A Search for Tidal Tails in Carina

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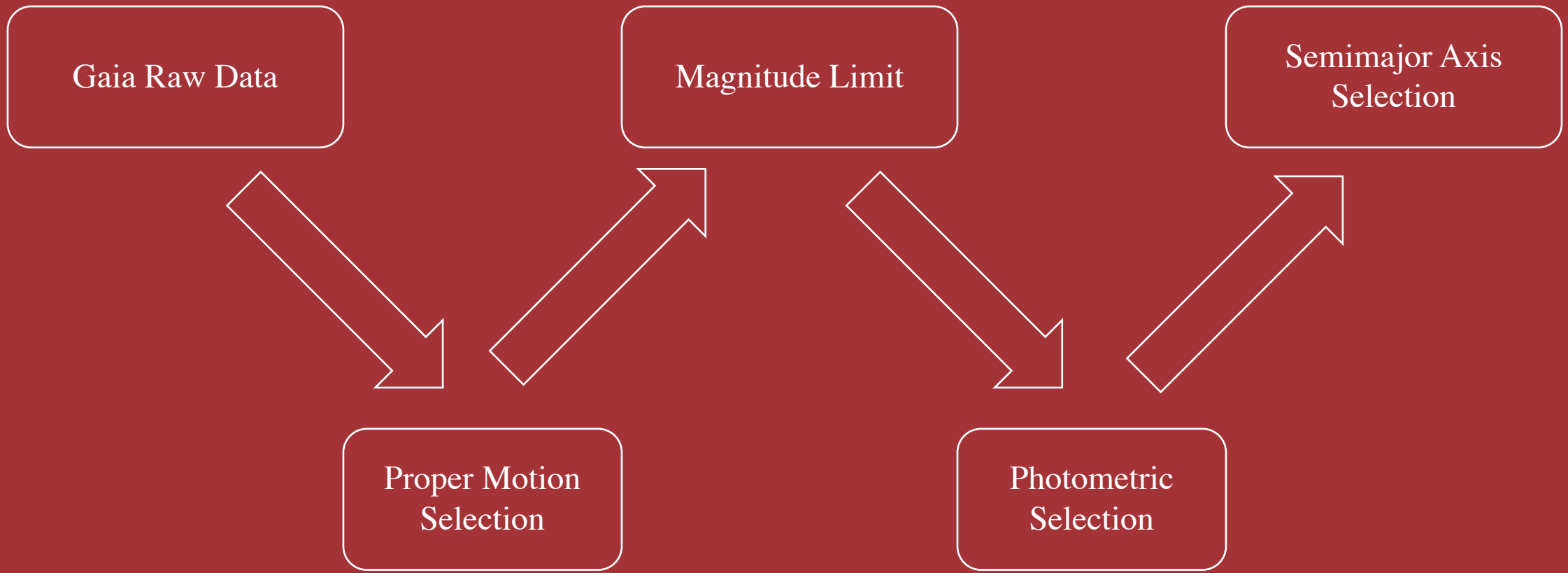
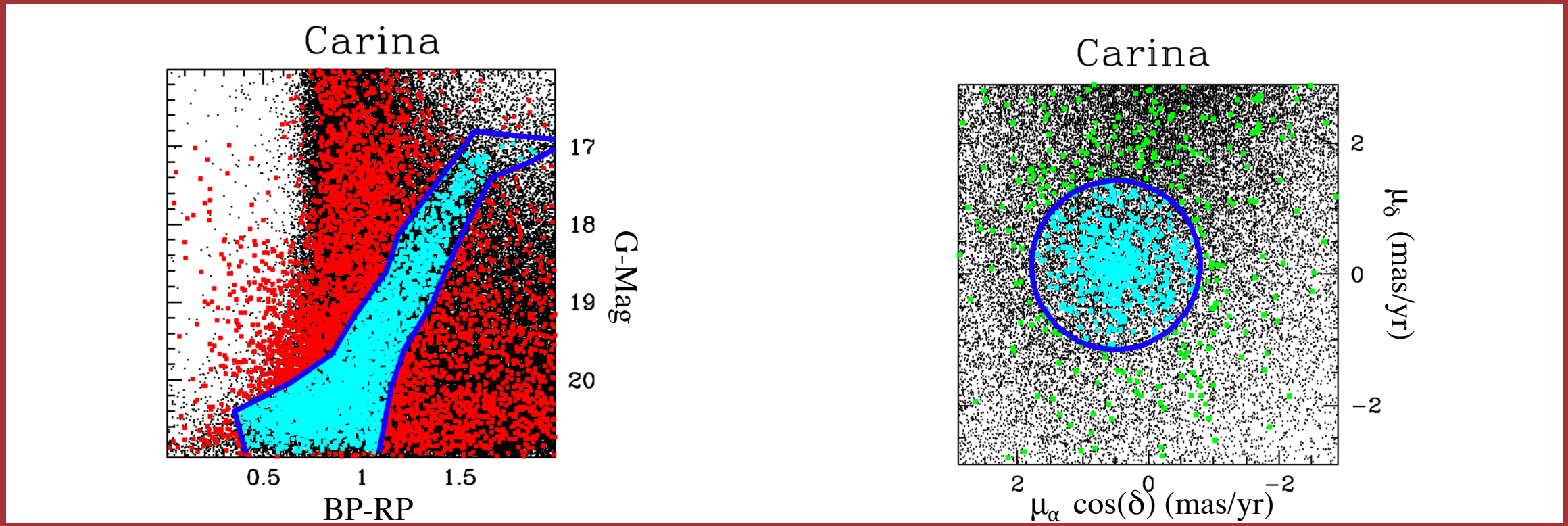
Background

- Gaia DR-2 provides data on 1.6 billion stars (Gaia Collaboration 2018a)
  - Includes proper motion and parallax
- Dwarf satellite galaxies are remnants from Milky Way formation
- Carina member stars indicate it was once more massive
- Tidal tails could provide clues to history of Carina
- Using Gaia data, we searched for low-surface-density tidal features

Data Flow

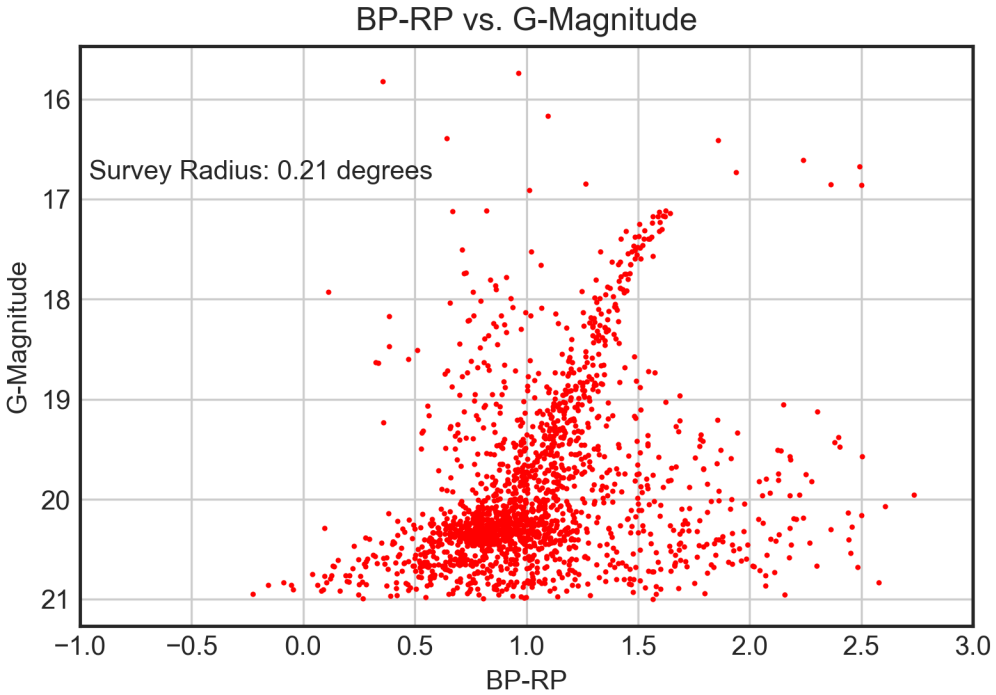

Gaia Raw Data
Magnitude Limit
Semimajor Axis Selection
Proper Motion Selection
Photometric Selection

Data Flow



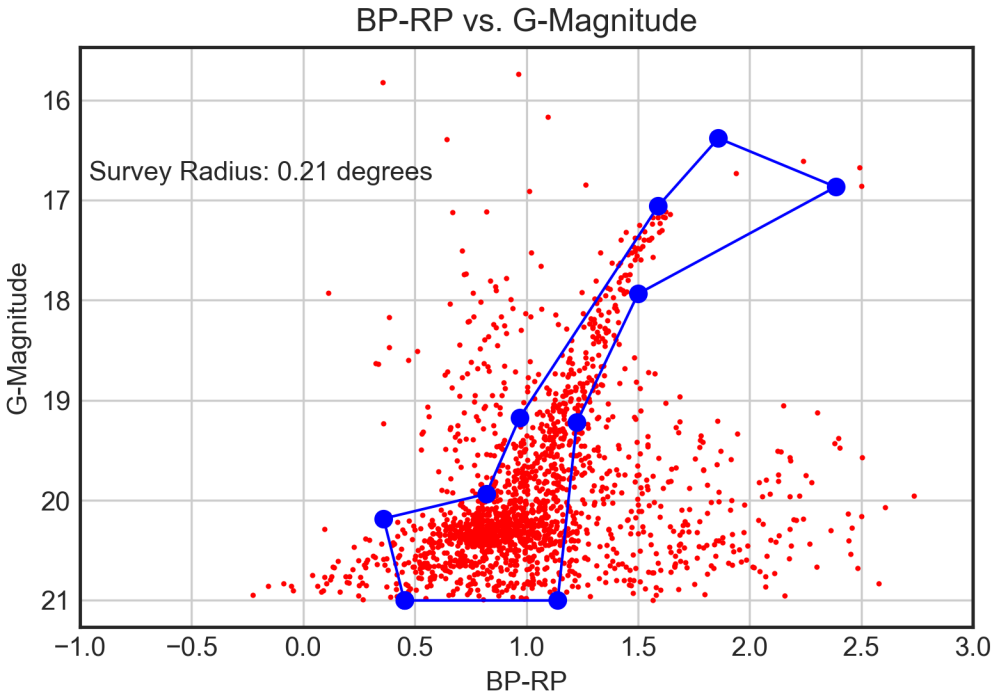
Gaia Collaboration et al. (2018b)

Data Flow

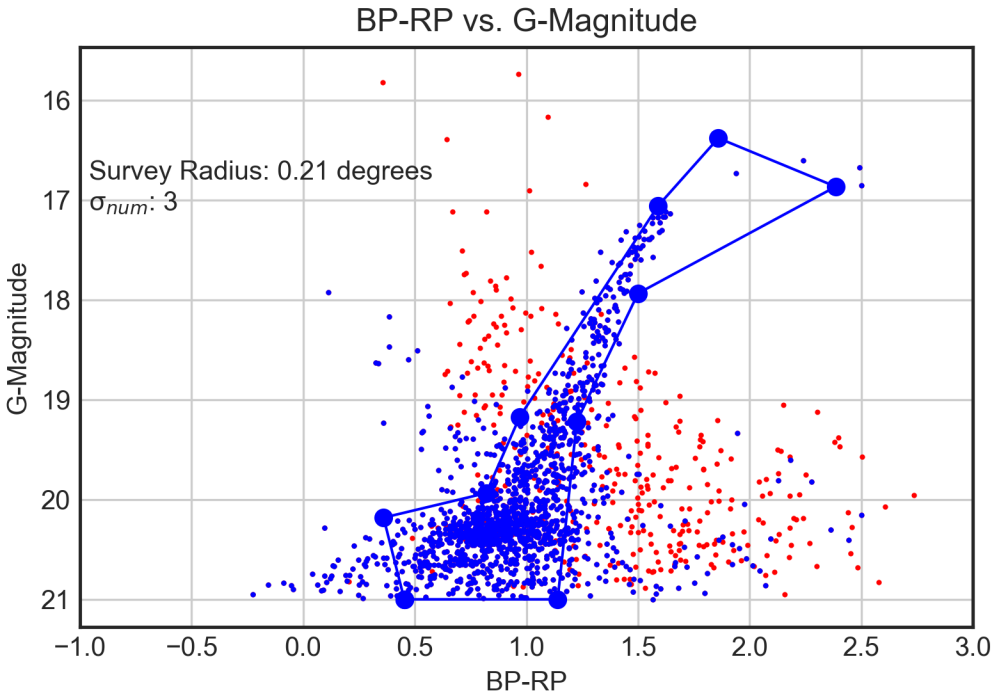


- An initial survey radius of 0.21 degrees contains mainly Carina member stars
- The color magnitude diagram clearly shows the giant branch and red clump
- The diagram guided the selection of bounds

Data Flow

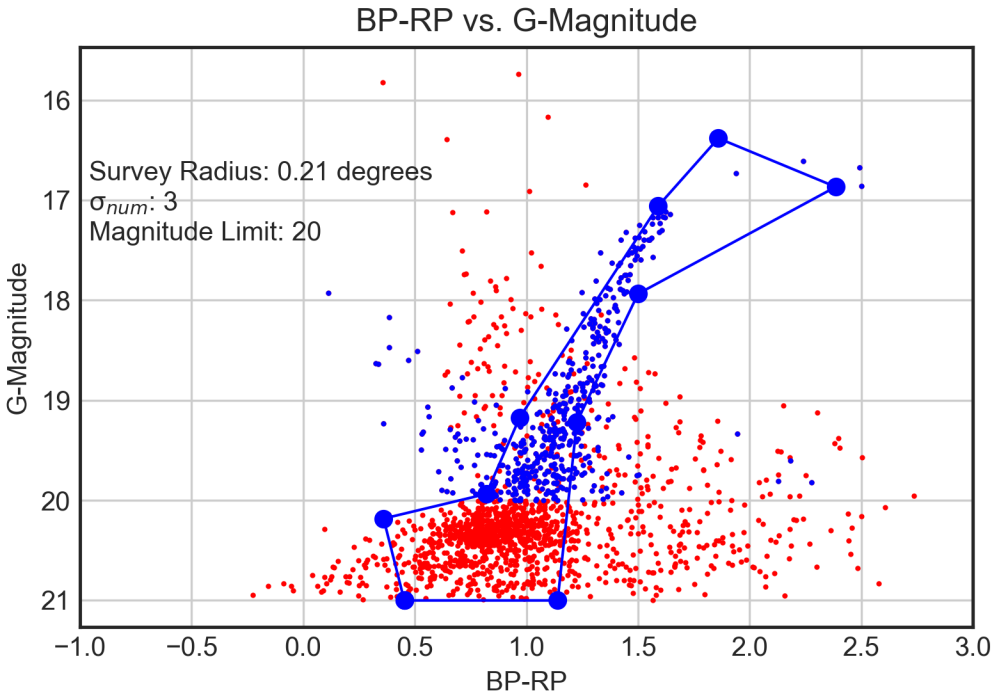


Bounds on the color-magnitude diagram

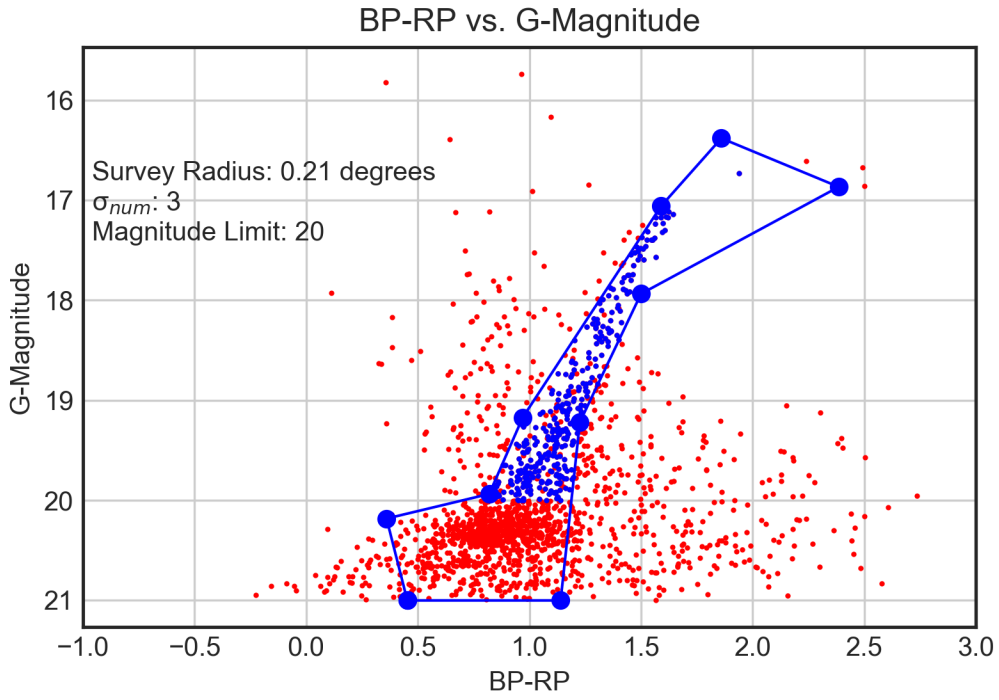


Proper motion selection

Data Flow

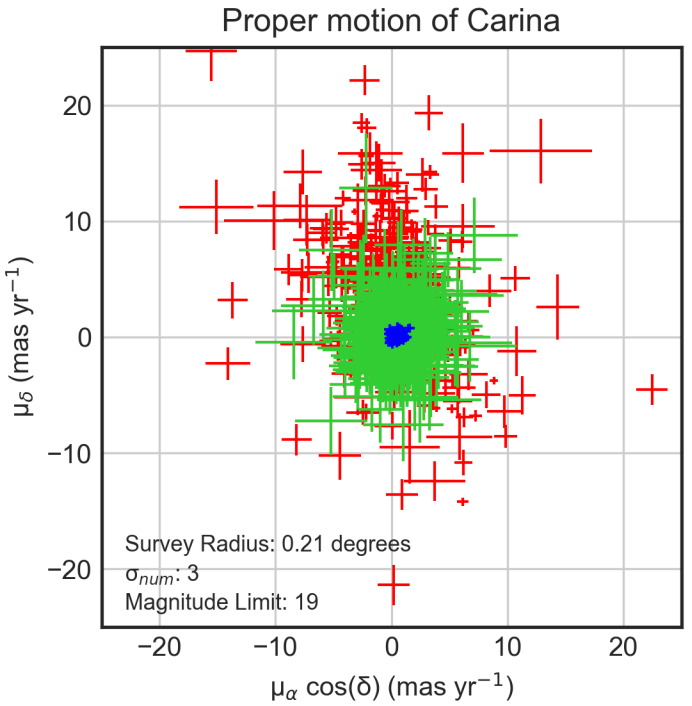


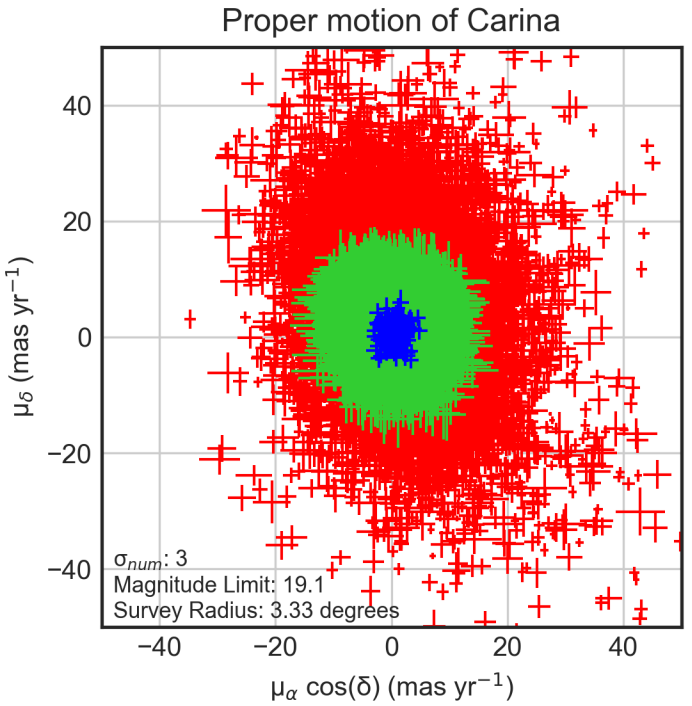
Magnitude limit



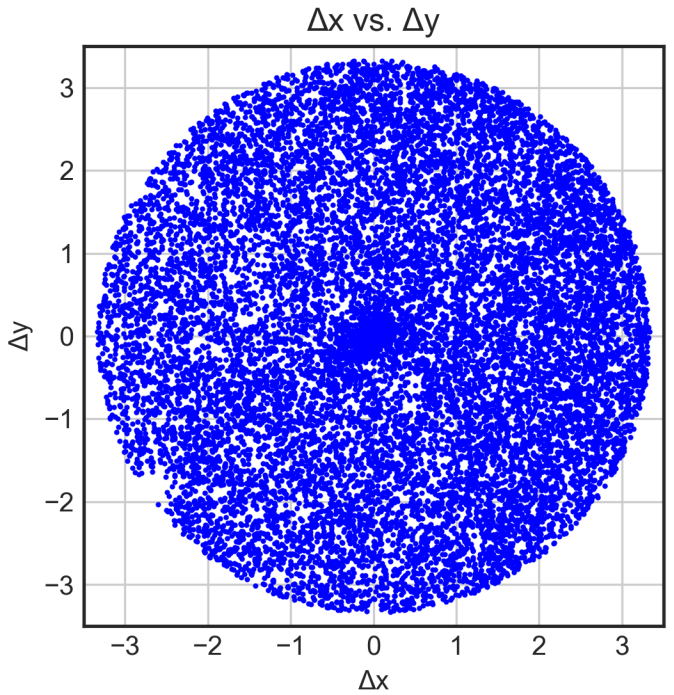
Photometric and Semi-major axis selection

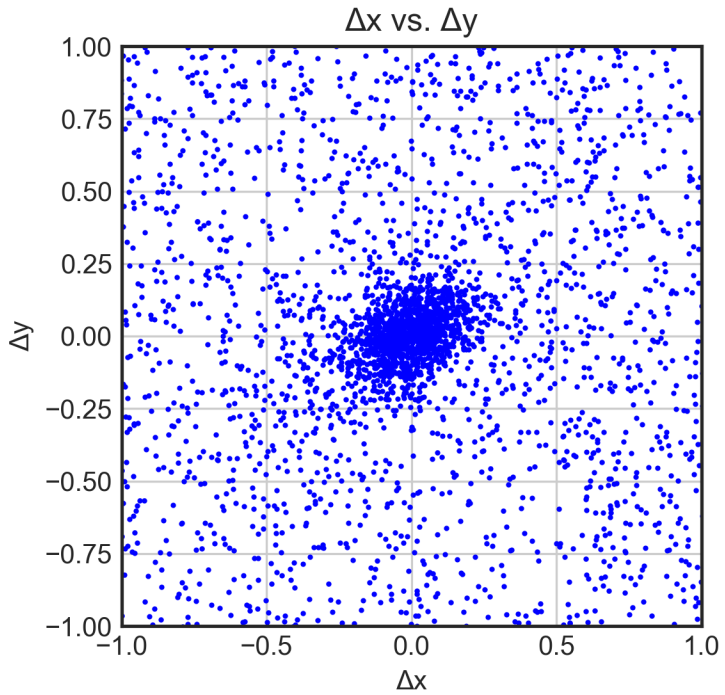
Proper Motion Problems



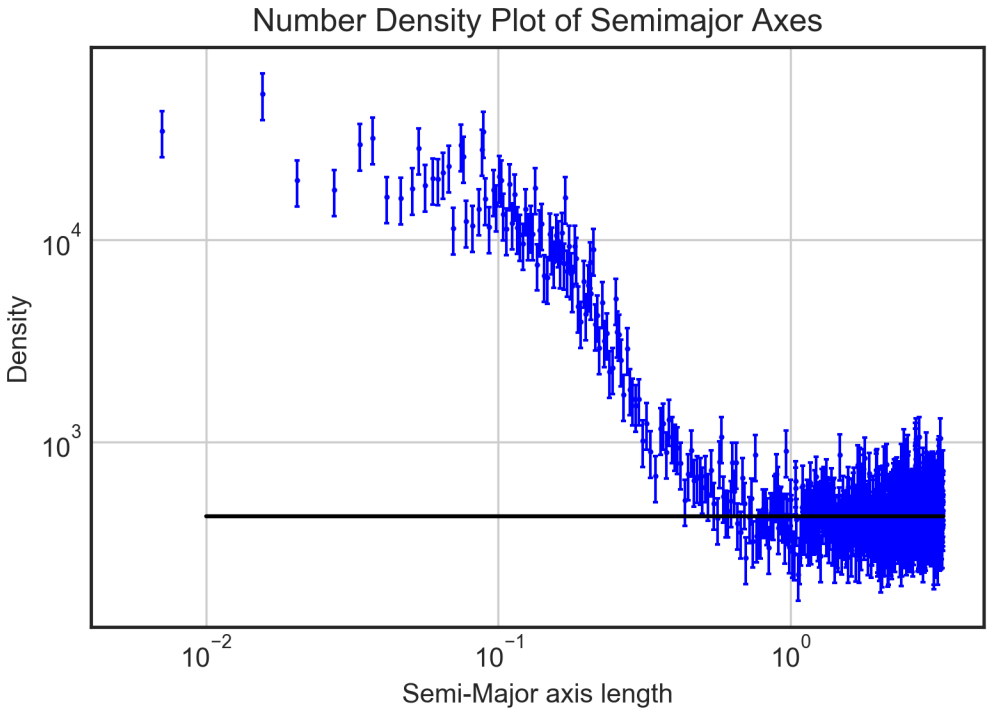


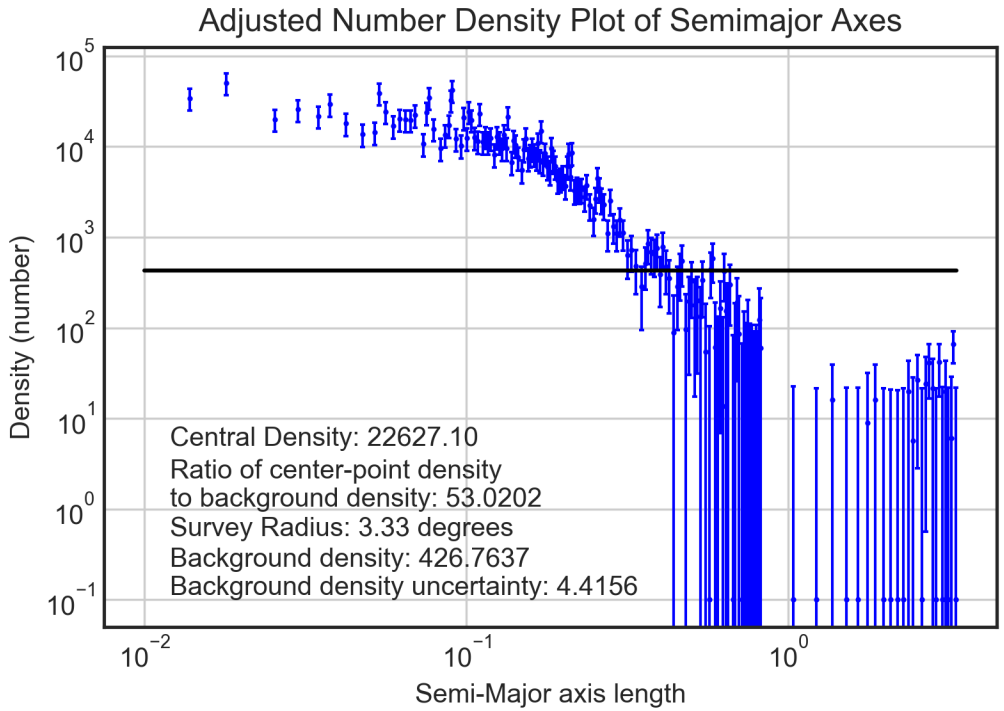
Tangent Plane Projection





Radial Density Plots Before and After Background Subtraction





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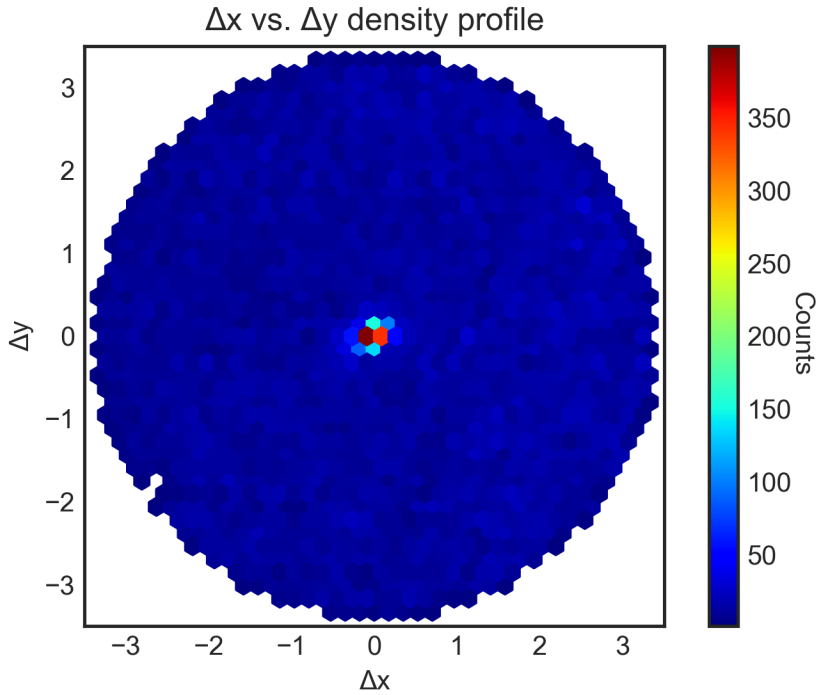

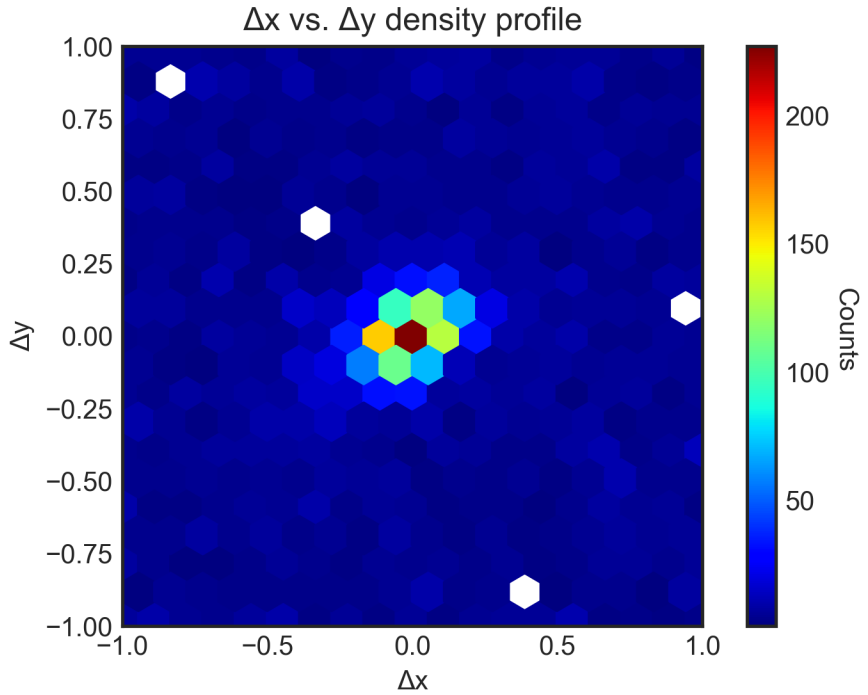

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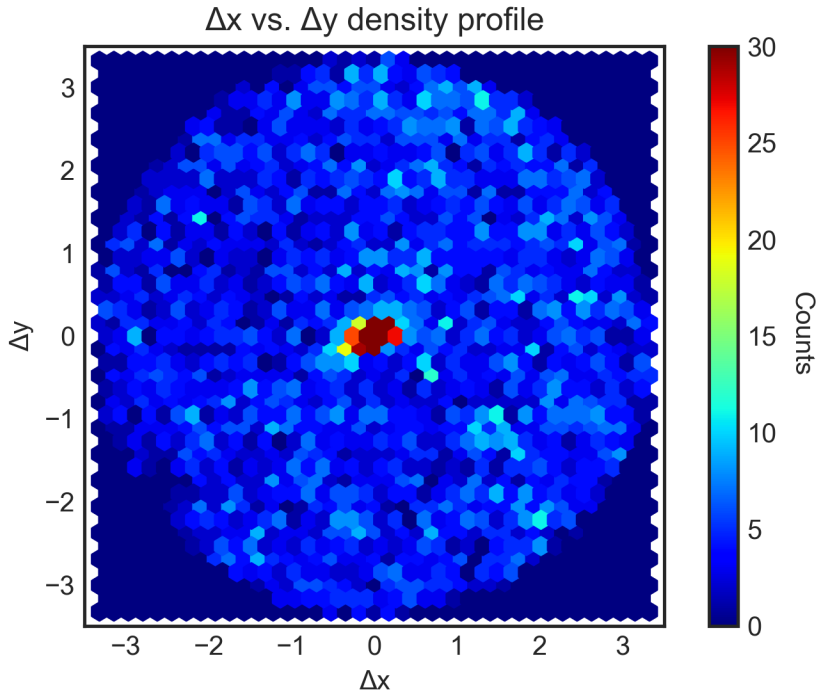

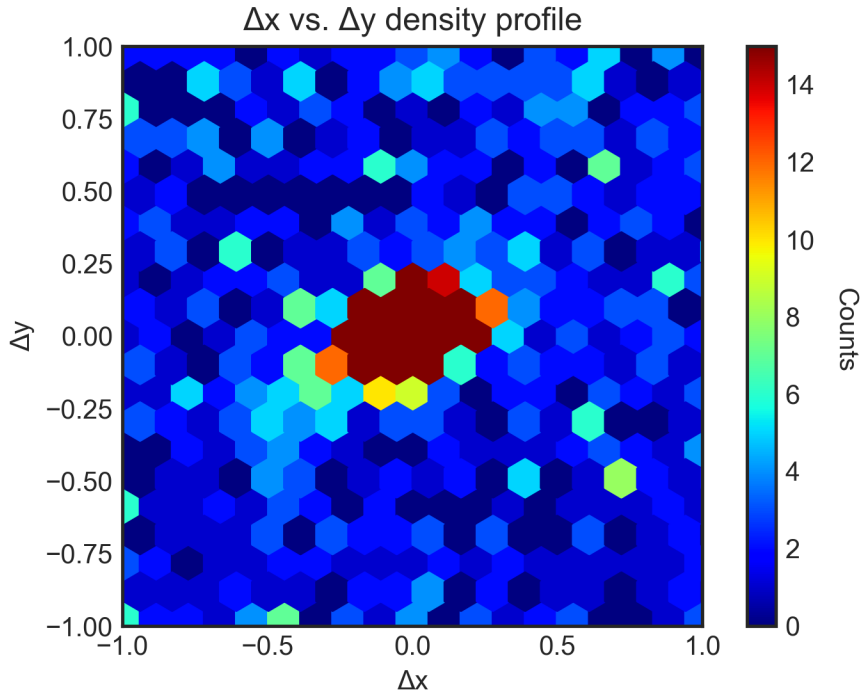

Conclusion

- No evidence of large-scale tidal tails
- Possible small-scale structure close to the galaxy
- No strong evidence of tidal effects in the radial profile
  - In conflict with Munoz et al. (2006)
- Future Gaia data releases will provide more precise data
  - Will allow better removal of foreground non-members using photometry and proper motions
  - Hence, allowing searches for fainter structures at larger radii

References

- Gaia Collaboration, Helmi, A., van Leeuwen, F., et al. 2018b, A&A, in press (arXiv:1804.09381)
- Muñoz, R. R., Majewski, S. R., Zaggia, S., et al. 2006, ApJ, 649, 201
- Gaia Collaboration, Brown, A.G.A., Vallenari, A., et al. 2018a, A&A, in press (arXiv:1804.09365)

Tools

- Matplotlib
- Rutgers University – New Brunswick
- Jupyter