E tra una battuta e una chiacchiera, abbiamo anche lavorato un po’

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Tracing the root of the bipolar jet in IRAS 20126+4104: VLBA observations of H_2O masers⋆

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Abstract. We present VLBA observations of the H_2O masers towards IRAS 20126+4104, a high-mass young stellar object which is believed to be associated with a rotating disk and a bipolar outflow/jet system collimated along the disk axis. A model fit to the posi… demonstrates that the… interface between th… The masers expand … within the uncertai… young stellar objec… measured on a muc… indicates that the j… the interaction wit…

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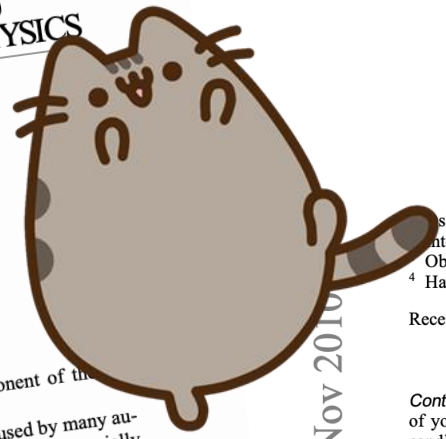

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Water masers in the massive protostar IRAS 20126+4104: ejection and deceleration

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Abstract. We report on the first multi-epoch, phase referenced VLBI observations of the H_2O maser emission in a high-mass protostar associated with a disk-jet system. The source under study, IRAS 20126+4104, has been extensively investigated in a large variety of tracers, including H_2O maser VLBA data acquired by us three years before the present observations. The new findings fully confirm the interpretation proposed in our previous study, namely that the maser spots are expanding from a common origin coincident with the protostar. We also demonstrate that the observed 3-D velocities of the maser spots can be fitted with a model assuming that the spots are moving along the surface of a conical jet, with speed increasing for increasing distance from the cone vertex. We also present the results of single-dish monitoring of the H_2O maser spectra in IRAS 20126+4104. These reveal that the peak velocity of some maser lines decreases linearly with time. We speculate that such a deceleration could be due to braking of the shocks from which the maser emission originates, due to mass loading at the shock front or dissipation of the shock energy.

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Methanol and water masers in IRAS 20126+4104: The distance, the disk, and the jet⋆

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ABSTRACT

Context. Knowledge of the distance to high-mass star forming regions is crucial to obtain accurate luminosity and mass estimates of young OB-type (proto)stars and thus better constrain their nature and age. IRAS 20126+4104 is a special case, being the best candidate of a high-mass (proto)star surrounded by an accretion disk. Such a fact may be used to set constraints on theories of high-mass star formation, but requires confirmation that the mass and luminosity of IRAS 20126+4104 are indeed typical of a B0.5 star, which in turn requires an accurate estimate of the distance.
Aims. The goal of our study is twofold: to determine the distance to IRAS 20126+4104, using the parallax of H_2O masers associated with the source, and unveil the 3D velocity field of the disk, through proper motion measurements of the 6.7 GHz CH_3OH masers. At the same time, we can also obtain an estimate of the systemic velocity in the plane of the sky of the disk+star system.
Methods. We used the Very Long Baseline Array and the European VLBI Network to observe the 22.2 GHz H_2O and 6.7 GHz CH_3OH masers in IRAS 20126+4104 at a number of epochs suitably distributed in time. The absolute positions of the maser features were established with respect to reference quasars, which allowed us to derive absolute proper motions.
Results. From the parallax of the H_2O masers we obtain a distance of 1.64 ± 0.05 kpc, which is very similar to the value adopted so far in the literature (1.7 kpc) and confirms that IRAS 20126+4104 is a high-mass (proto)star. From the CH_3OH masers we derive the component in the plane of the sky of the systemic velocity of the disk+star system (−16 km s^{-1} in right-ascension and +7.6 km s^{-1} in declination). Accurate knowledge of the distance and systemic velocity allows us to improve on the model fit to the H_2O maser jet presented in a previous study. Finally, we identify two groups of CH_3OH maser features, one undergoing rotation in the disk and possibly distributed along a narrow ring centered on the star, the other characterised by relative proper motions indicating that the …material …nations

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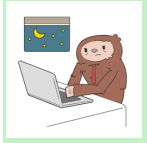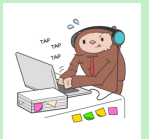
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