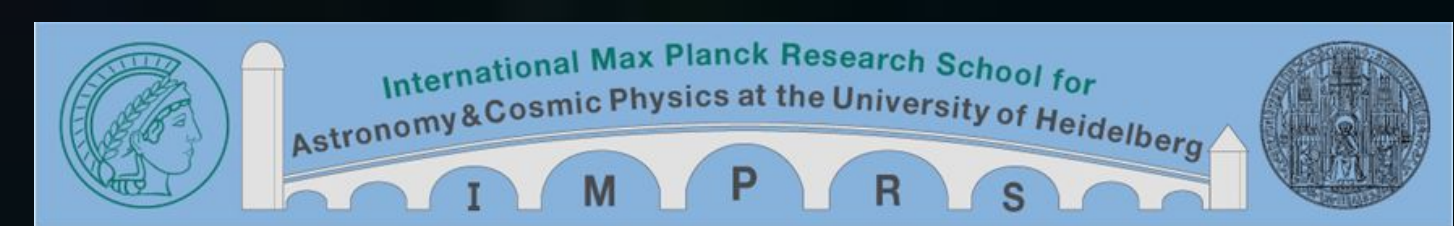
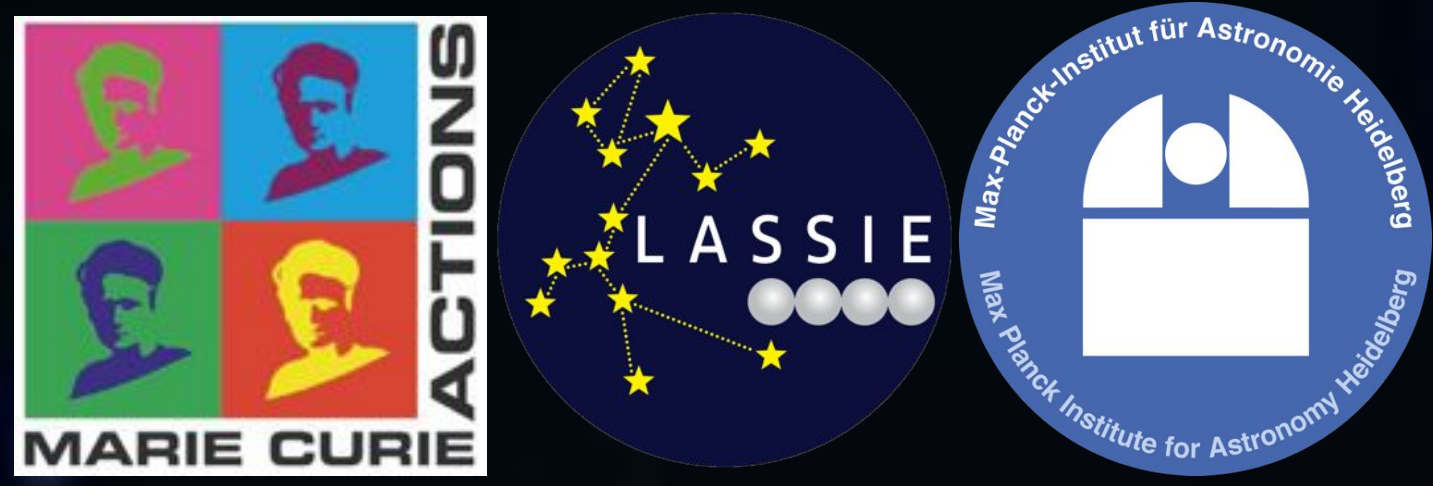


Chemical Substructure at Small Scale in NGC7538S & NGC7538IRS1

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Summary

At a spatial resolution of $\sim 0.4''$ (linear resolution $\sim 800\text{AU}$), our interferometric study on NGC7538 with the Plateau de Bure Interferometer (PdBI) has revealed spatial complexity (Fig.1&Fig.3) and chemical differentiations (Fig.2), ranging from properties known for starless cores to real hot molecular cores (Tab.1). Since these sub sources are embedded within the same large scale gas clump, their ages should be very similar. Although not coeval, it is indicative that the evolutionary time-scales among these different stages can be very short, and short heat-up phases may be sufficient to explain such chemical differences^[2].

Data

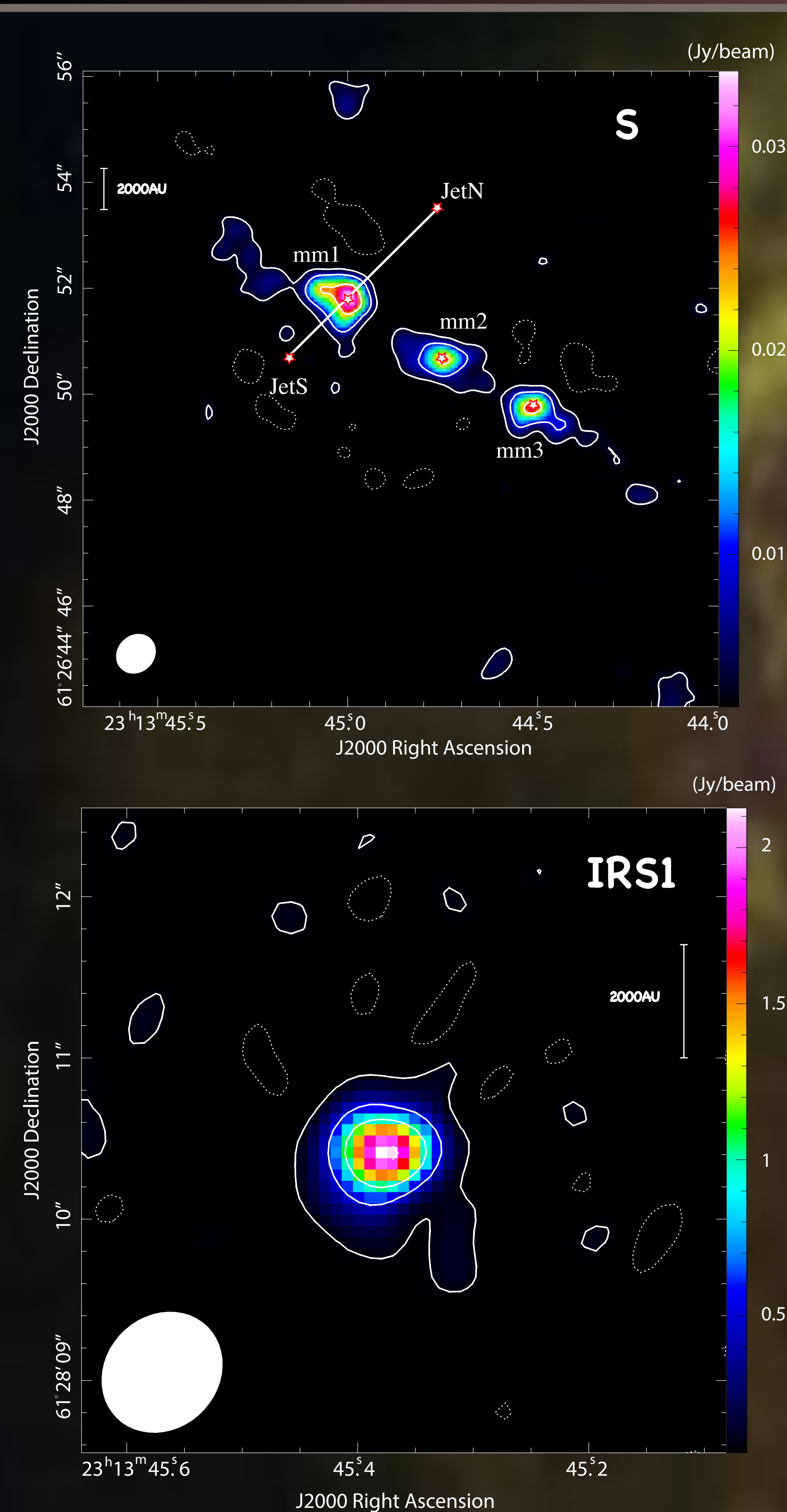


Fig.1 1.3mm continuum emission obtained from PdBI is shown as colour map, overlapped by contours at 3σ , 6σ and 15σ levels (dashed contours show negative features due to missing flux). Upper: Red stars marked the peaks of sub sources mm1, mm2, mm3, northern and southern parts of the jet regions in NGC7538S. Lower: IRS1 still remains a single core at the high spatial resolution.

References

- [1] S.Y., Feng, H.Beuther, Chemical Substructure at Small Scale in NGC7538S & NGC7538IRS1 (*in prep.*)
[2] H. Beuther, H. Linz, & Th. Henning
A&A, 2012, 543, A88

Results

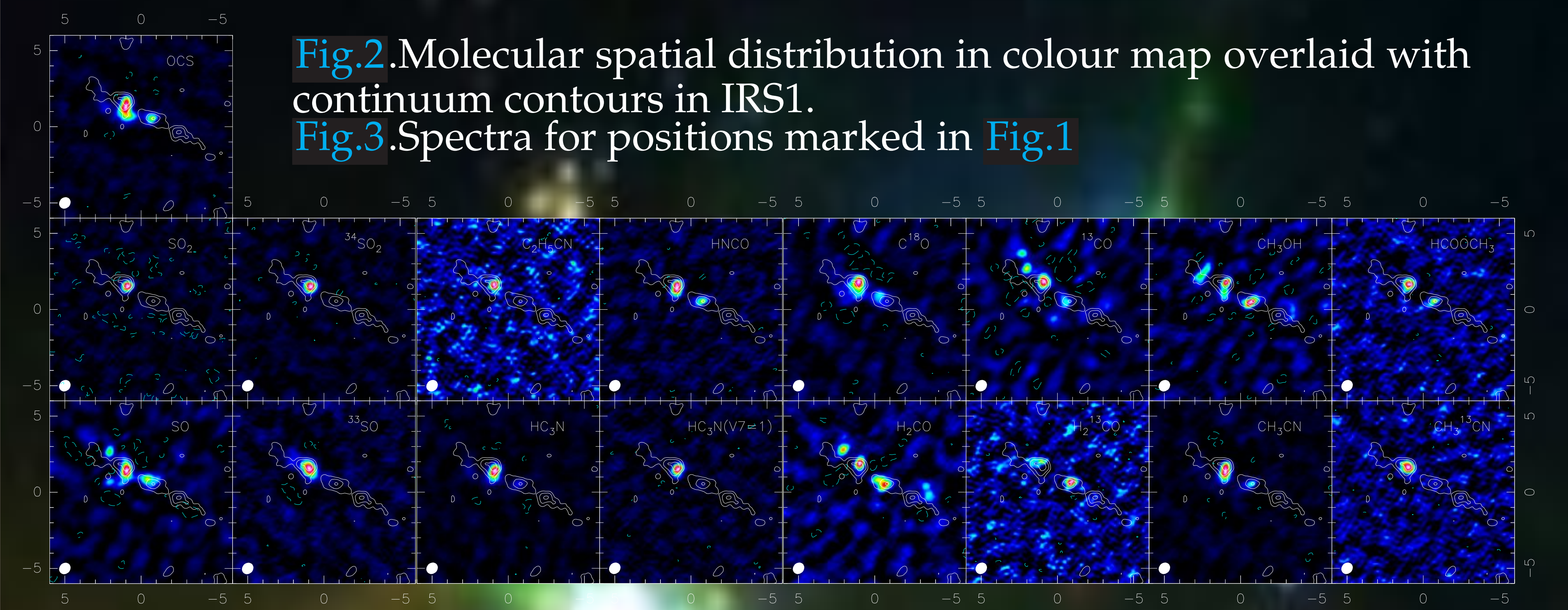


Fig.2.Molecular spatial distribution in colour map overlaid with continuum contours in IRS1.
Fig.3.Spectra for positions marked in Fig.1

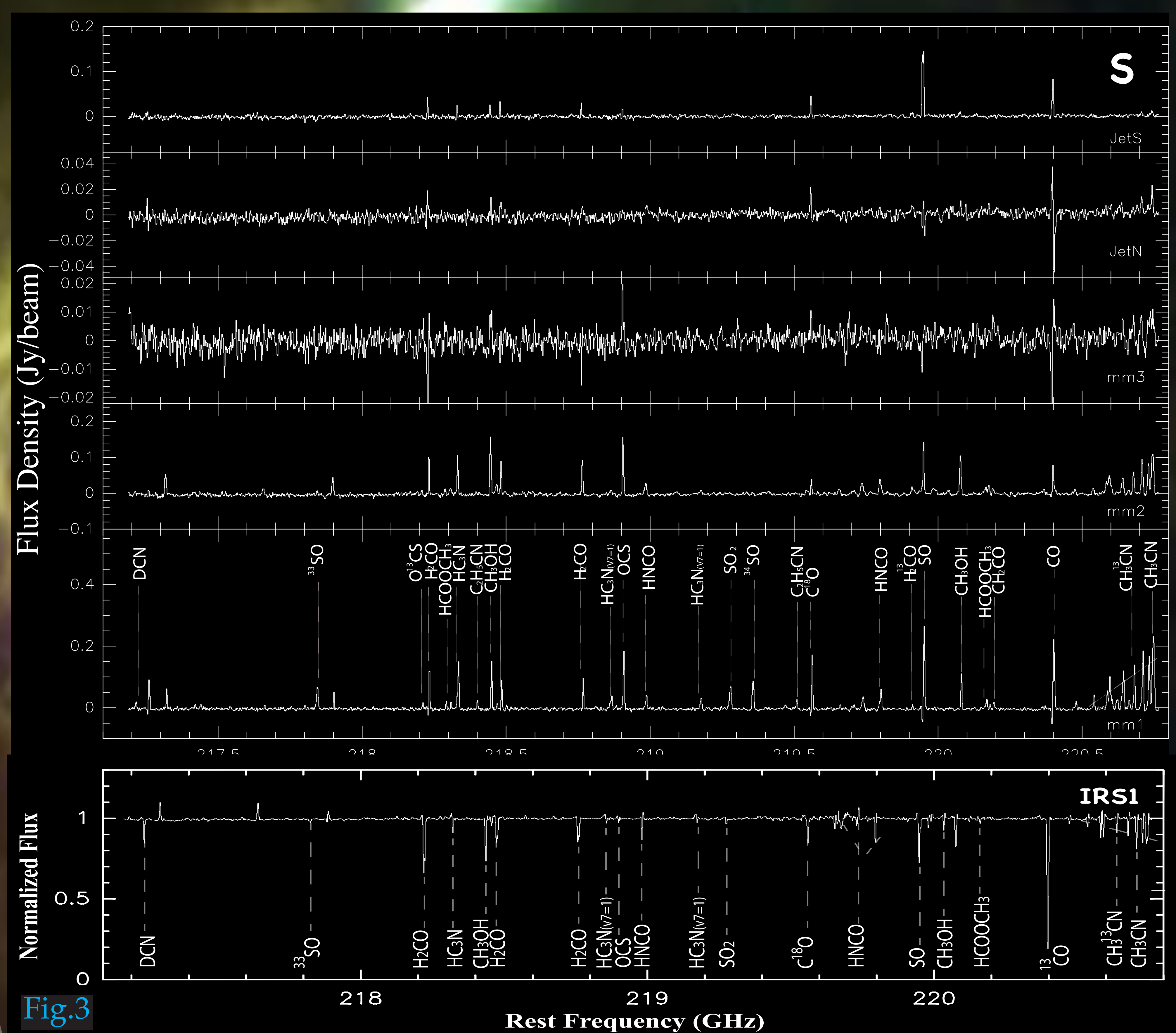


Fig.3

Calculation

Column density calculated under the assumption of Local Thermodynamic Equilibrium, in $\text{Log}_{10}/\text{cm}^2$.

Species	mm1 (220K)	mm2 (170K)	mm3 (40K)	JetN (30K)	JetS (30K)	IRS1 (230K)
OCS	16.2	16.0	15.3	<15.1	15.3	<14.5
SO	16.0	15.6	—	—	15.6	16.5
³³ SO	16.2	15.2	< 14.5	<14.5	—	16.2
SO ₂	17.3	16.8	≤ 18.2	< 19.1	<19.5	17.2
³⁴ SO ₂	16.2	15.5	< 14.3	< 14.1	< 14.6	<14.6
C ¹⁸ O	17.5	16.7	15.6	16.0	16.3	18.2
¹³ CO	17.7	17.1	—	—	16.6	19.2
H ₂ CO	15.9	15.6	≤ 13.7	14.0	14.3	17.2
H ₂ ¹³ CO	14.5	15.0	≤ 13.9	≤13.7	< 15.2	15.3
HC ₃ N	14.7	≤ 14.5	<13.6	<13.7	14.4	15.0
HC ₃ N _(v7=1)	15.0	14.8	—	≤ 17.9	< 17.9	15.1
CH ₃ ¹³ CN	15.4	14.3	<13.9	<13.8	< 14.0	16.1
CH ₃ CN	16.2	15.8	< 15.1	15.5	< 14.5	16.5
C ₂ H ₅ CN	15.0	14.7	14.7	—	<14.9	<15.0
HNCO	15.6	15.4	<14.0	<15.2	<14.6	16.4
CH ₃ OH	16.9	16.9	≤ 15.2	15.0	15.2	17.9
HCOOCH ₃	16.8	16.9	16.1	16.3	< 15.9	17.1

Tab.1.Columns correspond to the star-marked places in Fig.1.



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