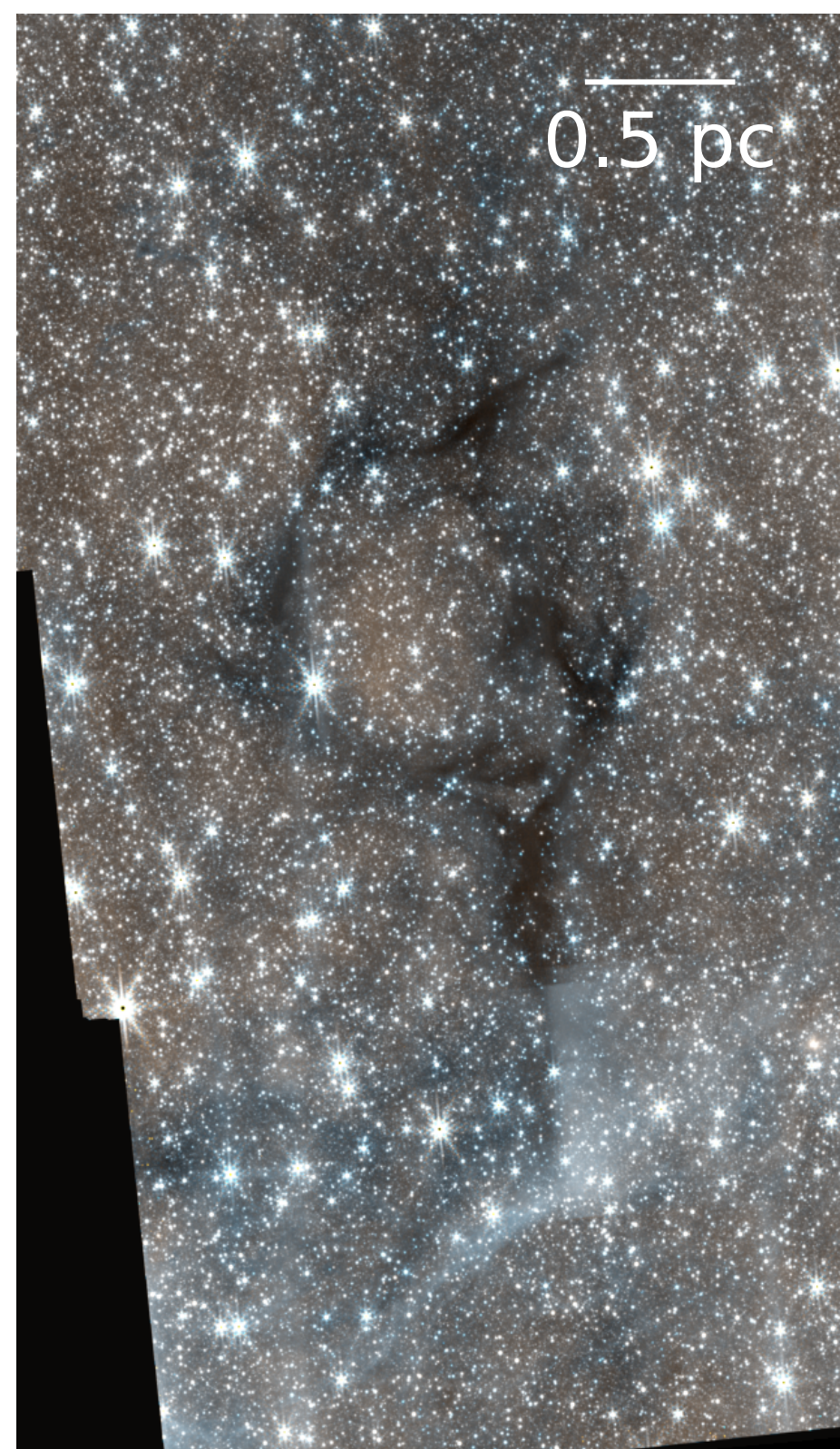


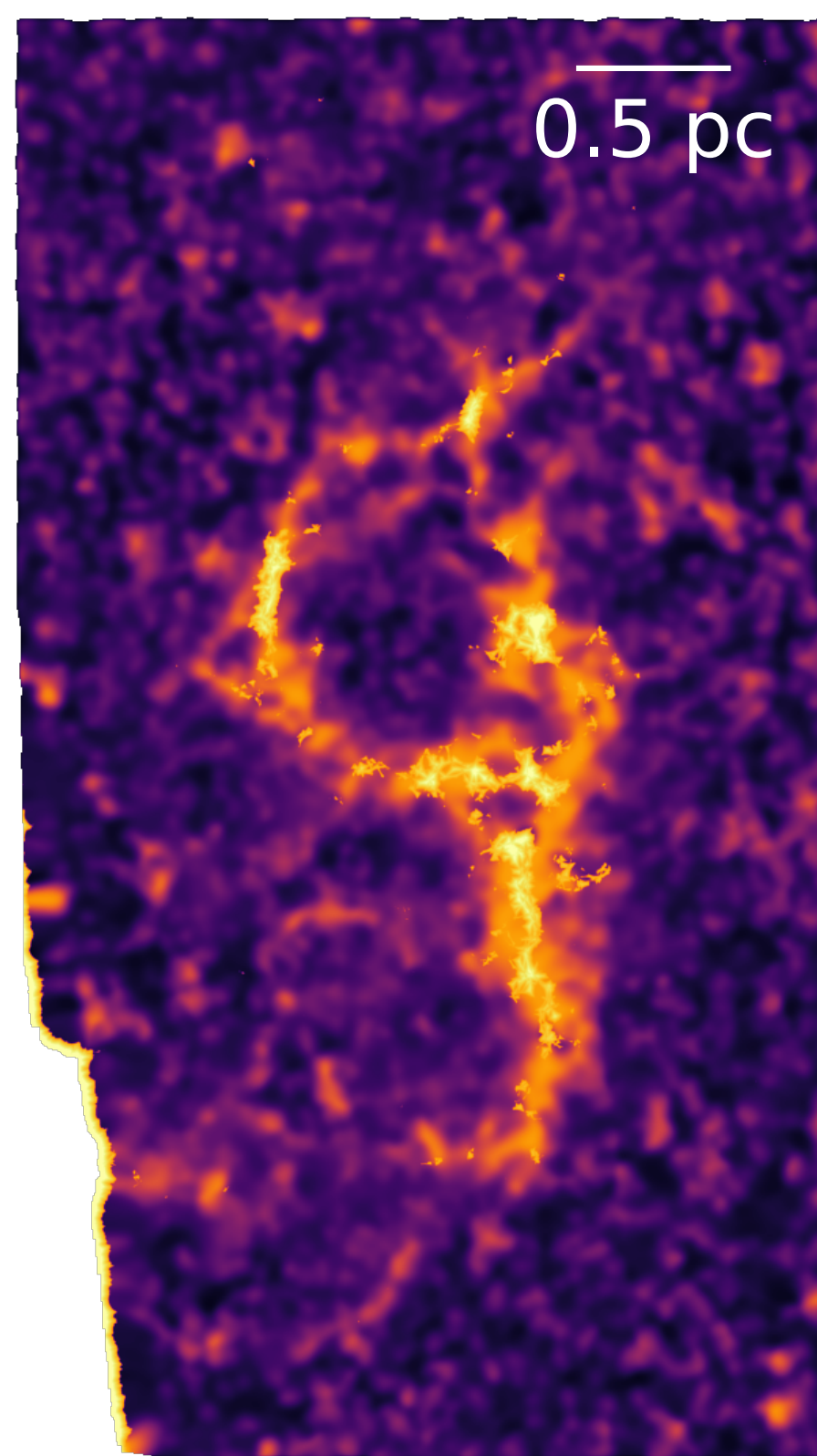
Using JWST to Map CO Ice in a Star Forming Filament

Savannah Gramze, Adam Ginsburg

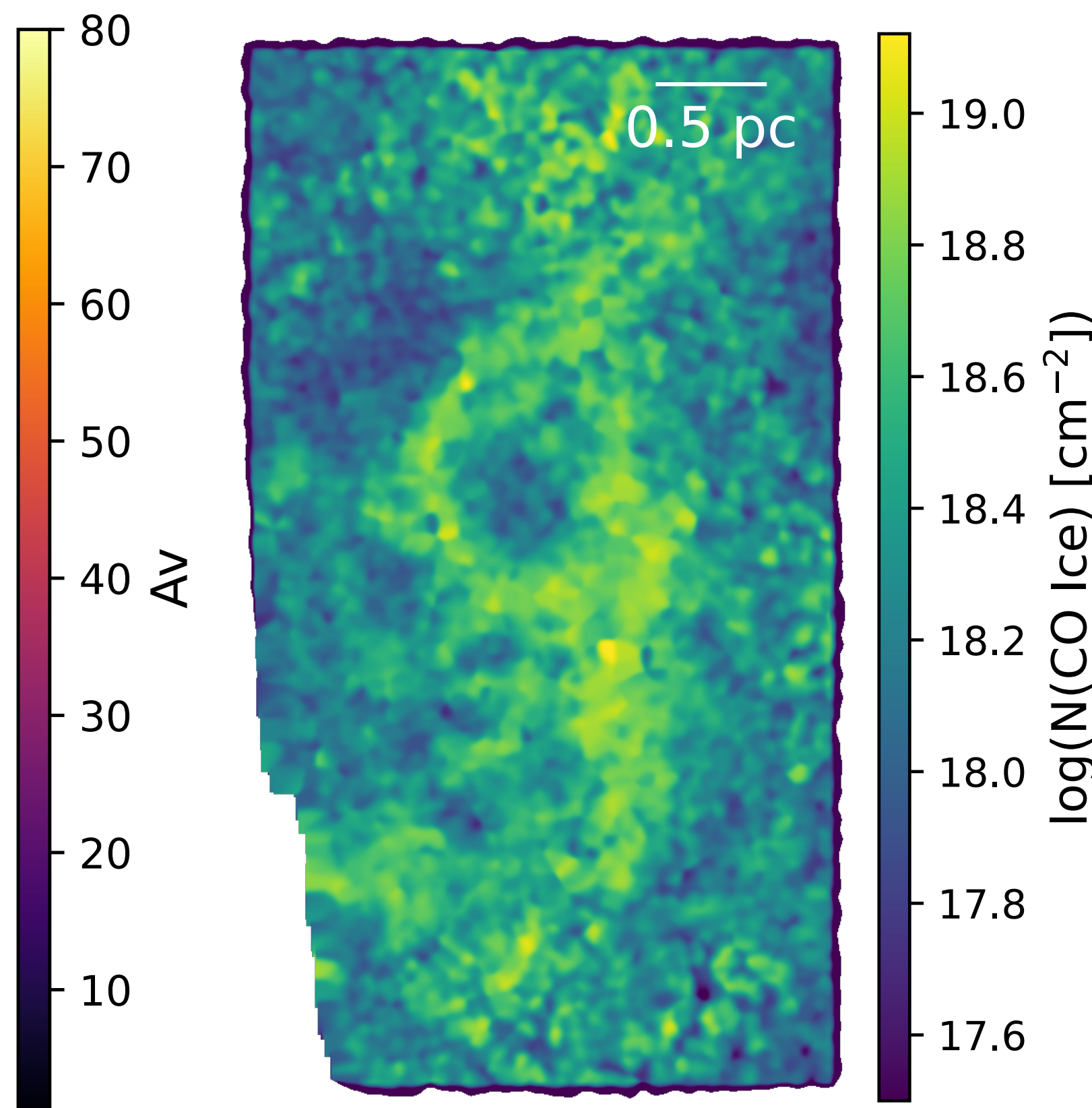
Department of Astronomy,
University of Florida



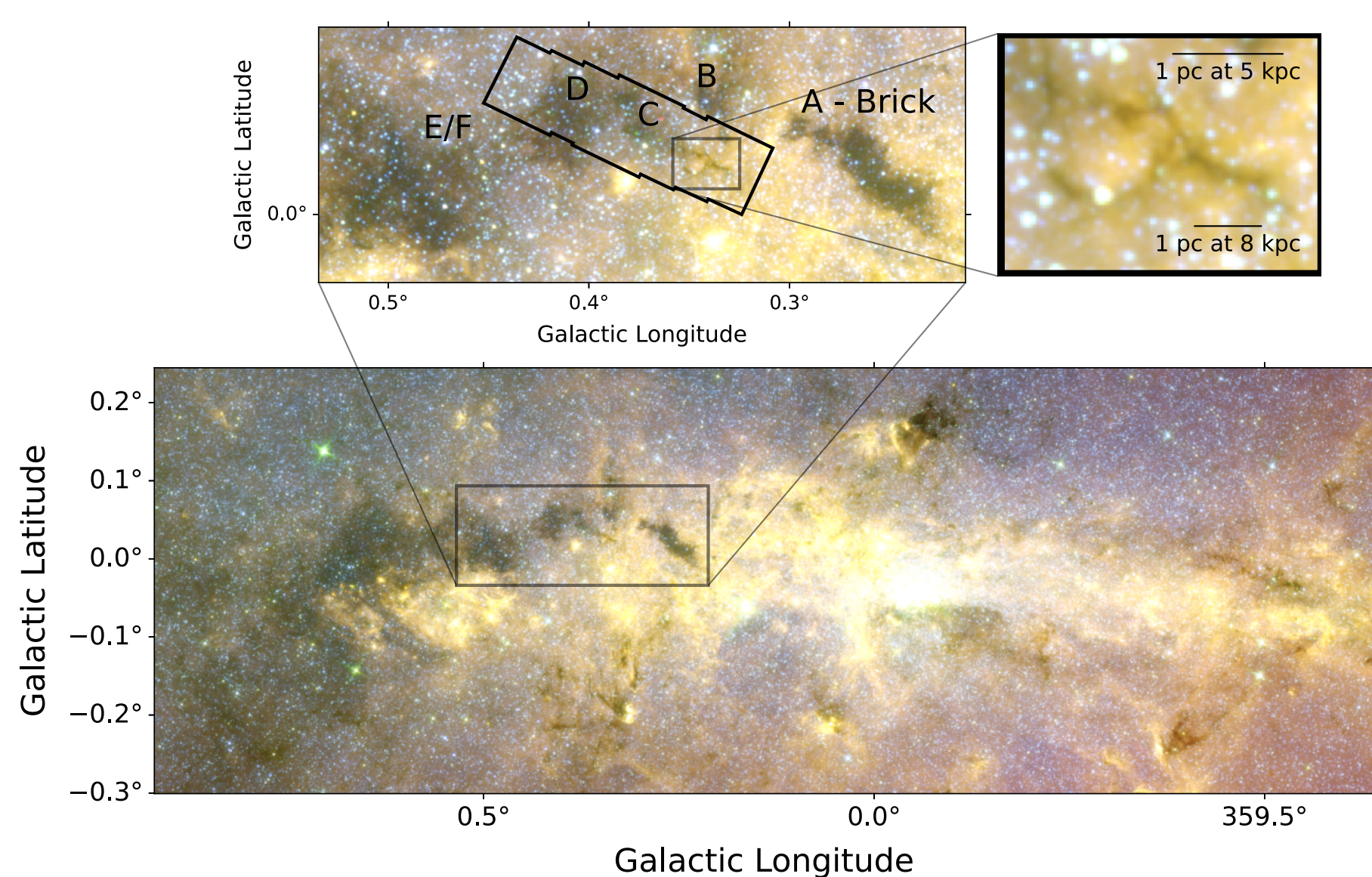
3 kpc Arm Filament



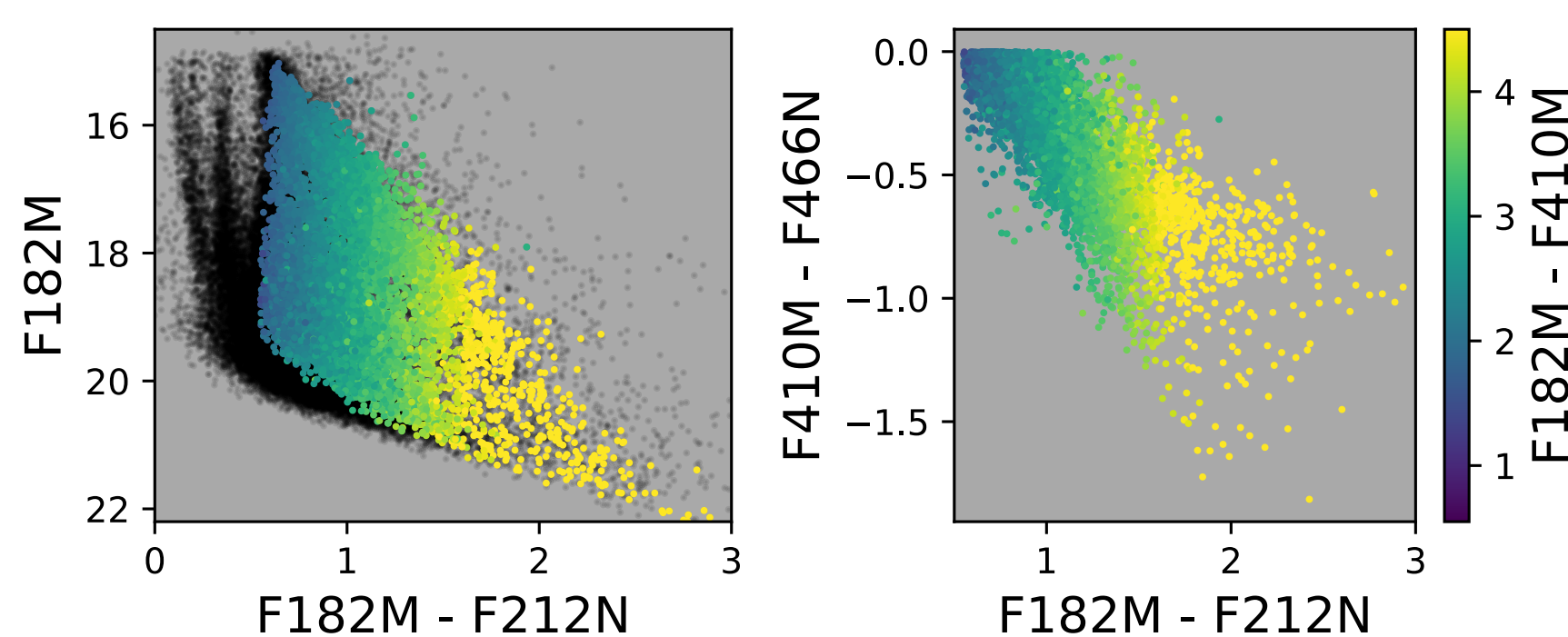
Extinction Map



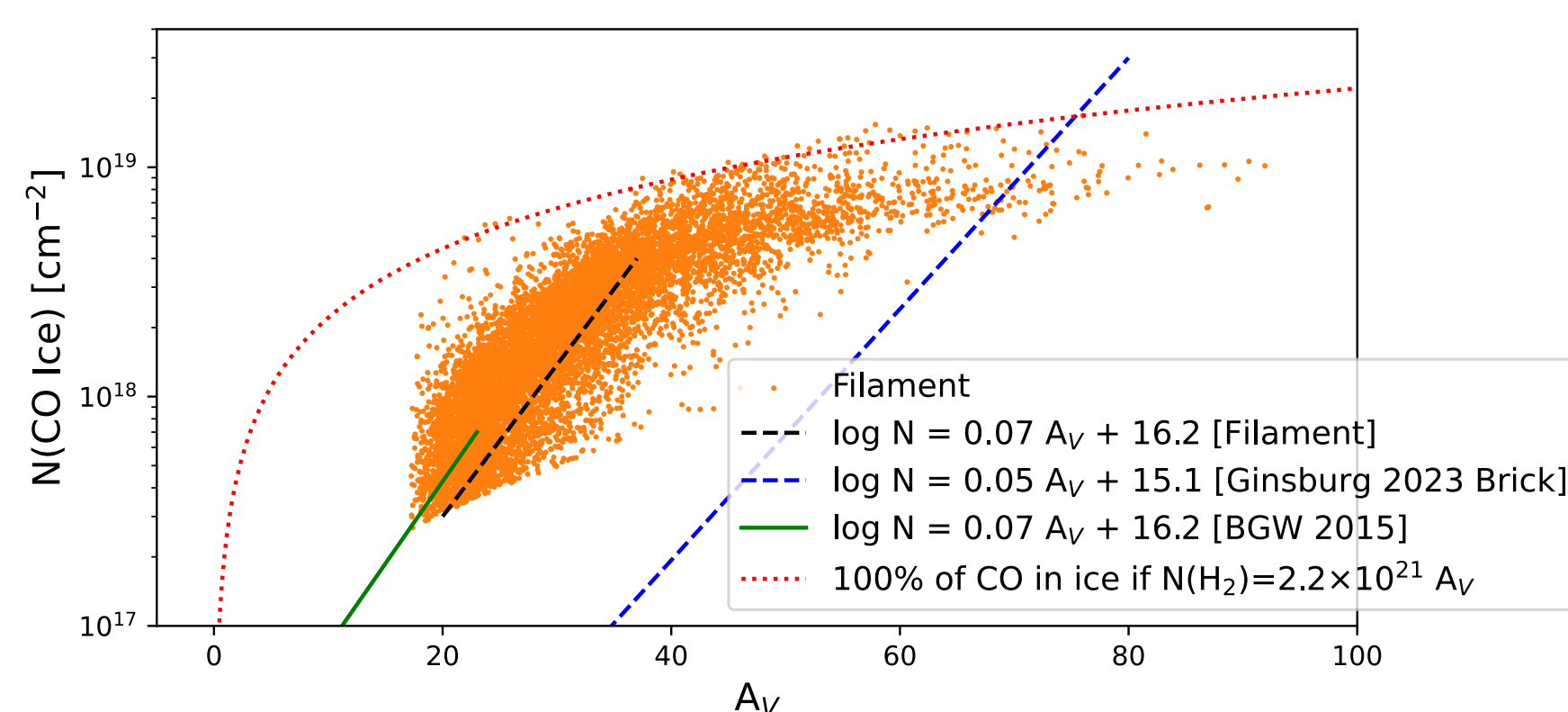
CO Ice Column Density



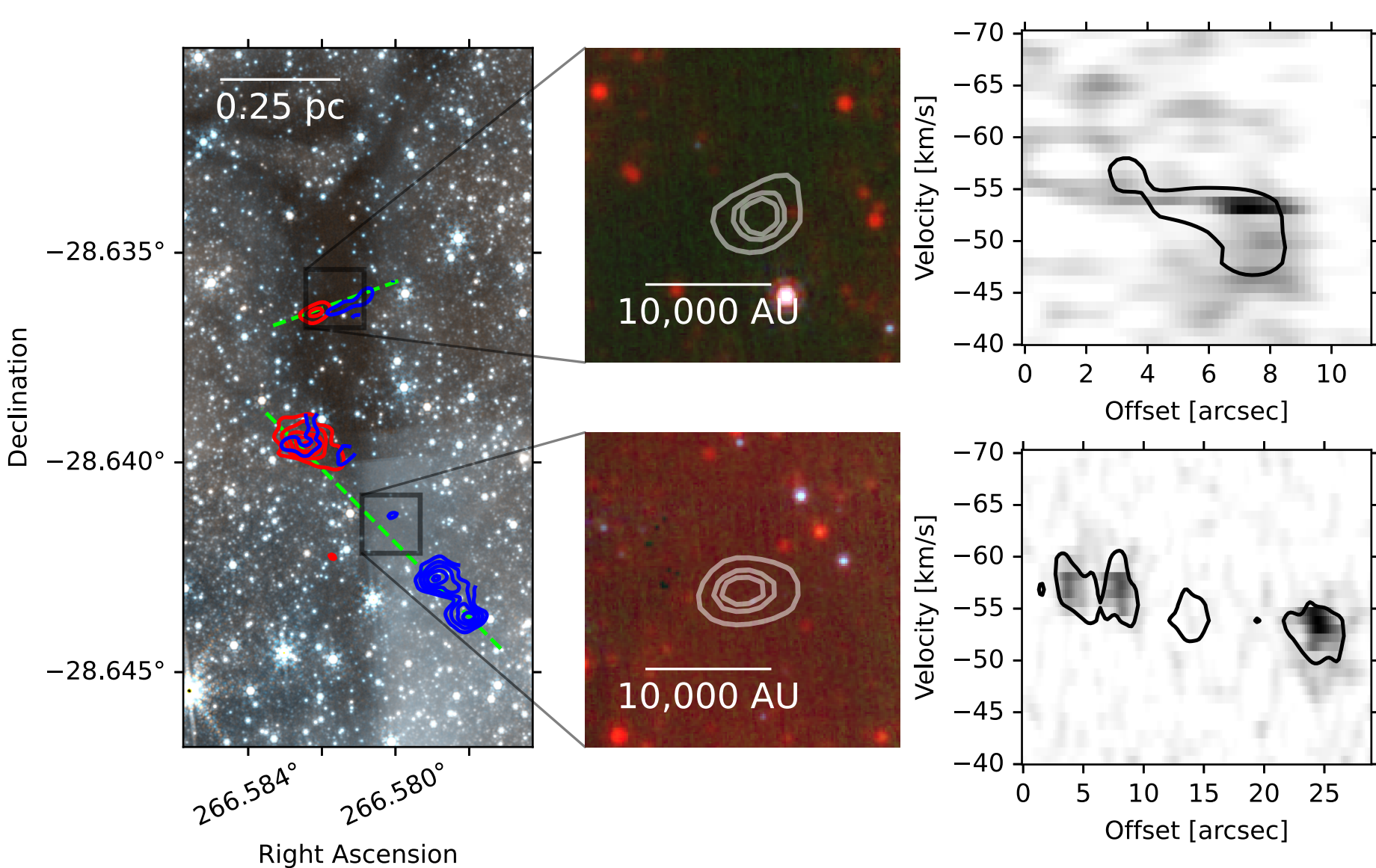
- Interposed in front of the Galactic Center (GC) are several spiral arms, including the 3 kpc arm.
- The 3kpc arm is the innermost spiral arm and has a bar-like shape due to the Galaxy's bar-shape potential.
- JWST observations of the GC dust ridge also included a filament in the 3 kpc arm.
- Backlit by thousands of stars, we made an extinction map of the filament with an effective resolution of $\sim 1/3''$



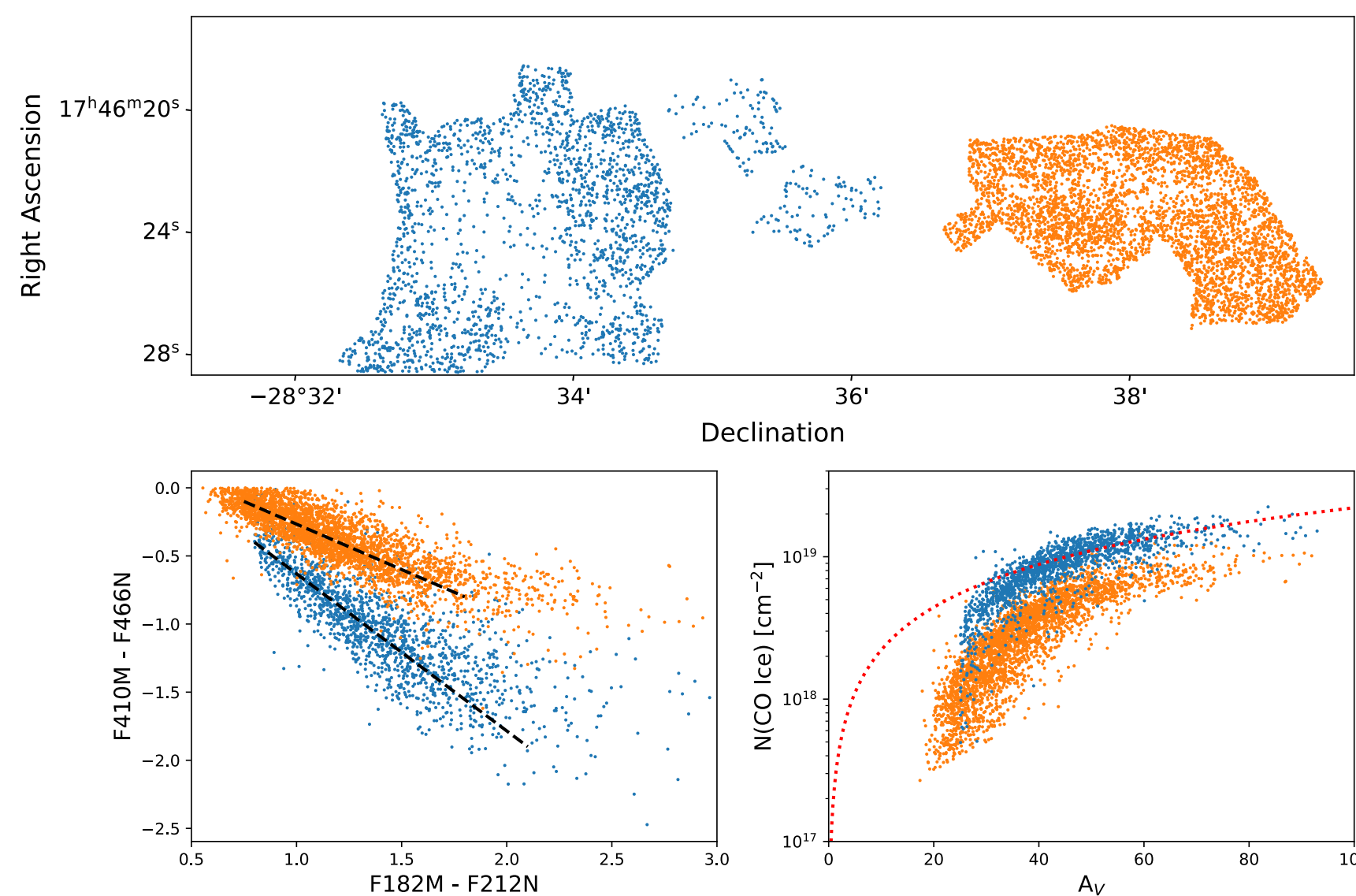
- For any two pair of filters, the color should get redder as extinction increases.
- However, the F466N filter is strongly impacted by absorption from CO ice, making stars appear bluer.
- This makes reddened stars appear up to magnitudes dimmer in the F466N band than dust extinction laws predict.



- Using an H₂O:CO ratio of 10:1, we model the impact of interstellar ice on the brightness of stars with laboratory measurements of ice opacities.
- With these models, we measure the column density of CO ice for each star behind the filament.
- We then create a map of the filament in CO ice.
- We also show the relationship between extinction and CO ice for the filament.



- Using Band 3 ALMA data from ACES, we identify two protostellar continuum cores that are molecular outflows, meaning that the filament is actively forming stars.
- The line of sight velocity of the filament is -55 km/s, firmly placing it in the 3 kpc arm as the arm's velocity toward the GC is -53 km/s, and GC clouds along similar lines of sight occupy more positive velocities.



- Spatially selecting the dust ridge clouds, we find a different relationship between extinction and CO ice column density.
- Clouds in the GC have more CO ice for the amount of measured extinction than the filament, possibly directly tracing metallicity differences in the cold interstellar medium between the 3 kpc arm and GC.