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Lower Band Chorus Wave Scattering Causing the Extensive Morningside Diffuse Auroral Precipitation During Active Geomagnetic Conditions: A Detailed Case Study

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The diffuse aurora is a natural phenomenon observed over the Earth's polar region. Compared with the nightside diffuse aurora, the brightness of the dayside diffuse aurora (0600-1800 magnetic local time (MLT)) is relatively weak, thus requiring more stringent observation conditions. Therefore, the current understanding of what causes the dayside diffuse aurora is still quite limited. Here, we present an intense morningside diffuse aurora (0600-1000 MLT) event observed on 1 January 2016 during the recovery phase of the substorm, using conjugate observations of wave and particle spectrum from the Radiation Belt Storm Probes (RBSP) and auroral emission from the Special Sensor Ultraviolet Spectrographic Imagers on the Air Force Defense Meteorological Satellite Program (DMSP/SSUSI). We perform calculations of diffusion coefficients and simulations of the electron fluxes for this event. Our results show that the chorus waves are the primary contributors to the formation of the morningside diffuse aurora, with precipitated electron energies ranging from a few keV to tens of keV. The lower band chorus shows significant pitch angle scattering efficiency for electrons with energies from 5 keV to 20 keV. The upper band chorus waves induce acceleration effects on 1 keV - 20 keV electrons. We suggest that the upper band chorus waves accelerate low-energy electrons to higher energies, enabling them to engage in the scattering process of the lower band chorus waves. Our study makes a contribution to recent research on the formation mechanisms of diffuse aurora and deepens our understanding of wave-particle interactions leading to dayside electron precipitation.