The wiggle morphology of the HH 211 bipolar outflow

Anthony Moraghan[1]; Chin-Fei Lee[1]; Po-Sheng Huang[1]; Bhargav Vaidya[2]
[1]*Academia Sinica Institute of Astronomy and Astrophysics;* [2]*Department of Physics, University of Torino*

Recent high-resolution, high-sensitivity sub-mm observations of the HH 211 protostellar outflow with the Submillimeter Array (SMA) have revealed it to possess a clear reflection-symmetric wiggle. The most likely explanation is that the HH 211 jet source may be moving as part of a protobinary system. Here, we test this assumption by simulating HH 211 through 3D hydrodynamic jet propagation simulations using the PLUTO code with a molecular chemistry and cooling module, and initial conditions based on an analytical model derived from SMA observations. Our results show the reflection-symmetric wiggle can be recreated through the assumption that the jet source perturbed by binary motion at its base, and that a regular sinusoidal velocity variation in the jet beam is close to matching the observed knot pattern. However, a more complex model with either additional heating from the protostar, or a shorter period velocity pulsation may be required to account for enhanced emission near the source, and weaker knot emission downstream.