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The science of high-speed imaging of aurora

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Pulsations, irregularly switching on and off in the brightness with typical durations of an order of 2 to 20 s, are a fundamental characteristic of post-midnight aurora. Although the pulsating aurora is weak compared with those of quiet arcs or breakups, a cutting-edge sensitive high-speed camera is now capable of detecting the faint aurora with more than several hundred frames per second. In fact, it has been found that a fastest-ever-observed fluctuation is superimposed on a pulsating aurora, which is more than an order of magnitude faster than well-known 3 Hz modulation [1]. The generation mechanism remains unknown, and two different possibilities of the modulation source arise at the equatorial magnetosphere and at the magnetosphere-ionosphere coupled region. The new science of high-speed imaging of aurora will be discussed, including the latest results obtained from the high-speed imaging of aurora at subauroral latitude (AUGO2, Alberta), combined with earlier results obtained at high latitude (PFRR, Alaska) [2, 3].

[1] Kataoka, R., et al. (2012), Pulsating aurora beyond the ultra-low-frequency range, J. Geophys. Res, 117, A08336.

[2] Kataoka, R., et al. (2011b), Ground-based multispectral high-speed imaging offlickering aurora, Geophys. Res. Lett., 38, L14106.

[3] Kataoka, R., et al. (2011a), Turbulent microstructures and formation of folds inauroral breakup arc, J. Geophys. Res., 116, A00K02.