Introductory Remarks (Part II)

One of the main research projects of the Japanese programs of IMS in Antarctica is the observation of the polar ionosphere and auroras by means of sounding rockets. Starting with a single-stage sounding rocket, S-160JA, which has a diameter of 160 mm and can reach an altitude of about 85 km, the sounding rocket experiment under the special conditions in Antarctica has been steadily developed. At present, S-210JA type (210 mm in diameter, max altitude 130 km) and S-310JA type (310 mm, 230 km) rockets are available for the auroral observations at Syowa Station. To date, three S-160JA type, thirty-one S-210JA type and seven S-310JA type rockets have been successfully launched from Syowa Station gaining a large quantity of fruitful scientific results well coordinated with the ground-based observation data.

During the IMS period, 19 sounding rockets (seven S-310JA and twelve S-210JA) were launched into auroras from Syowa Station at various stages of polar substorms. Through the successful rocket flights, significant physical quantities within auroras were measured: namely, 18 profiles of the electron density and temperature in the ionosphere, 13 energy spectra of precipitating electrons, 15 frequency spectra of VLF and HF plasma waves, 5 vertical profiles of electric and magnetic fields, 2 profiles of auroral X-rays, and 12 vertical profiles of NO and O_3 concentration.

Practically, it was difficult to put a sounding rocket into a bright auroral arc or band even when the auroral activity as a whole was very strong and the overhead sky was covered with a number of auroral arcs. Among 15 trials to shoot auroral arcs with a S-210JA or a S-310JA type rocket, two S-210JA and four S-310JA rockets were able to penetrate a bright auroral arc. All other rockets passed some distance away from or through a weak aurora close to a bright auroral arc.

In Part II of this volume, the experimental results of some of these rocketborne studies are presented and summarized. Seventeen papers in Part II are concerned with profiles of electron density and temperature (5 papers), electric DC and AC fields (4 papers), precipitating electrons (3 papers), VLF-HF emissions (3 papers), rockets attitude (1 paper) and general description of S-310JA-4 rocket (1 paper).

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