



Ionosphere and Thermosphere above EISCAT-ESR during IPY

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In a previous study we showed that, with the use of 13-moment, parallel, two-ion (atomic and molecular) energy equations to fit the full Incoherent Scatter (IS) profiles along the magnetic field, it was possible to overcome two major difficulties for a proper analysis of the ion energy budget in the F1- and F2-regions, namely getting accurate estimates of the ion composition in the F1-region, and then being able to separate the relative contributions from the neutral atmosphere and from frictional heating. It was shown that this "full profile" method is sufficiently robust for routine use, even for periods with moderately high convection electric fields. In the present study, the method is applied to the three-year IS dataset recorded at the EISCAT Svalbard Radar (ESR) during the International Polar Year (IPY) period (March. 2007 - Sept. 2009), and the results are used to study long-term variations in the ionosphere and neutral atmosphere. For that purpose, we choose to use a similar approach to that used in the *MSIS* models for determining the time variability of the measured/inferred parameters and built what we call *ESR-IPY* models of ionospheric and atmospheric parameters. After discussing a case-day example for which the quality of the global models fits is shown, the long term behavior (year-to-year, seasonal, solar flux and geomagnetic activity) is shown and contrasted, when available, with existing standard models such as *MSIS* and *IRI*.

Key words. Polar cap ionosphere, Ionosphere/atmosphere interactions, Modelling and forecasting