

Na layer variation related with cosmic noise absorption observed at Syowa, Antarctic

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Metallic layers, containing such elements as Na, Fe, Mg, K, and Ca, exist in the mesosphere and lower thermosphere, that correspond to the height range of the ionospheric D and E regions. In the polar region, energetic particles precipitating from the magnetosphere can often penetrate into the E region and even into the D region. Therefore, the influence of energetic particles on the metallic layers is of interest regarding changes in atmospheric composition accompanied by auroral activity or geomagnetic activity.

In this work, we have performed a statistical data analysis on relationship between simultaneous Na density data and cosmic noise absorption (CNA) data, which is an indicator for energetic particle precipitation, obtained at Syowa, Antarctic (69.0°S, 39.6°E) in 2000-2002. It is found that the Na densities around the topside of Na layers (above ~95 km height) tended to be smaller when the CNA was larger. The amounts of Na density responses, i.e., Na density decrease or Na loss, were increasing with magnetic local time (MLT) from dusk hours to dawn hours, and those of CNA responses, i.e., CNA increase, were also increasing with MLT. Thus, there were clear negative correlations between the Na density and CNA variations. These results indicate that the Na loss around the topside of Na layer would be induced by the energetic particle precipitation, and its effect would be more severe in dawn hours.