

Title: Atmospheric Pressure-Induced Effects in the VUV Absorption Spectrum of C₂H₂

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Abstract

It is well known that high pressure in an absorbing system can cause line broadening, line shifts, and pressure-induced transitions. Real planetary atmospheres consist of a mixture of various molecules. It is well known that the pressure effects vary in nature depending on the characteristics of the collision constituents. It is thus desirable to measure the cross sections of molecules under the planetary atmosphere conditions of interest. For example, in Jupiter's atmosphere typical absorber (e.g., C₂H₂) abundances vary from 0.2 cm-atms to 5 cm-atms in the presence of H₂. The pressure of H₂ is in fact about 10⁽⁷⁾ times that of C₂H₂. We have investigated the absorption cross section of C₂H₂ in the presence of Ar and N₂ up to the highest pressure possible using our existing apparatus, namely, a factor of about 1.6 x 10⁽⁵⁾ times that of C₂H₂. We have initially carried out a study of pressure effects in the 150-153.5 nm, 124-126 nm, 119.5-123.0 nm, and 116.5-118.5 nm regions, which covers three different Rydberg transitions of C₂H₂. In the case of Ar only pressure broadening effects are observed whereas, in the case of N₂, pronounced pressure-induced transitions are also observed in addition to the well known spectral broadening. In the future we will investigate the pressure effects on C₂H₂ in the presence of H₂. The preliminary results obtained to date will be presented. This research is based on work supported by the NASA Planetary Atmospheres Program under Grant NAG5-11042.