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High-temperature, high-resolution photoabsorption cross sections of O₂ in the 108.5-nm region

C. Y. Robert Wu

Space Sciences Center and Department of Physics and Astronomy, University of Southern California, Los Angeles, California

T. Hung

Space Sciences Center and Department of Physics and Astronomy, University of Southern California, Los Angeles, California

D. L. Judge

Space Sciences Center and Department of Physics and Astronomy, University of Southern California, Los Angeles, California

Takashi Matsui

Hiroshima Synchrotron Radiation Center, Hiroshima University, Kagamiyama, Higashi-Hiroshima, Japan

Abstract

The high-resolution absorption cross-section measurements of O₂ in the 108.0- to 108.7-nm spectral region have been carried out with a resolution of 0.0008 nm and at temperatures of 295 and 535 K. The absorption features in this spectral region exhibit primarily a blue-shaded broad band with a band head peaked at 108.52 nm. The center of gravity of the diffuse band is located at 108.452 nm. The present room temperature cross-section data of the NII 108.5-nm sextuplets agree well with the unpublished data of J.A.R. Samson (private communication, 1990). As the temperature increases from 295 to 535 K, we observe a decrease in cross-section values by as much as 30% over the contour of the diffuse band. Similarly, the cross-section values of the sharp features decrease as temperature increases. The NII 108.5-nm multiplets are one of the prominent emissions in the Earth's airglow. The EUV-UV dayglow limb scans of the thermosphere and ionosphere have currently been gathered by satellite, e.g., ARGOS, at a tangent ray height of 200 km, above where the ambient absorption due to O₂ and N₂ is expected. The present temperature-dependent cross sections of O₂ provide the important database required for modeling the dayglow observations. © 2001 American Geophysical Union