

Giant Molecular Outflows Powered by Protostars in L1448

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We present sensitive ($T_R^* \approx 0.1\text{K}$), large-scale ($47' \times 7'$ —corresponding to $4 \text{ pc} \times 6 \text{ pc}$ at the source) maps of the CO J=1→0 emission of the L1448 dark cloud at $55''$ resolution. The maps were acquired using the On-The-Fly (OTF) capability of the NRAO's 12-meter telescope. Careful comparison of the spatial and velocity distribution of the high-velocity CO with previously published optical and near-infrared images and spectra has led to the identification of four distinct, parsec-scale molecular outflows from our maps. These CO flows are powered by four Class 0 protostars: L1448C, L1448N(A), L1448N(B), and L1448 IRS2 and end at the cloud's boundaries. The famous, well-collimated, high-velocity molecular outflow powered by L1448C can now be traced to distances an order of magnitude greater than previously. We present strong evidence for interactions between all four outflows on scales over a parsec from the driving sources. The magnitude of the combined flow momenta, as well as the combined kinetic energy of the flows, are sufficient to disperse the $50 M_\odot$ ammonia core in which the protostars are currently forming. It remains to be shown whether the combined directions of the outflow momenta, and the efficiency of momentum transfer from outflow to ambient material, are sufficient for dispersal of the L1448 molecular cloud.

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