Vibrational and rotational spectroscopy of CD$_2$H$^+$

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spectroscopy of $\text{CD}_2\text{H}^+$

- first IR spectra by Oka
  
  \[ \nu_1 \]

  measured ~300 lines
  with ~90 MHz accuracy
  band is perturbed

- no pure rotational lines up to date

- potential interest for ISM
Laser induced reactions LIR

\[ \text{CH}_2\text{D}^+ + \text{H}_2 \rightarrow \text{CD}_2\text{H}^+ \]

Counts vs. frequency

\( v=0 \)

\( v=1 \)
reaching cryogenic temperatures ...

22-pole ion trap


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measured 108 transitions of $\nu_1$ band of $\text{CD}_2\text{H}^+$

use frequency comb (FC) to calibrate frequency
plenty of combination differences …

… give good definition of ground state
Double resonance spectroscopy

$\text{CH}_2\text{D}^+ \rightarrow H_2\rightarrow \text{CD}_2\text{H}^+$

$v=0$ tuned

$v=1$ fixed

$v_1$
measured 25 rotational transitions

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again combination differences ....

14.178647 cm$^{-1}$
14.178660
14.1786686
14.178683
14.178727
Summary + outlook + thanks:

- double resonance rotational spectroscopy quite powerful

- further targets:
  - \( \text{H}_2\text{D}^+ \), \( \text{D}_2\text{H}^+ \)  
    - talk WI05 P. Jusko
  - \( \text{CH}_2\text{D}^+ \)  
    - completed
  - \( \text{C}_2\text{HD}^+ \)  
    - soon ....

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4 K trap machine COLTRAP