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Auroral Initial Brightening and Maximum Poleward Expansion Locations based on POLAR/VIS and POLAR/UVI Observations

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The locations of Earth's auroral initial brightening and maximum poleward expansion are indicated as the magnetic latitudes, when the auroral breakup is expected to occur at magnetic local time between 22:00-1:00. Auroral images taken by the Visible Imaging System (VIS) and the Ultraviolet Imager (UVI) instruments on-board POLAR spacecraft reveal the variation of the locations that different auroral phases, initial brightening and maximum poleward expansion, took place. From different substorm events, the locations of the auroral phases appear to be highly variable. Quantitative analysis of the times and locations of both phases are presented via the time-series plots, keograms, and intensity profiles, for VIS; 557.7, 130.4, 391.4, 630.0 nm and for UVI; lbhl, lbhs, 130.4, and 135.6 nm emissions. For aurora associating with low-energy, "soft", precipitating electrons, the responsive auroral emissions were shown in Polar/VIS 3914 Å, Polar/VIS 5577 Å, and Polar/VIS 6300 Å. On the other hand, the FUV auroras are presented in Polar/UVI images, representing the results of higher energy precipitating auroral particles (mostly electrons). Those visible auroras appear to be mostly expansive to higher latitude in comparison to the FUV auroras. The different locations of the auroral initial brightening and the less extensive FUV aurora are due to the different origins and distributions of high energy electrons in the magnetotail. Moreover, the location variation for different substorm events, in corresponding to the solar wind conditions, will be discussed.

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