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Probing Feedback from Super Star Clusters in the Central Starburst of NGC253

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Contributed talk

Abstract:
“Large-scale, multiphase outflows seen in nearby prototypical starburst galaxies, such as NGC253, are thought to be powered by feedback from massive stellar clusters.
Resolving these dusty compact structures outside the Milky Way system requires the spectral resolution and sensitivity of ALMA and future facilities such as the ngVLA. Using ALMA data at 350 GHz with 25 milliarcsecond (0.4 pc) resolution, we present direct evidence for outflows from super star clusters (SSCs) in the nuclear starburst of NGC253. We detect blue-shifted absorption and red-shifted emission towards four of the candidate SSCs in multiple lines, including HCN(4-3), H13CN(4-3), HCO+(4-3), and CS(7-6). These P-Cygni profiles are direct evidence for massive outflows from these SSCs. This is the first time outflows from stellar clusters have been identified outside the Milky Way system. The brightest SSC has an outflow velocity of ~50 km/s. We model the P-Cygni line profiles to constrain the outflow open ing angles and inclinations. These observations are the first of their kind, showing the formation and feedback of massive stellar clusters. This analysis allows us to determine the feedback SSCs exert on their environment and how the cluster-scales are related to the galaxy-scale outflow. From the high resolution dust continuum data, we identify >20 compact sources, with several of the clusters previously identified at lower resolution (1.9 pc; Leroy et al. 2018) breaking apart into multiple components. By combining this dust continuum data with 36 GHz radio continuum measurements made by the VLA (Gorski et al. 2019), we can constrain the ionizing flux, cluster spectral energy distributions (SEDs), and the cluster mass function (CMF). The CMF is related to the stellar initial mass function (IMF), and these SSCs provide a unique test in a region where a top-heavy IMF may be expected if it exists. “

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Session Classification: Galaxies