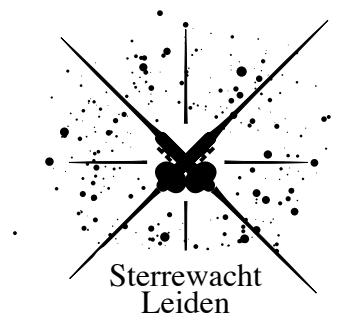


Radiative transfer tools and molecular data bases for ALMA

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Available ALMA analysis tools

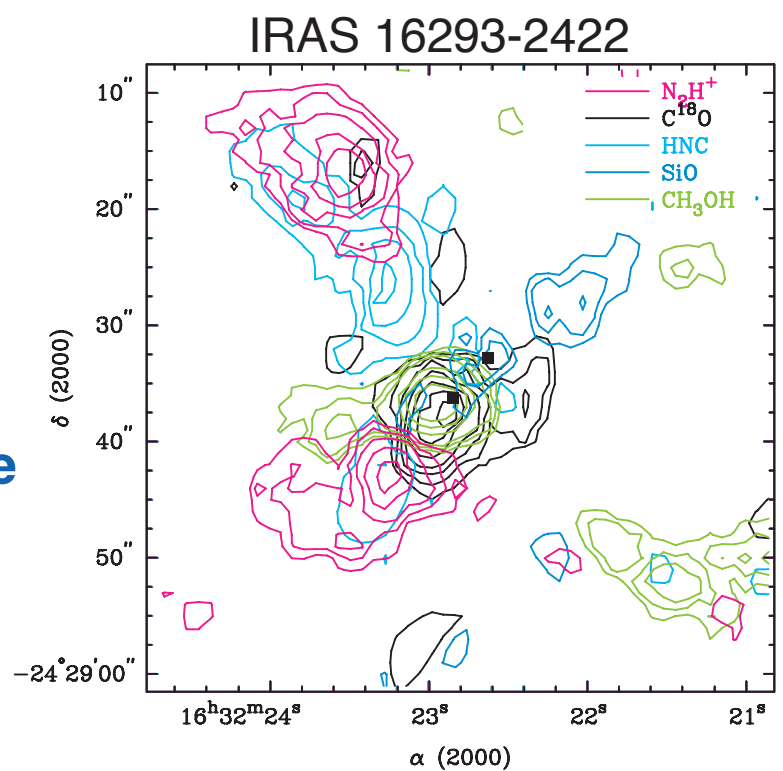
1-2D continuum and molecular line radiative transfer codes
(3D versions in development)

Dynamical models

Chemical networks

Challenges

Rich small scale structure

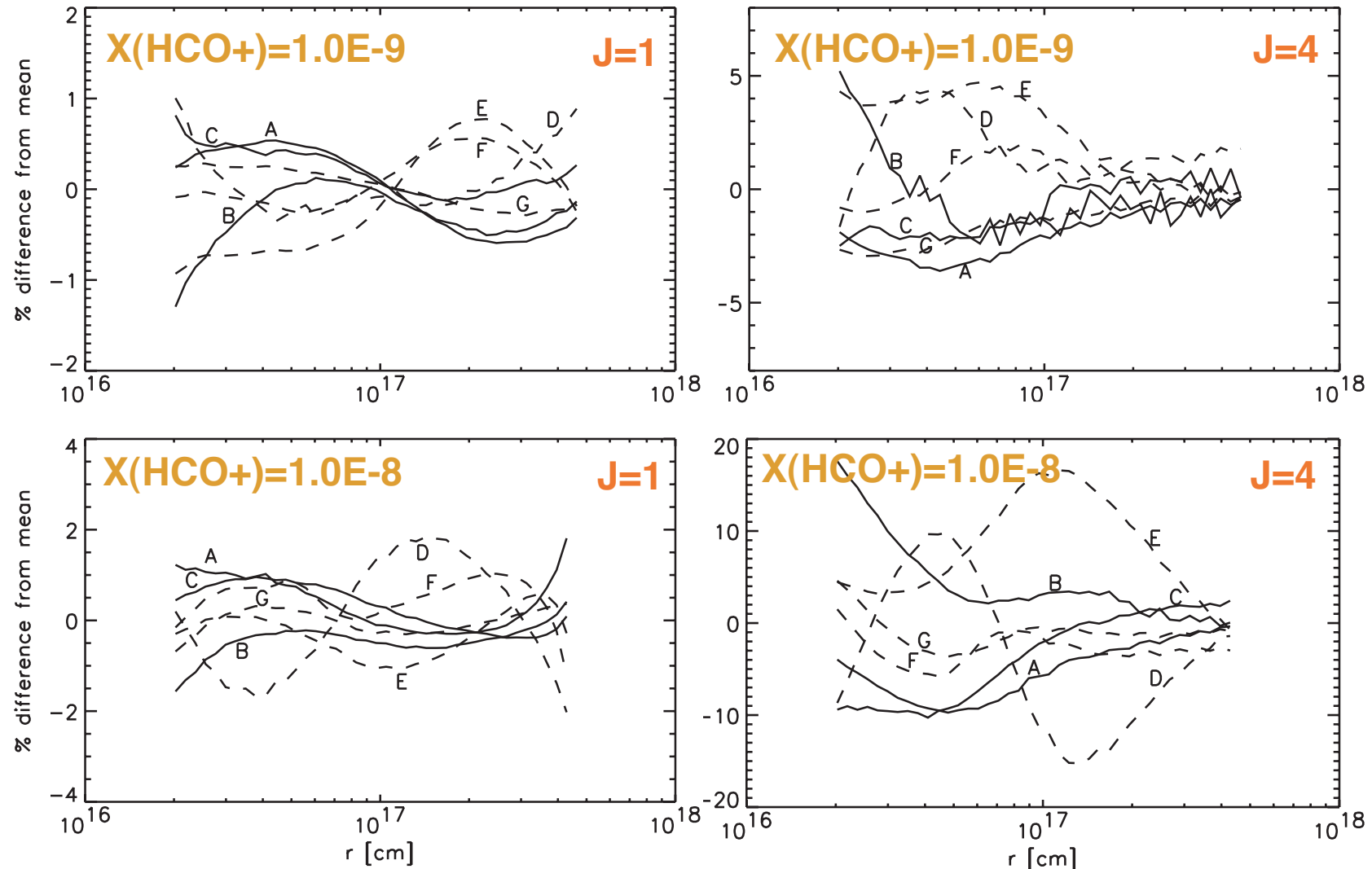


(Schöier et al. in prep.)

High calibration accuracy (a few percent) is an ALMA goal. Is this accuracy matched by model accuracy?

Benchmarking molecular line radiative transfer codes

B335 model (van Zadelhoff et al. 2002): comparison of 7 different 1-D codes



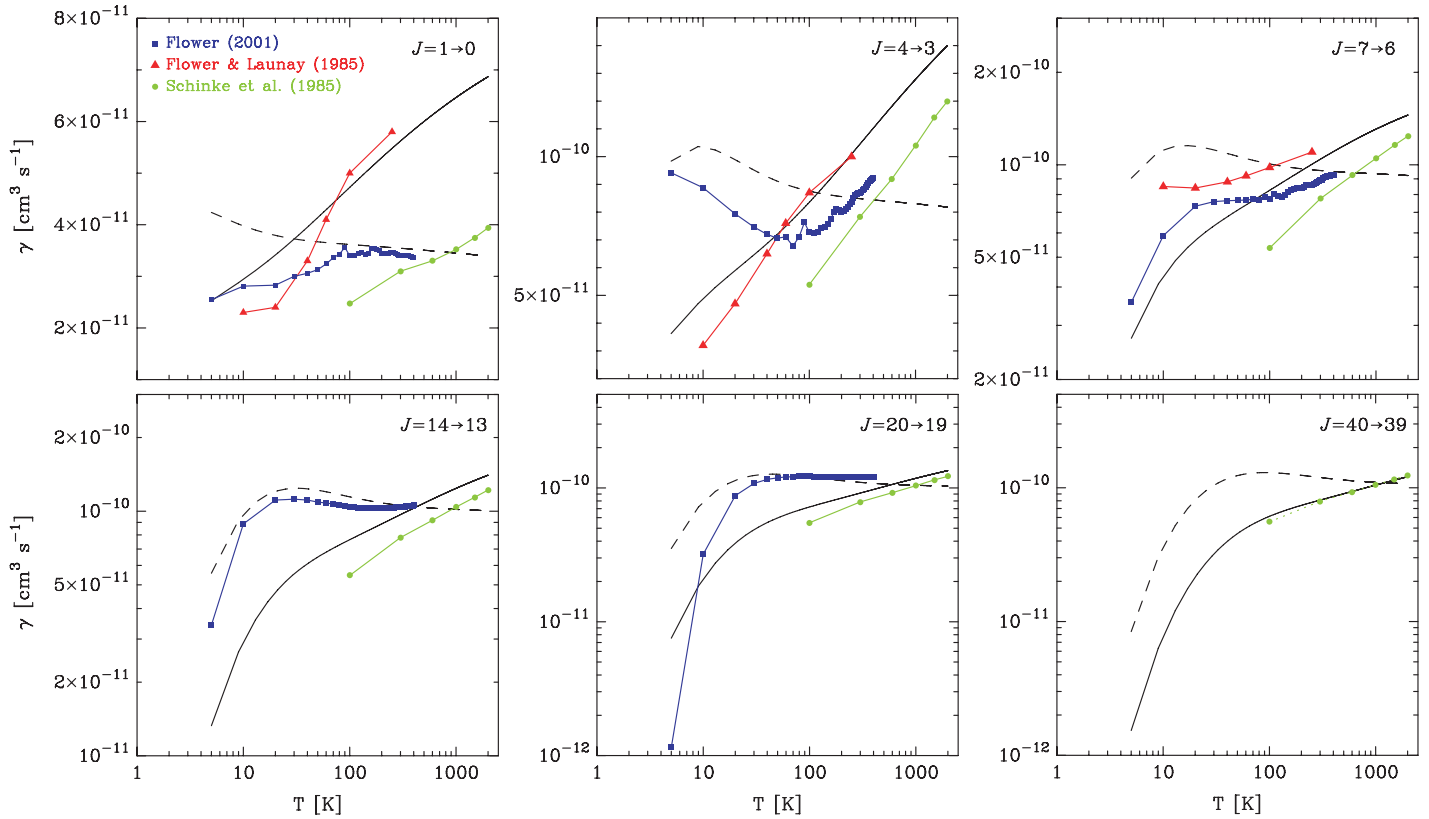
(www.strw.leidenuniv.nl/~radtrans)

Note: differences up to 20% for optically thick lines

Collisional rate coefficients

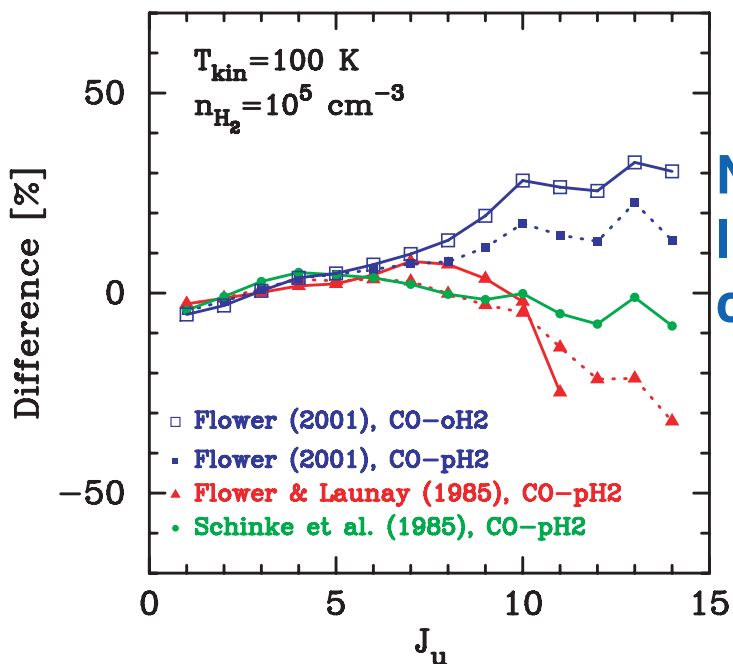
Extrapolation of the rates

(Schöier et al., in prep; www.strw.leidenuniv.nl/~moldata)



(Solid and dashed black lines are extrapolations of the rate coefficients from Flower & Launay and Flower, respectively. Several transitions have been weighted together in the fitting procedure.)

Predicted CO line intensities



Note: differences in predicted line intensities due to different collisional rate coefficients

(Relative to Flower (2001) CO-pH2. Solid lines are calculated rates whereas dashed lines are fitted rates)

Summary

The high calibration accuracy of next generation submillimetre telescopes is a challenge for current state-of-the-art molecular line radiative transfer codes.

Benchmark tests show that differences as large as 10-20% may arise in certain cases between various codes. The main source of the deviations is thought to be due to gridding.

The collisional rate coefficients used as input to these codes pose the largest source of uncertainty. Tests indicate that deviations up to 50% can arise depending on which set of rates are adopted. Furthermore, extrapolation of the rates is generally required, introducing additional uncertainty.

The submillimetre community needs to invest in and support the development of accurate molecular data bases and analysis tools if it is to fully benefit from ALMA