Space environmental changes and their effects on the Earth's atmosphere explored from the polar cap region

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New JARE Prioritized Research Project AJ1007 (Space environmental changes and their effects on the Earth's atmosphere explored from the polar cap region, 2022-2027), “auroraXcosmic project” in short, is supported by NIPR. We are studying space weather and space climate from Antarctica to understand how the Earth system is open to space. Auroras can visualize the atmospheric impact from auroral electrons and solar protons. However, the auroras in the polar cap are less understood because of relatively poor coverage of imaging observations. We will be able to solve the technical problem by developing and distributing new imagers by international collaborations. We will also contribute to real-time cosmic-ray observation network. We will then contribute better understanding of the outer boundary of Earth system, via close collaborations with simulations and data science (data will be open to public).

We are developing a new auroral imager system, including a tough housing bearable for Antarctica. The system will be low-cost, low-power, portable, and the data will be obtained real-time. The first model will be tested in new Dome-Fuji station in 2023, and then be provided or distributed for future international collaboration in Antarctica. High-energy solar protons will also be observed by neutron monitor and muon detector at Syowa Station. During the auroraXcosmic, the cosmic ray observation at Syowa will be full-system in 2024 and real-time data will be obtained every 10 min. Further, we will fully use our heritages: A suit of comprehensive geophysical observations is ongoing at Syowa Station, including SuperDARN, PANSY radar, radio, riometers, high-speed auroral imagers, and magnetometers. Unmanned network observations are also ongoing along the auroral oval via international collaborations.