

Birthplace of 6.7 GHz methanol masers

Cong-Gui Gan^{1,2,3}, Xi Chen^{1,2} and Zhi-Qiang Shen^{1,2}

¹Key Laboratory for Research in Galaxies and Cosmology, Shanghai Astronomical Observatory

²Key Laboratory of Radio Astronomy, Chinese Academy of Sciences, China

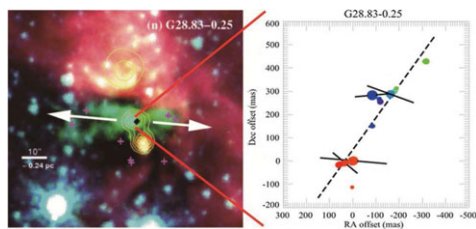
³Graduate School of Chinese Academy of Sciences, 100039, China; email:cggan@shao.ac.cn

Abstract. We performed polarization sensitive VLBI observations of 6.7 GHz methanol masers toward high-mass young stellar objects with clear outflow seen from *Spitzer* IRAC images in the 4.5 μm band (i.e. EGOs, see Cyganowski *et al.* 2008) with the EVN to investigate the birthplace of the masers. By comparing direction of the major axis of methanol maser distributions with directions of higher resolution outflow and magnetic field vector, we suggest that the methanol masers toward source G28.83-0.25 may arise from surrounding disk.

Keywords. magnetic fields — masers — polarization — stars: formation

Methanol masers at 6.7 GHz excited by Infrared pumping locate close (within 1'') to high mass young stellar objects, which may pinpoint surrounding disk regions or shock regions of outflows/jets, although genuine origin of methanol maser is still in debate. One way of testing these two models is to compare major axis of the maser distribution with directions of outflow/jet and maser magnetic field vector. The outflow model suggests that directions of maser major axis and magnetic field vector is along the direction of jet/outflow due to materials flow. The disk model should have the major axis of masers perpendicular to jet/outflow direction with magnetic field direction radially from the central mass (Dodson & Moriarty 2012). Our EVN observations show that the birthplace of methanol maser toward source G28.83-0.25 is consistent with the disk model.

Figure 1. A close-up view of methanol maser features detected toward G28.83-0.25. The left panel is three-color IRAC image showing 8.0 μm (red), 4.5 μm (green), and 3.6 μm (blue). Direction of jet/outflow is marked with white arrows. Right panel shows distributions of 6.7 GHz methanol masers detected by our EVN observations. Direction of major axis of maser distributions and the EVPA are overplotted with dashed and solid lines, respectively.



Acknowledgments

This work is partly supported by China Ministry of Science and Technology under State Key Development Program for Basic Research (2012CB821800), the National Natural Science Foundation of China (grants 10625314, 11121062, 11173046, 11273043, 1133008 and 1173041) and the CAS/SAFEA International Partnership Program for Creative Research Teams.

References

- Cyganowski, C. J., Whitney, B. A., Holden, E., *et al.* 2008, *AJ*, 136, 2391
Dodson, R. & Moriarty, C. D. 2012, *MNRAS*, 421, 2395