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Sub-arcsecond (sub)millimeter imaging of the massive protostellar outburst in G358.93-0.03

Tuesday, October 15, 2019 5:35 PM (15 minutes)

Contributed talk

Abstract:
"The recent identification of accretion outbursts in two massive protostars, both heralded by 6.7 GHz methanol maser flares, has invigorated single-dish maser monitoring programs on a quest to find more cases. As a result, a third event was discovered on 14-Jan-2019 in a poorly-studied massive star-forming region G358.93-0.03. Since then, the global maser community has discovered 20 new torsionally-excited methanol maser transitions from 6 to 360 GHz toward this source(!), all likely powered by an ongoing accretion outburst in a massive protostar. We present (sub)millimeter imaging of the massive star-forming region G358.93-0.03 acquired in multiple epochs following the flare. Using DDT SMA and ALMA observations, we have discovered twelve new Class~II methanol lines which range in frequency from 199 to 361 GHz, and originate mostly from torsionally-excited states (vt=1 and vt=2). The positions of all of the maser lines coincide with the brightest continuum source (MM1),
which also hosts a line-rich hot core. The masers present a consistent velocity pattern that wraps around MM1. In contrast, the thermal lines exhibit a linear velocity gradient which bisects MM1 but at different position angles depending on optical depth. The maser spectral profiles evolved significantly over just a few month period, and the intensities have dropped significantly, however so far the dust continuum emission from MM1 is consistent with no change since our (sub)millimeter monitoring began at +1 month. This third massive protostellar outburst event exhibits properties quite different from either of the other two known cases (which also differed from each other significantly), highlighting the importance of further characterizing what may be an important and even essential phase in massive star formation."

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