Schar (2004), "TOPIST: Automated processing of ISIS topside ionograms," *Radio Sci.*, **39**, RS1S27, 2004.

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

3. D. Bilitza, "A correction for the IRI topside electron density model based on Alouette/ISIS topside sounder data", *Adv. Space Res.*, **33**, 838-843, 2004.