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A multi-scale ALMA view of starless and protostellar dense cores in Aquila

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Star formation is governed by many complex physical processes that intertwine at all scales, some of which include turbulent motions, mass inflow, thermal pressure and magnetic fields. These physical processes have direct impacts on the formation of many types of systems (e.g., single stars, multiple star systems, stellar clusters). Recent work studying a survey of all starless cores in Orion B North with ALMA (Fielder+2024) showed that protostellar cores and only a few percent of starless cores have high-density material (>10^7 cm^-3) on small scales (~100's of au), with only a few complex fragmenting regions. We extend this view into fragmentation with a new archival ALMA main- and compact-array analysis of the 100 most gravitationally unstable cores in the Aquila region. We utilize data from many spatial scales to show how the material is arranged on small and larger scales. A few % of the starless cores are high-density (>10^7 cm^-3) on similarly small scales (~100's of au), while around half of the starless cores have moderately high densities (>10^6 cm^-3) on larger spatial scales (~1000's of au). We also find a significant number (~20%) of unstable cores that show highly complex fragmentation morphologies, which are strong candidates for higher-order multiple systems.

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