

降下電子ビームと 630-nm オーロラ発光強度との関係

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Relation of 630-nm auroral intensities to incoming electron beams

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The 630-nm emission arises when an electron in the 1D state of an oxygen falls to a lower energy level. Since incoming electrons with lower energies lead to more $O(^1D)$ state excitation, there exists a relation of 630-nm intensity's being stronger as the incoming electron energy is lower. Rees and Roble [1986] formulated this relation including the effect of the energy flux of the incident electron. However, no experimental tests have been done so far. This is because one-to-one correspondence between the precipitating electrons observed by a satellite and the auroral emission that occurs in a similar place cannot be determined. However, if the auroral emission is relatively stable after the precipitating electrons are observed, the stable emission can be associated with the observed electron beams. Using 630-nm data from a high-sensitivity all-sky imager set up at Longyearbyen, Svalbard, in October 2011, and precipitating electron data from DMSP satellites (F16, F17, and F18), we found several cases in which this situation actually occurred. Using those simultaneous observation events, we formulated 630-nm auroral intensities relative to the incoming electron energy and energy flux. The obtained relation has a similar trend to the formulation given by Rees and Roble. However, there some differences between them. We present the detail characteristics of our formulation, and discuss the reason for the differences between the two formulations.