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Wiggling Structures Along the NGC 1333 IRAS 2A Outflow

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Abstract. Wiggling structures in a bipolar outflow may be attributed to orbital motion of a binary system or precession of an accretion disk perturbed by a companion. The shocked knots along the outflow axis display a morphology with either mirror symmetry due to the orbital motion or point symmetry resulted from disk precession. Using the Submillimeter Array (SMA), our CO (2-1) and SiO (5-4) observations show wiggling structures in the collimated bipolar outflow driven by the NGC 1333 IRAS 2A Class 0 protostar ($d \sim 200$ pc). By fitting the peak positions of emission knots, we can examine the lateral displacement of the molecular jet to constrain parameters of the unresolved binary system, such as the binary separation and total binary mass. With an angular resolution of $\sim 3''$, we have determined the knot positions in SiO (5–4)(Fig. 1) and CO (2–1). As a first attempt, we consider the scenario of orbital motion in a binary system and estimate a total binary mass of $\sim 1\ M_\odot$ and a binary separation of roughly ~ 20 AU, corresponding to $\sim 0.1''$. Such a small separation makes it challenging to resolve this hypothesized proto-binary system, which is thought to be responsible for the large-scale quadrupolar outflow nearly perpendicular with each other in CO (1–0).

Keywords. ISM: individual (IRAS 2A) — ISM: jets and outflows

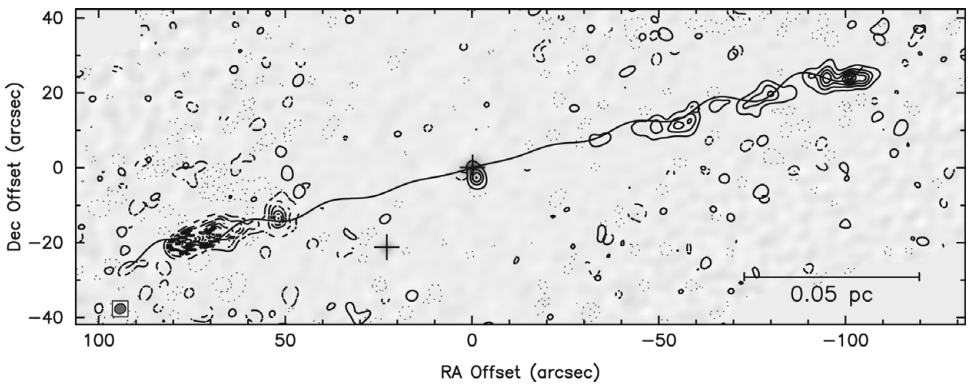

Figure 1. SMA integrated maps of the blue- (*thick contours*) and red-shifted (*thick dash contours*) components of the SiO (5–4) emission overlaid with the 1.3 mm continuum map (*gray scales*). Black crosses mark the positions of IRAS 2A (center) and IRAS 2B. The black curve is our best fit result.