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

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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.

Herschel-PACS GASPS programme: [OI] 63, 145 & [CII] lines detected

Model parameters

- B9.5V star, 5 Myrs, d=108pc
- Dust (disc) \( \sim 2.6 \times 10^{-4} \) M\(_{\odot}\)
- Gas (disc) \( \sim 2.5 \times 10^{-4} \) M\(_{\odot}\)
- PAH (disc) \( \sim 1.8 \times 10^{-12} \) M\(_{\odot}\)
- Inner disc: 5-110 AU
- Outer disc: 185-500 AU
- Gas mass/Dust mass \( \sim 100 \)

Disc continuum modelling with MCFOST

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

Gas chemistry and line transfer modelling with ProDiMo

[OI] 63, [OI] 145, [CII], and CO 3-2: flat gas-to-dust=100 disc models produce fluxes within a factor 2 except for [OI] 63.

Conclusions

- From the PAH image, the inner disc extends 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 (fit discs are denser).

Please contact me for more details. I am also looking for a tenure/tenure-track position.