IRAS 17233-3606:

a new exceptionally line-rich hot core in the southern hemisphere

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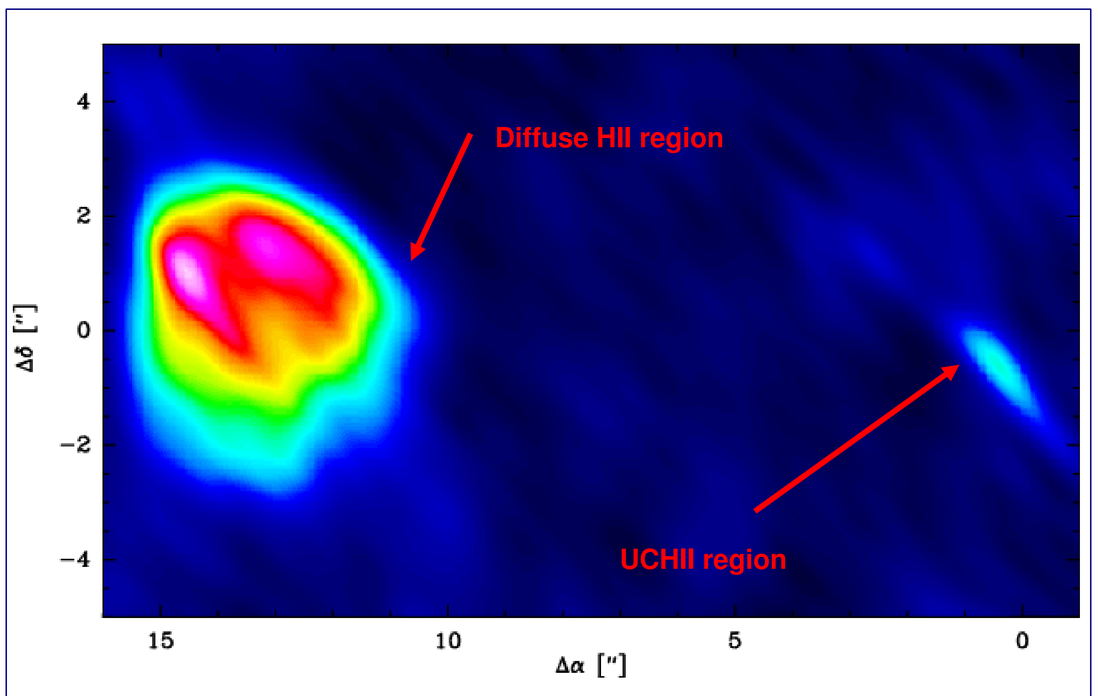
High mass star forming region IRAS 17233-3606:

The region IRAS17233-3606 contains a 6cm continuum diffuse source (Hughes&MacLeod 1993) and a compact cm continuum double source ~12" to the west of it. In the vicinity of the double source, intense star-formation activity is evidenced by OH, H_2O and CH_3OH masers (Forster&Caswell 1989, Walsh et al. 1998). Moreover, non-Gaussian profiles were detected in CO(2-1) by Osterloh et al. (1997) which are probably associated with a molecular outflow. Continuum observations at 1.2~mm (Faundez et al. 2004) derived a mass of 200M and a bolometric luminosity of 1.7 10^4L for the region. Because of the vicinity of its direction to that of the Galactic centre, the uncertainty on its kinematic distance is large. However, previous studies seem to agree that the source is located at its close distance (between 700pc and 2.2kpc, Miettinen et al 2006, Forster&Caswell 1989) rather than at the far distance (~16 kpc).

APEX and SMA observations:

IRAS17233 was observed during April and August 2006, with the Atacama Pathfinder Experiment 12m telescope (APEX) located on Llano de Chajnantor in the Atacama desert of Chile. The 1.2~mm continuum peak position from Faundez et al. (2004) was used as target for the observations. We observed simultaneously the HCO^+ (4-3) transition and the CO (3-2) line from the lower side band, and mapped a region of 70"×70" with a spacing of 10". These observations were followed up by ON-OFF integration on the peak of the HCO^+(4-3) emission in CH_3OH (6_k-5_k) and (7_k-6_k) vt=0,1, and CH_3CN (16_k-15_k). In August 2006, continuum cross-scans were performed with the APEX-2A and the FLASH receivers at 344.7, 461 and 806.7 GHz respectively.

In April 2006, the source was observed in the compact configuration of the SubMillimeter Array with a mosaic of two fields, in CO(2-1) in upper side band. The ^{13}CO(2-1) line and the CH_3CN (12_k-11_k) transitions were detected in the lower side band. The CLEANed beam of the observations is5.3"×2.7".

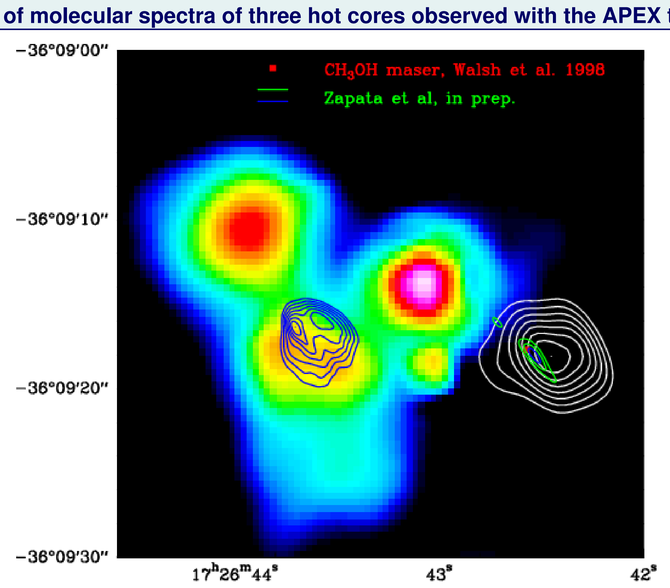


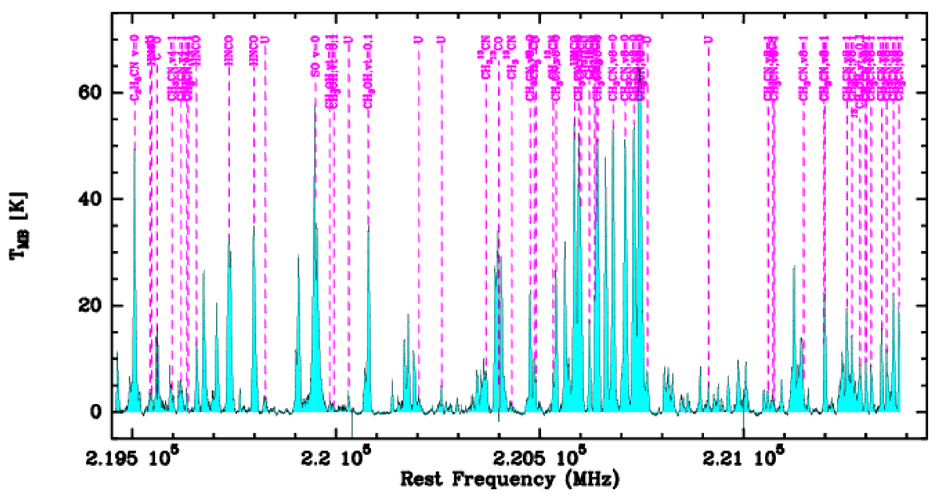
3.6 cm VLA emission (with a CLEANed beam of 1.55"×0.44") (Zapata et al. in prep.).

Top: in colour scale the emission at 8μm from the GLIMPSE survey. The white contours are the SMA 1.2 mm continuum emission, while the green and blue contours the VLA 3.6 cm continuum emission (Zapata et al in prep.).

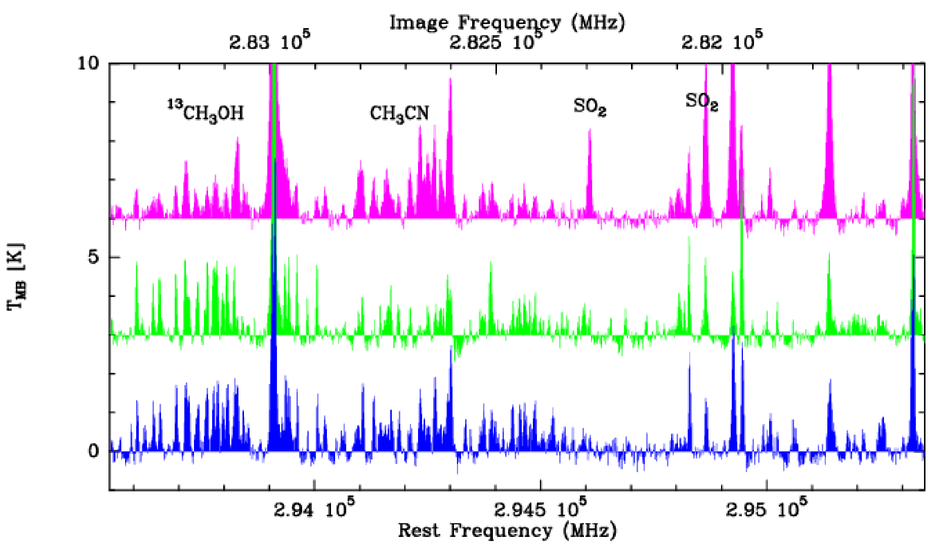
Middle: Spectrum of IRAS17233 at 220 GHz towards the 1.2 mm continuum emission, taken with the SMA array.

Bottom: comparison of molecular spectra of three hot cores observed with the APEX telescope.





IRAS 17233
NGC 6334−I
G327.3−0.6



The hot core in IRAS 17233:

The molecular spectrum of IRAS17233 shows strong emission from several complex molecules, typical of hot cores. Linewidths are of the order of 7km s^{-1}, but many transitions show non-Gaussian wings probably associated with the outflow. The SMA data towards the continuum peak position shows an extraordinary reach molecular emission, with almost no channel free of lines. The torsionally excited CH_3CN (12_k-11_k) band is detected, up to k=5. The analysis of the molecular spectrum of IRAS17233 is compatible with that of a hot core of **200K, with a source size of ~2"**. For comparisons, the hot cores in NGC6334I and G327.3-0.6 were observed in the same spectral windows with APEX. The data show that although IRAS17233 is probably the less luminous of the three sources, their molecular spectra are comparable. Our observations support the findings of the last years (e.g., Ceccarelli et al., 2000) that indeed hot cores are a common phenomenon associated with active star forming regions of any mass, and that the exceptional emission sources like Orion-KL is not due to their particular physical properties, but to their close distances.

The 1.2 mm SMA continuum emission has an extension of 6"×5", and peaks very close to the CH_3OH maser spots and the UCHII region. Assuming T_{dust}=50K and a distance of 1.5 kpc, the total mass of the region is **119 $M_\odot$**.From the cm flux, the spectral type of the source corresponds to a B1 Zero-Age-Main-Sequence star.

The outflow from IRAS 17233:

A bipolar outflow is detected in CO but also in other molecular species. It originates from the peak of the continuum emission. Its total mass (not corrected for optical depths) is 3.1 $M_\odot$. The outflow has a collimation factor of 4.5, and coincides with extended emission detected in the 4.5 μm GLIMPSE survey.

The colours show the combined 3.6, 4.5 and 8.0 μm GLIMPSE emission of IRAS 17233, while the red and white contours indicate the red- and blue-shifted emission of the bipolar outflow, observed with the SMA array.