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ANTARCTIC STUDIES OF STRATOSPHERIC AND IONOSPHERIC ELECTRODYNAMICS USING MULTIPLE BALLOONS: THE PPB AND MINIS CAMPAIGNS

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This paper will present a summary of results from a new approach to study of upper atmospheric Physics in Antarctica. Identical stratospheric balloon payloads were launched as close together in time as allowed by weather conditions to constitute a cluster of balloons during their flights. Such a "Balloon Cluster" is suitable to observe temporal evolution and spatial distribution of phenomena in the ionospheric regions and boundaries that the balloons traversed during their circumpolar trajectory. Two such campaigns will be reported, the second campaign of the Polar Patrol Balloon (PPB) experiment (2nd-PPB) and the MINIS campaign. 2nd-PPB was carried out at Syowa Station in Antarctica during 2002-2003. In that experiment, three balloons were launched for the purpose of upper atmosphere physics observation (3 balloons). More than 20 days of simultaneous fair weather 3-axis electric field and stratospheric conductivity data were obtained at geomagnetic latitudes ranging from sub-auroral to the polar cap. Balloon separation varied from ~60 to ~500 km. The MINIS campaign provided the first opportunities for multi-point measurements of electron precipitation up to MeV energies, including simultaneous measurements at different longitudes and at near-conjugate locations. Two balloons, each carrying an X-ray spectrometer for measuring the bremsstrahlung produced as electrons precipitate into the atmosphere, were launched from Churchill, Manitoba at 0850 UT on 21 January 2005 and 0140 UT on 25 January 2005. Four balloons, each carrying an X-ray spectrometer, a Z-axis search coil magnetometer, and a 3-axis electric field instrument providing DC electric field and VLF measurements in 3 frequency bands, were launched from the South African Antarctic Station (SANAE IV).

The Southern launches took place at 1400 UT on 17 January, 1309 UT on 19 January, 2115 UT on 20 January, and 0950 UT on 24 January 24 2005. This paper will provide a summary of the electric field observations from these flights, with emphasis on the conclusions drawn from simultaneous multiple balloon observations.