AOGS 2005

Coma abundances in comets and clues about their formation and evolution

MICHAEL KÜPPERS[1], GERONIMO VILLANUEVA[1,2] and PAUL HARTOGH[1]
[1]*MPI für Sonnensystemforschung, Katlenburg-Lindau, Germany*
[2]*Goddard Space Flight Center, Greenbelt, Maryland, USA*

We observed the dynamically new comets 2001 Q4 (NEAT) and 2002 T7 (LINEAR) on 2004 May 7-11 with the Sub-Millimeter Telescope (SMT) on Mt Graham Observatory. With the Chirp Transform Spectrometer, velocity resolution up to 60m/s was reached. Emissions of HCN (3-2), HNC (3-2), CS (5-4), H_2CO (312-211) and methanol (several lines) were detected. CO (2-1) was searched for but not conclusively detected.
Coma temperatures are derived derived from the intensity ratio between different methanol lines. For comet T7 (LINEAR), the resulting temperature is 120 K, well in the expected range for a comet at LINEAR's heliocentric distance.
We compare the relative molecular abundances of the comets with that determined in previous observations (e.g. [1]), where mostly dynamically old comets were studied. While the composition of both comets appears nominal, we find a depletion of CO. A possible explanation is the dynamically history of new comets: Past passages lead them through the outer solar system only, where CO as the most volatile species may have partly evaporated, while more refractory molecules stay on the surface.
On 2005 January 11-16 additional data were acquired on Comet Machholz 2004/Q2. CO (3-2), HCN (4-3), $H^{13}CN$ (4-3) HNC (4-3), H_2CO, and (for the first time) the methanol transitions at 338 GHz were observed. Analysis of the data is in progress. We will also present the results for Machholz and compare the measured composition of that dynamically old comet to that of the new comets observed in 2004.

References

[1] N. Biver et al., Earth, Moon & Planets **90**, 323 (2002).