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Auroral observation using NIR camera onboard balloons: A new approach for dayside and conjugate auroral observations

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Observations from multipoint and multi-instrument in space and on the ground have enormously improved our understanding of the solar wind – magnetosphere – ionosphere coupling and complicated mangetospheric procedures. However, some observations are restrained due to natural conditions and current technical limitations. For example, we are unable to observe small-scale structures of sunlit dayside aurora and storm-time conjugate aurora. It is well known that the visible auroral small-scale structures in the ionosphere manifest the invisible particle acceleration mechanisms in the magnetosphere. Part of the reasons why it has not been done from the ground is because the sunlight contamination for daytime aurora and limited land area in the Antarctica. To observe the auroral small-scale structures from space would require enormous funding and new imaging techniques. Recently, Polar/UVI and IMAGE/FUV have revealed very interesting dayside aurora, such as shock-aurora and mid-day detached proton aurora. Storm-time and substorm-time auroral conjugacy has not been fully studied due to a lack of observation. To explore the observation opportunities, we conducted an auroral observation using a NIR InGaAs camera in twilight at Poker Flat. It was found that near-infrared nitrogen emissions are detectable at the balloon altitude 35 – 40 km and above. It should be mentioned that this is a NASA routine balloon altitude. The NASA balloon technology can fly the payload with 270 kg up to $\sim$50 km altitude. In this paper we will discuss interplanetary shock/pressure pressure pulses generated aurora and ionospheric traveling convection vortices. We will present the auroral observation result using the NIR camera and a design of the

balloon observation that can coordinate with the space and the ground-based observations.