Herschel-PACS observation of gas lines from the disc around HD141569A

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HD 141569A was observed by Herschel as part of the Gas in Protoplanetary Discs Survey (Dent et al. 2013). We complemented with ground-based observations to constrain the gas and dust in the disc.

**Model parameters**

- B9.5V star, 5 Myrs, d=108pc
- \( M_{\text{dust}}(\text{disc}) \approx 2.6 \times 10^{-6} M_{\odot} \)
- \( M_{\text{gas}}(\text{disc}) \approx 2.5 \times 10^{-4} M_{\odot} \)
- \( M_{\text{PAH}}(\text{disc}) \approx 1.8 \times 10^{-12} M_{\odot} \)

**Density structure consistent with VISIR image at 8.6 micron**

- Inner disc: 5-110 AU
- Outer disc: 185-500 AU
- Gas mass/Dust mass \( \approx 100 \)

**Disc continuum modelling with MCFOST**

- Fit to the SED + PAH features with MCFOST (Pinte et al. 2006)
- Gas + dust opacity treated simultaneously
- PAH treatment: Draine & Li

**Disc continuum modelling with MCFOST**

- PAH emission at 8.6 micron
- Surface density profile
- Observed PSF star
- Model-spectrum obtained with MCFOST (non-LTE PAH emission, \( C_{150}H_{30}\) circumcoronene)

**Conclusions**

- From the PAH image, the inner disc extents to at least 110 AU.
- All models with gas-to-dust mass ratio from 10 to 100 overpredict the [OI] 63 micron flux. The oxygen chemistry may need to be revised.
- A model with gas-to-dust mass ratio of 100 is consistent with all the other gas constraints.
- Disc models with low opening angles (H/r) are favored due to the sensitivity of the [CII] and CO 3-2 flux on the gas density (flat discs are denser).

Acknowledgment: E. van Dishoeck for discussion, European contract EU FP7-2011 Grant Agreement nr. 284405 (PERIGEN-CA-2009-23613), ANR contracts ANR-07-BLAN-0021, ANR-2010-CJ-0504-01, ANR CHEX2011 SEED, Millennium Science Initiative “Nucleus P10-023-F”, Spanish grant AYA 2011-26202. Calculations were done on Fostino funded by ANR.