オーロラの高速撮像

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High-speed imaging of aurora

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It has been suggested that dispersive Alfven waves (DAWs) are capable of accelerating electrons via Landau resonance, and the interference of DAWs plays an essential role to create flickering auroral patterns. Here we show evidence that the leading front of a typical interference pattern is more energetic than the trailing part, based on ground-based high-speed imaging observations at wavelengths of 670.5 nm and 844.6 nm, which are sensitive to relatively hard and soft electrons, respectively. The fine spatial resolution of 9.5 deg field-of-view at magnetic zenith and the 100 Hz sampling rate of electron multiplying charge-coupled device (EMCCD) enabled us to resolve the spatiotemporal variation of the flickering aurora. It is found that there is only 10 ms time delay with 0.5 km spatial shift on average in the obtained flickering patterns at two wavelengths. The time delay and spatial shift can be comprehensively explained by the traveling inhomogeneous interference pattern of DAWs, probably associated with the Landau damping and/or time-of-flight effect, which is only detectable using the highest resolved temporal and spatial observations of flickering aurora. We report some other results of high-speed imaging for flickering aurora and onset arc evolution. Initial results from the latest experiment will also be reported.

References

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