



Presentation Abstract

Title Revisit to Nuclear Spin Temperature of Ammonia in Comets

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Abstract Comets had formed from dust and icy materials in the solar nebula 4.6 Gyrs ago. The cometary materials are considered as the most pristine in the solar system and both dust grains and icy materials in comets have been used to investigate the formation conditions of the solar system. One of interesting primordial characters is a nuclear spin temperature (related to an ortho-to-para ratio; OPR) of cometary molecules such as H₂O, NH₃, etc. The nuclear spin temperatures probably reflect the molecular formation temperatures in the solar nebula (or in the presolar molecular cloud). In this work, we analyzed high dispersion optical spectra of C/2001 Q4 (NEAT), C/2000 WM1 (LINEAR), 88P/Howell, fragments B and C of 73P/Schwassmann-Wachmann 3 and 8P/Tuttle. Our observations were performed by the Ultraviolet and Visual Echelle Spectrograph (UVES) mounted on the Very Large Telescope (VLT) in Chile and the High Dispersion Spectrograph (HDS) mounted on the Subaru telescope in Hawaii. We determined nuclear spin temperatures of NH₃ in five comets based on optical spectra of NH₂. The nuclear spin temperatures of NH₃ can be obtained from OPRs of NH₂. We used the (0,9,0) ro-vibronic band at ~610nm in this work. Absorption lines (by the telluric atmosphere) and cometary C₂ emission lines blended with NH₂ emission lines were also taken into account in our analysis. These lines have never been considered in previous studies. The origin of icy materials in the five comets will be discussed based on these results.