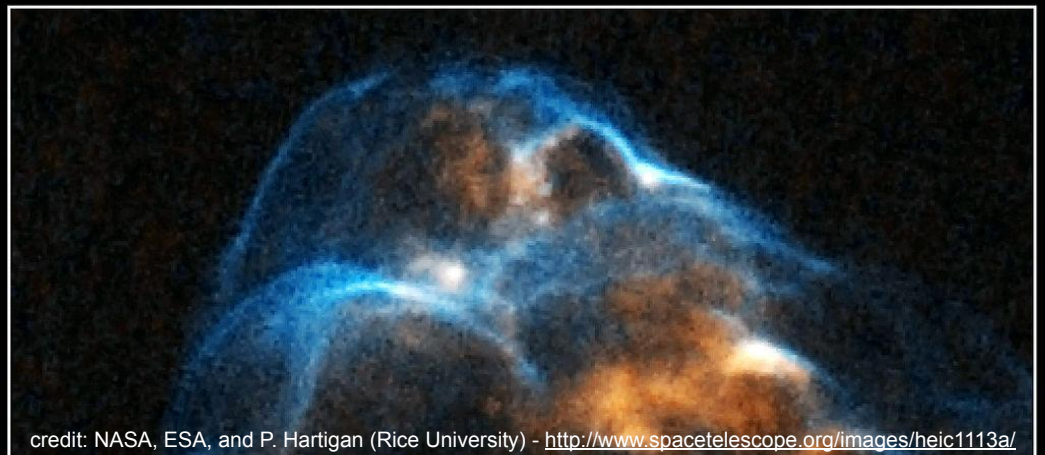
Hands-on-project

06-Modelling interstellar shock observations

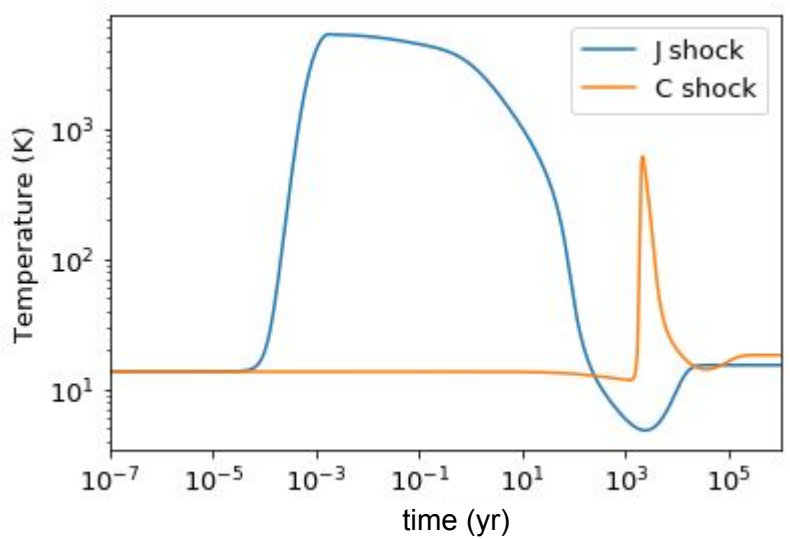


credit: NASA, ESA, and P. Hartigan (Rice University) - http://www.spacetelescope.org/images/heic1113a/

By: Sylvie Cabrit & Tram Le Ngoc

Paris-Durham 1D shock code

- Treats multi-fluid MHD shocks in the diffuse ISM
- good for modeling jets and outflows from forming stars, slow AGB winds, and supernova remnant shells, etc.
- Types of shocks we modeled:
  - plane parallel shocks (no curvature)
  - magnetic field parallel to the Vs
    - **J-shock** - hotter, faster
    - **C-shock** - stronger mag. field



Getting to know the model

- Input parameters we play with
  - Shock type, velocity, magnetic field, and radiation field
- Outputs we examine:
  - evolution of physical parameters, species abundances, line intensity, etc.

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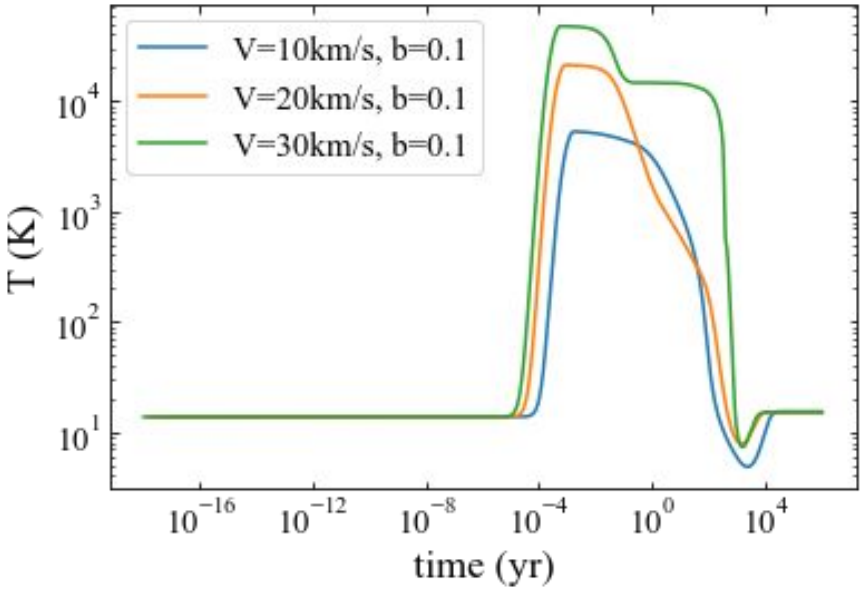
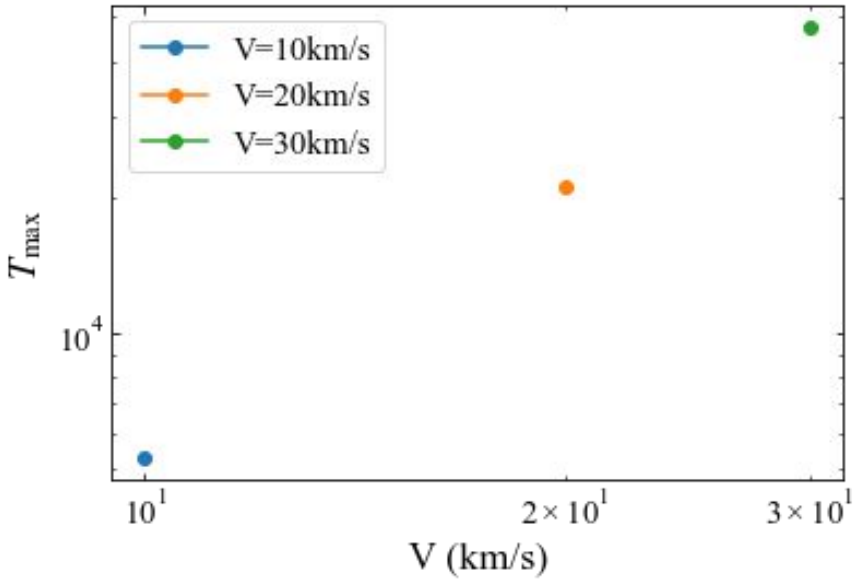
J-shock

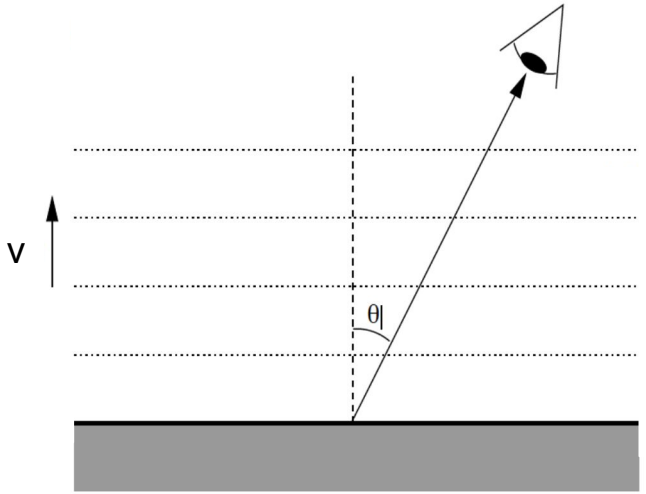


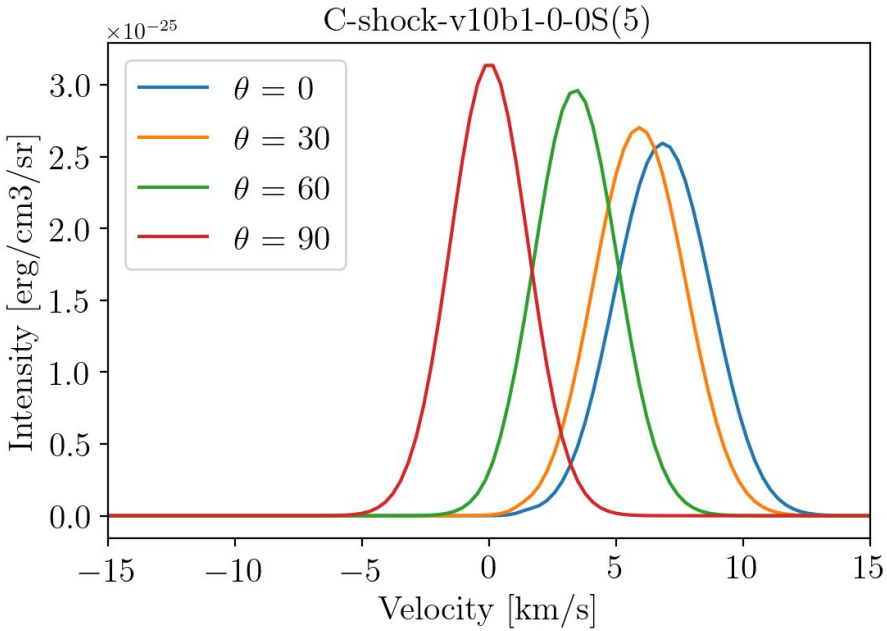


How can we compare our models with observations?

- H2 is an excellent shock tracer
- Post-processing products
  - **line profile of H2 emission (optically thin)** and excitation diagram

new parameter: viewing angle, Θ





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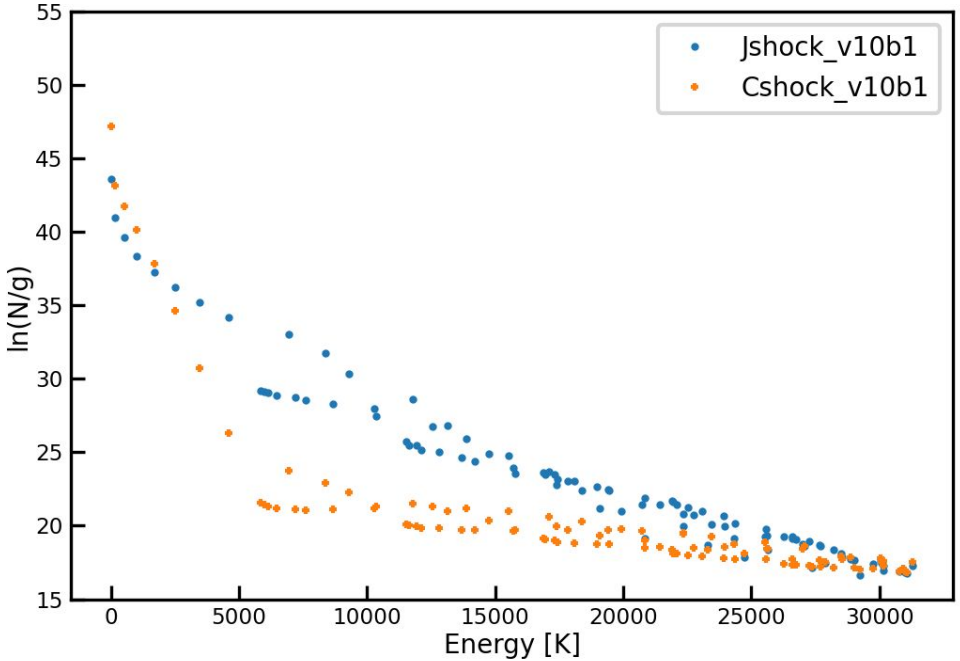
the intercept gives total column density

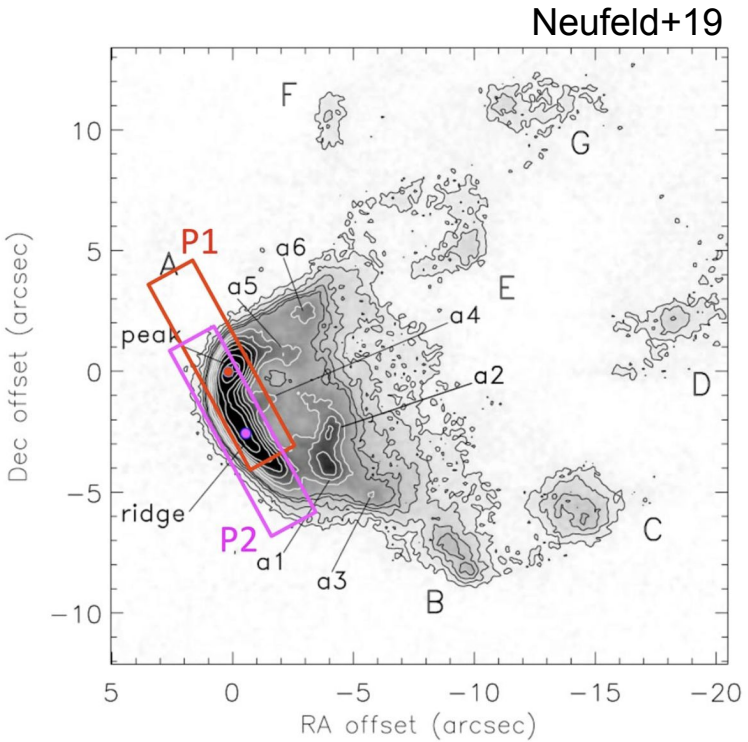
the slope of the curve gives the lower limit to shock temperature:

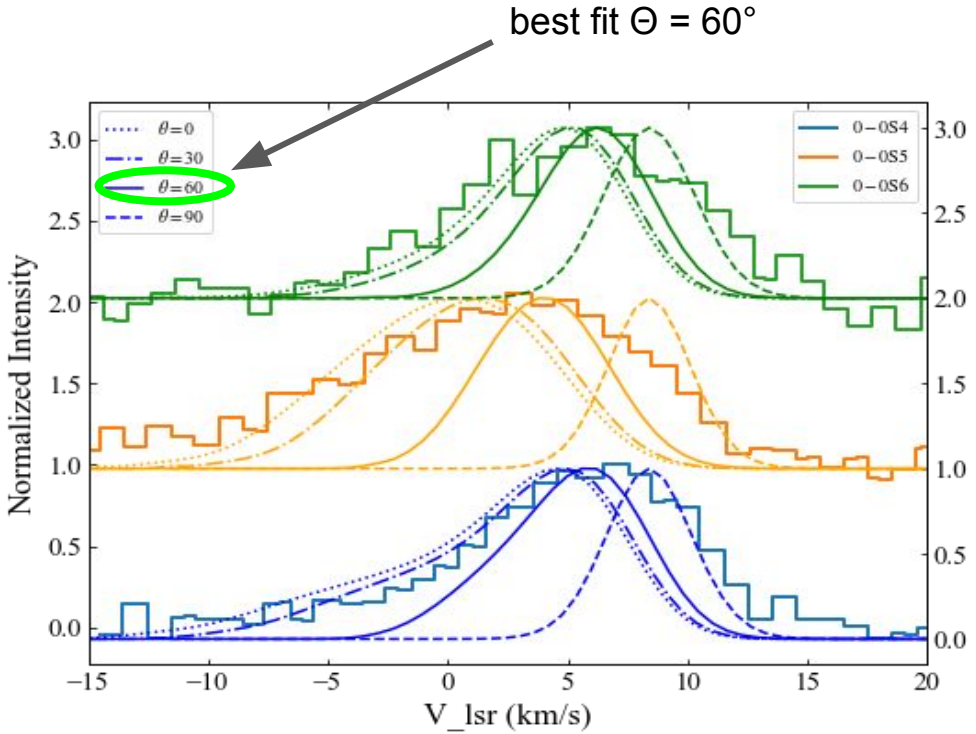
$$a = -\frac{1}{T}$$



Comparison with observations (Neufeld+19)

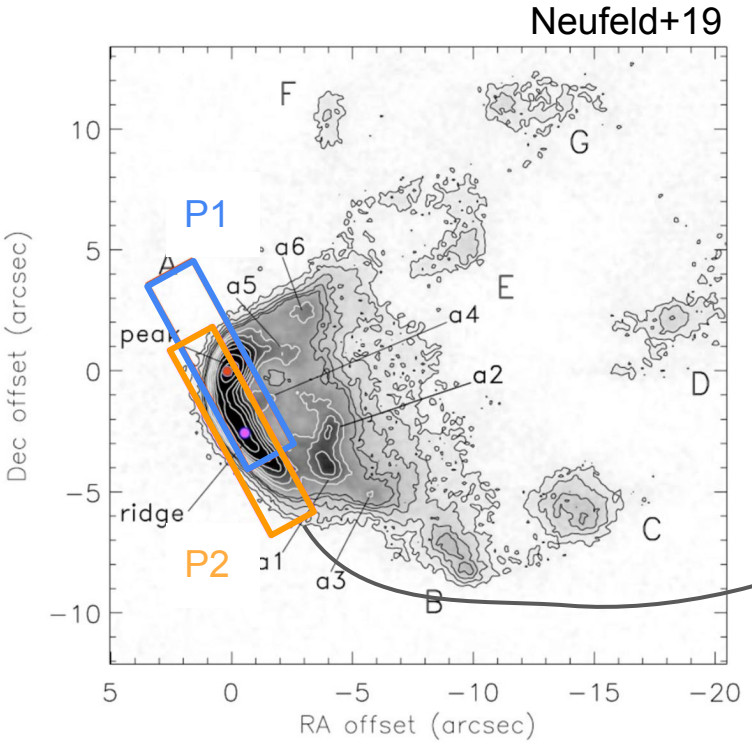
- H2 emission line profile

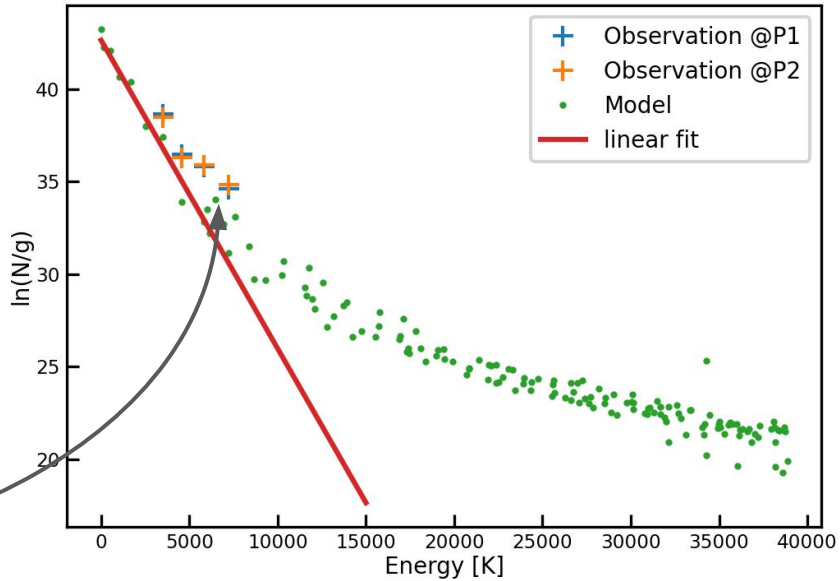




Comparison with observations (Neufeld+19)

- excitation diagram





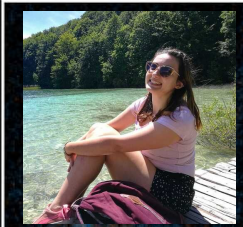
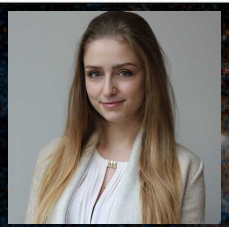
fit results for model, P1, P2:

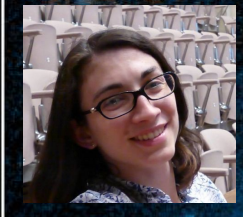
- temperature = 600, 980, 1110 K
- column density = 5e19, 3e19, 2e19 cm-2

Thank you!

Thanks Sylvie & Tram!!

Hands-on-project-06 group:
Ana Erceg, Cosima Eibensteiner, Dat Hoang, Fiorella Lucia Polles, Maximilien Franco, Yiqing Song



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Useful links

Paris-Durham Shock code: https://ism.obspm.fr/shock.html

Irradiated shock: Godard et al. 2019, A&A, 622A, 100

Paper of the observed data: Neufeld et al. 2019, ApJL, 878, L18