Detection of thermal SiO emission from a Massive Dense Cold Core

Nadia Lo[1,2], Maria Cunningham[1], Indra Bains[3], Michael Burton[1], Guido Garay[4]

[1] University of New South Wales, Australia
[2] Australia Telescope National Facility, CSIRO, Australia
[3] Swinburne University of Technology, Australia
[4] Universidad de Chile, Chile

The massive dense cold core G333.125–0.562

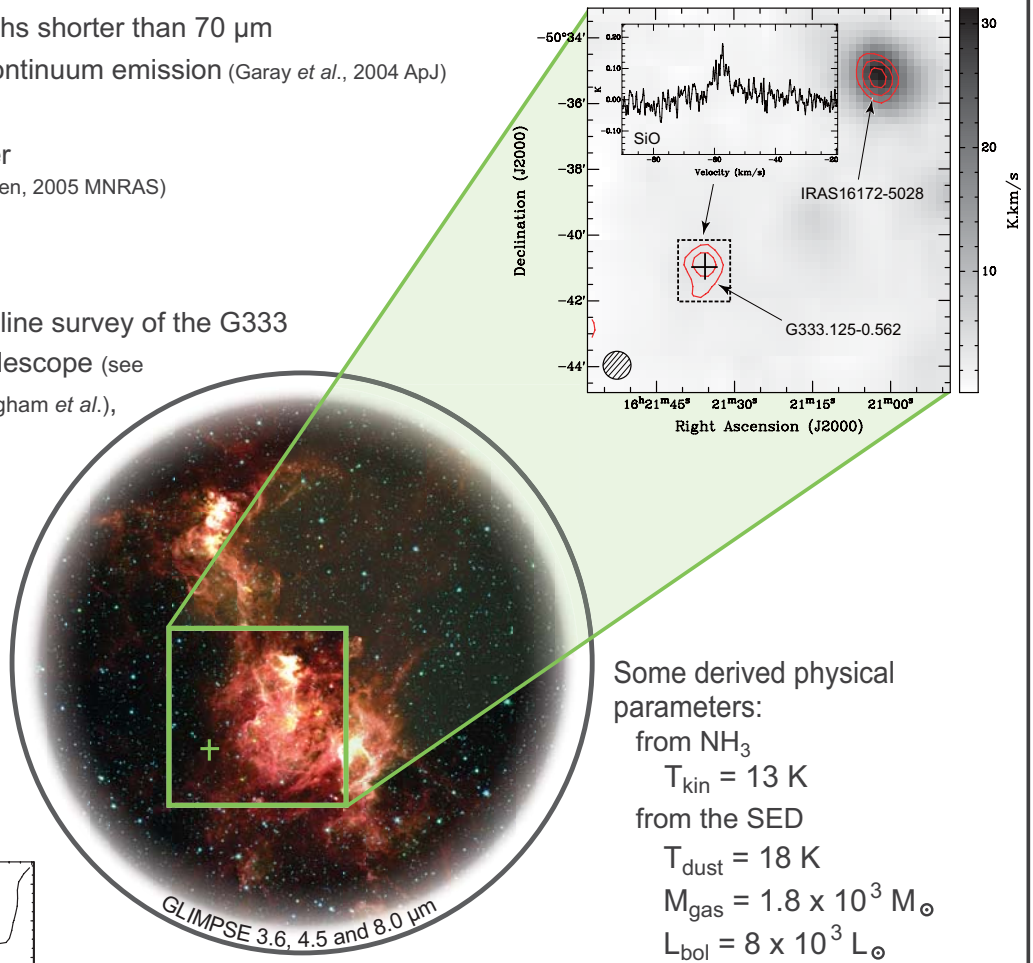
The core is located in the G333 giant molecular cloud complex, at a distance of 3.6 kpc. It

- is undetectable at wavelengths shorter than 70 μm
- has compact 1.2 mm dust continuum emission (Garay *et al.*, 2004 ApJ)
- is cold, massive and dense
- has 6.6 GHz methanol maser
  (Ellingsen et al., 1996 MNRAS; Ellingsen, 2005 MNRAS)

Why is it special?

From the UNSW multi-molecular line survey of the G333 GMC-complex with the Mopra Telescope (see "The Mopra DQS Survey" poster - Cunningham *et al.*), we have detected thermal SiO (a shock tracer) emission in this cold core (Figure 1), along with a range of other molecules (Figure 2). The **wider line** of the SiO (Figure 1 inset) suggests there is an embedded object driving an outflow.

Figure 1) Integrated emission of SiO (red contours) overlaid on the integrated emission of CS (grey scale) towards the warm starforming core IRAS16172-5028 and the cold core G333.125-0.562. Note the prominence of SiO c.f CS in the cold core. The cross marks the 6.7-GHz methanol maser. (Lo *et al.*, 2007 MNRAS in press)



Some derived physical parameters:

from NH_3

T_{kin} = 13 K

from the SED

T_{dust} = 18 K

$M_{gas} = 1.8 \times 10^3\ M_\odot$

$L_{bol} = 8 \times 10^3\ L_\odot$

$n_{H_2} = 1 \times 10^5\ cm^{-3}$

$N_{H_2} = 4 \times 10^{23}\ cm^{-2}$

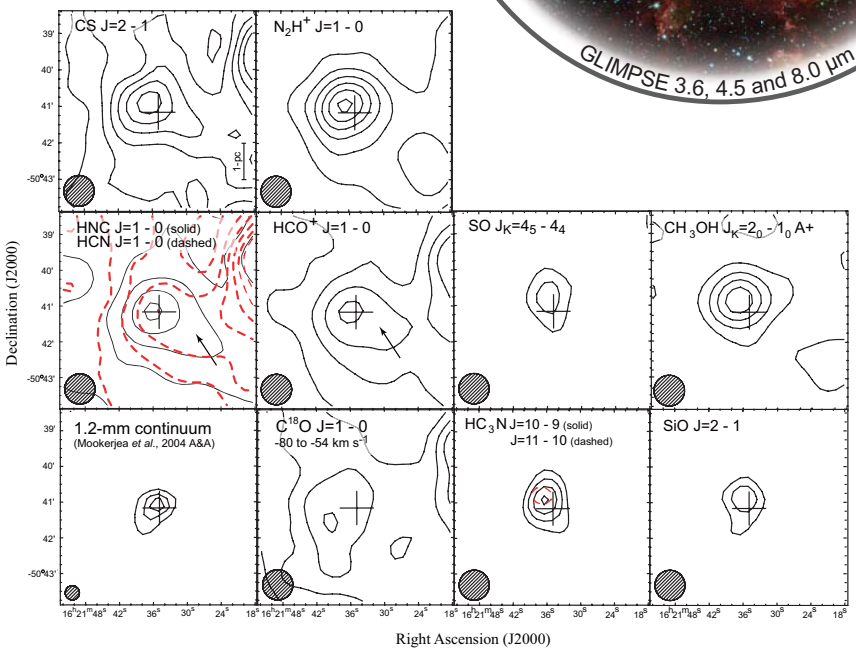


Figure 2) Integrated line emission from various molecules, the cross marks the peak of 1.2 mm continuum. (Lo *et al.*, 2007 MNRAS)

Conclusion

The cold massive core habours a deeply embedded massive protostellar object, that is driving an outflow. This is occurring at a very early stage of star formation, prior to the creation of an infrared source in the core.