Rings and Radial Waves in the Disk of the Milky Way

Xu, Newberg, Carlin, Liu, Deng, Li,
Schönrich & Yanny, ApJ, submitted (2015)

Heidi Newberg

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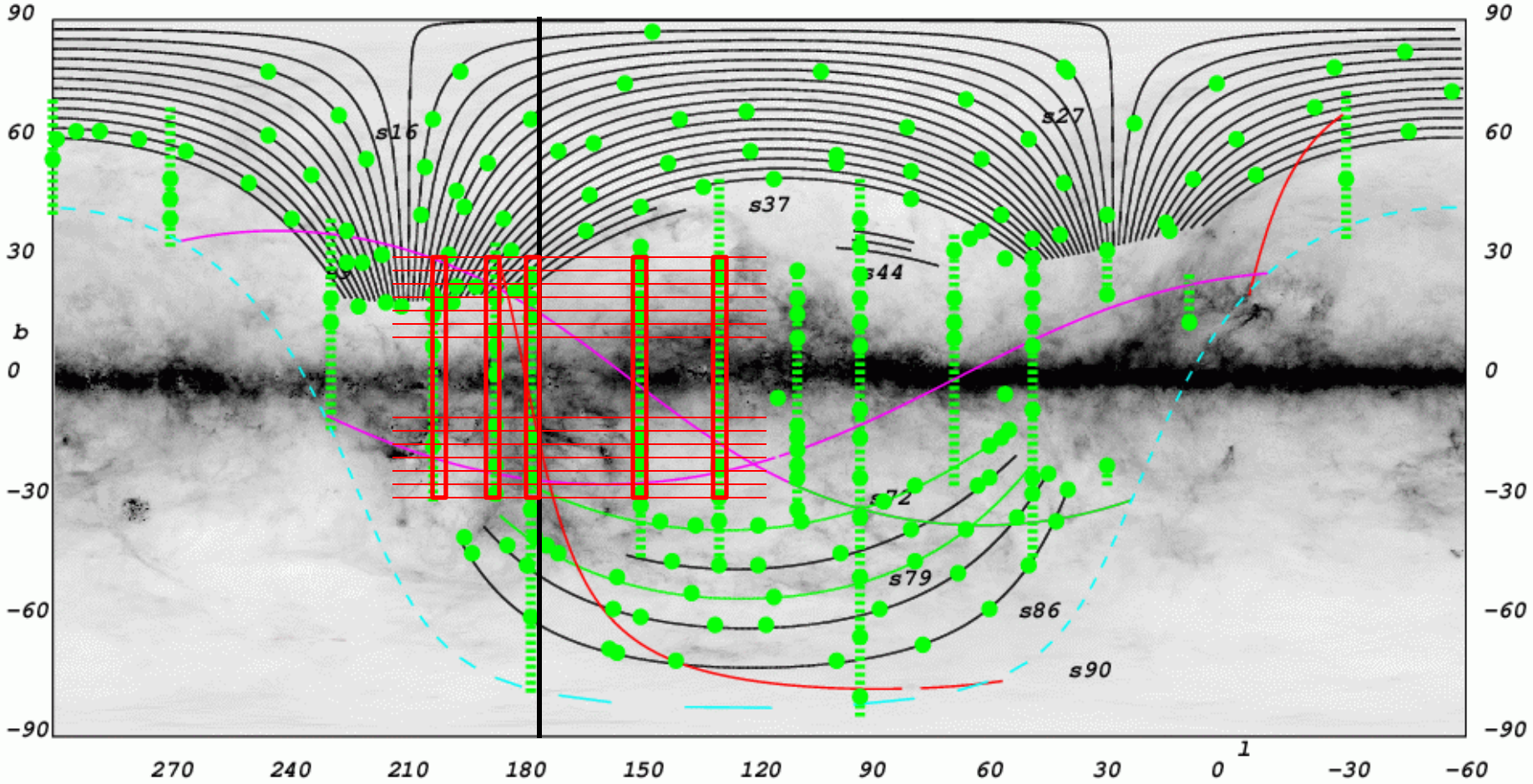
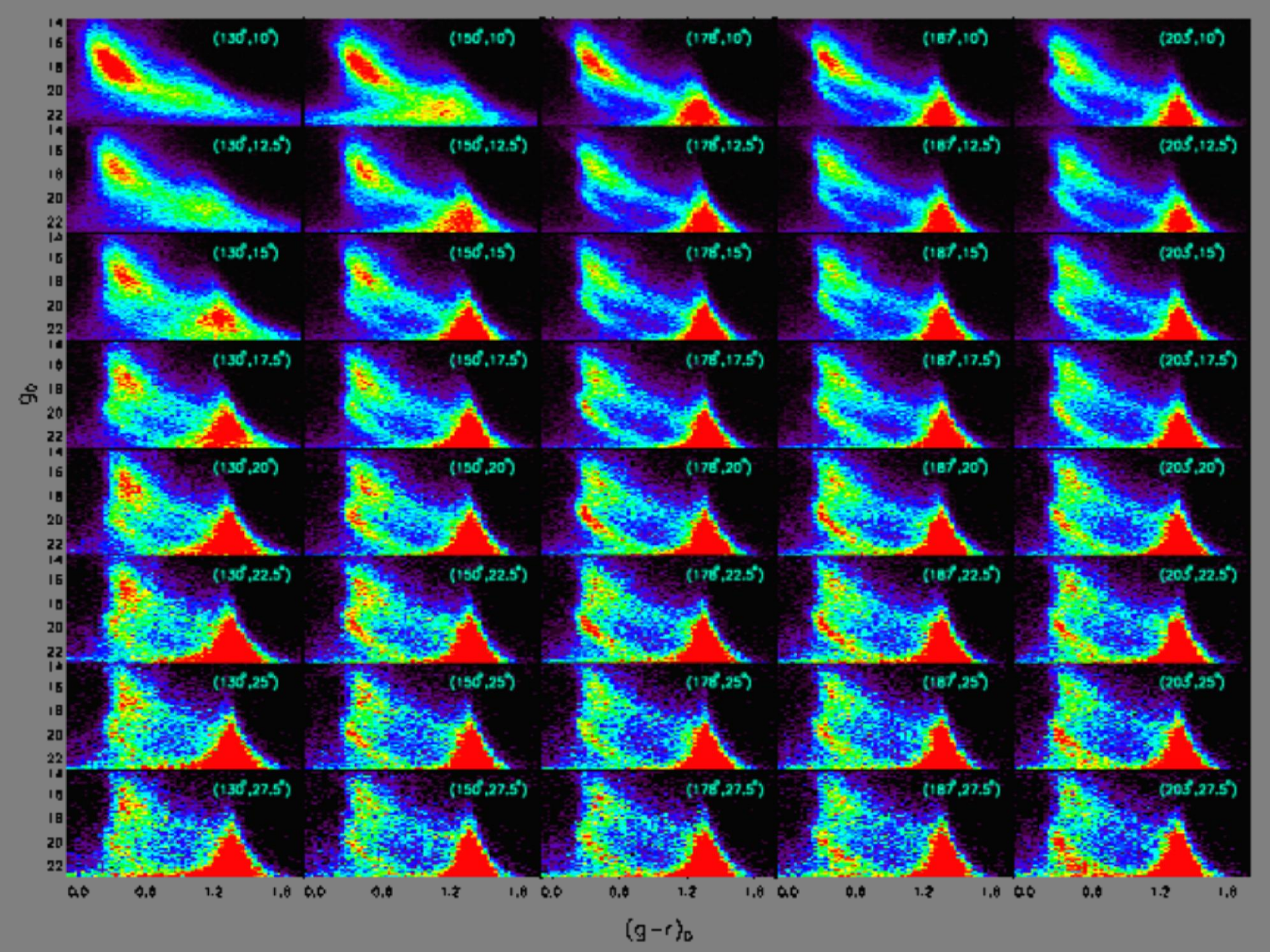
Xu Yan

We identify an asymmetry in disk stars that oscillates from the north to the south to the north to the south across the Galactic plane in the anticenter direction.



The SDSS also took imaging (and spectroscopic) data along 2.5°-wide stripes at constant Galactic longitude. These stripes cross the Galactic plane.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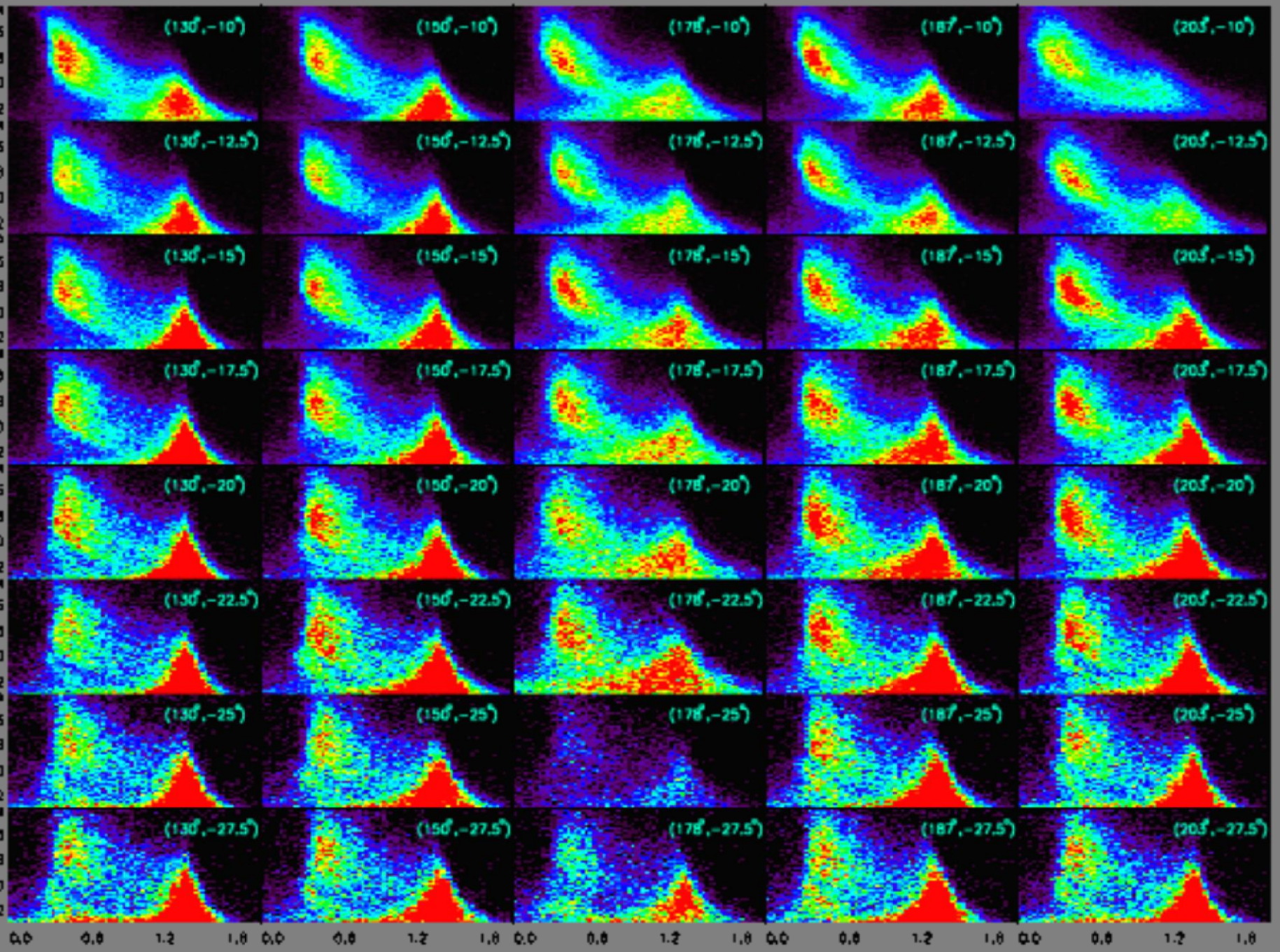
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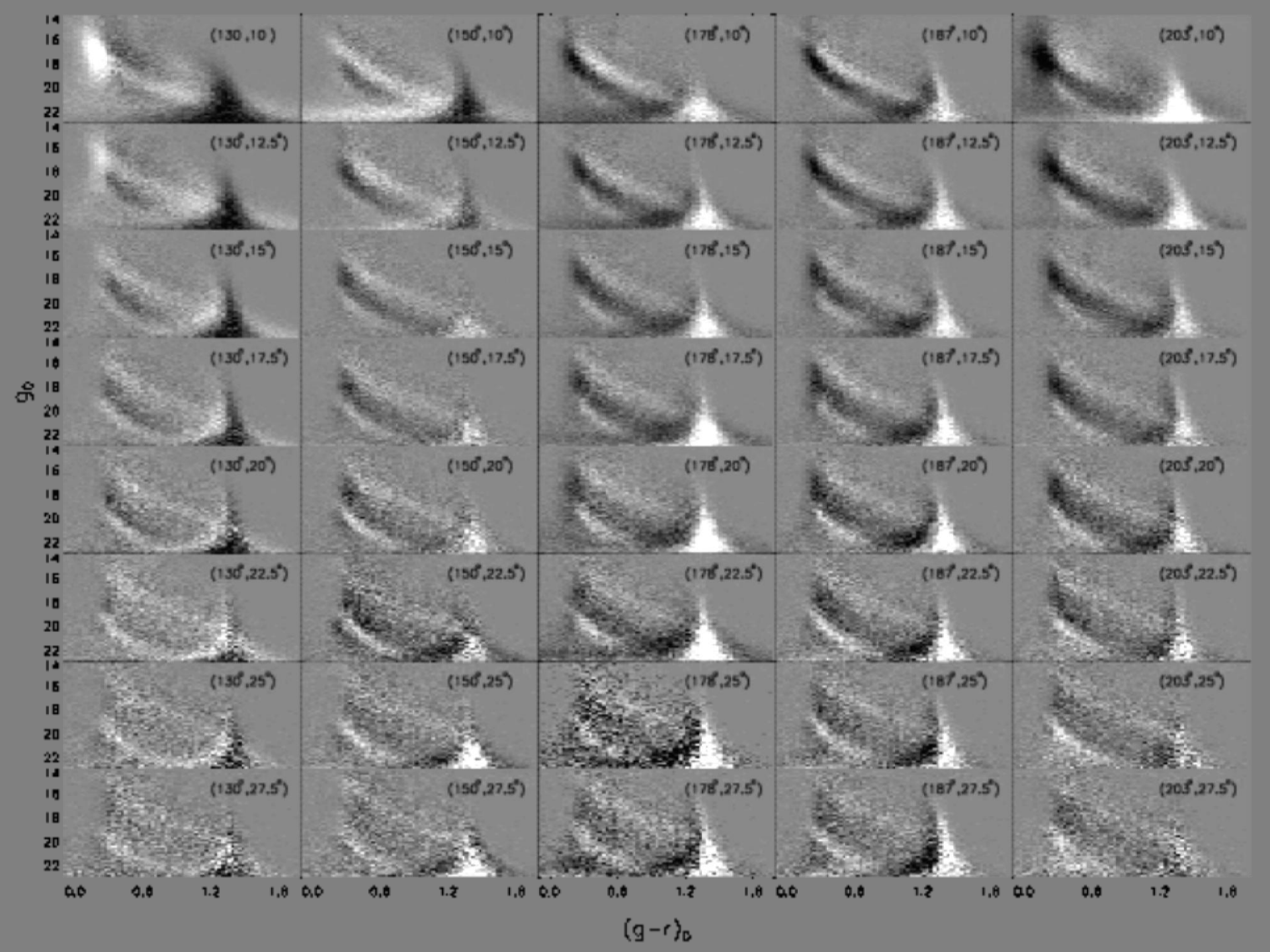
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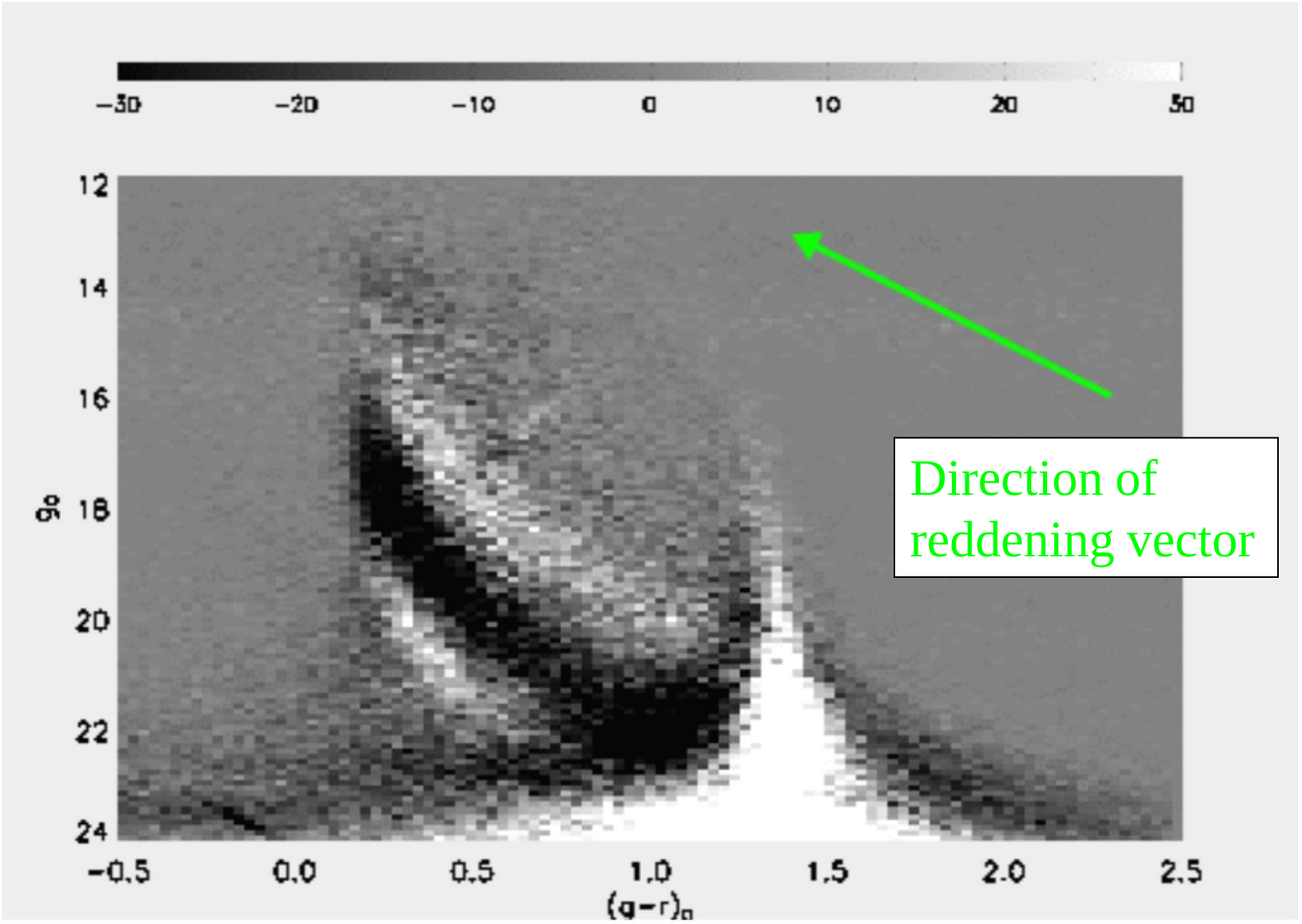
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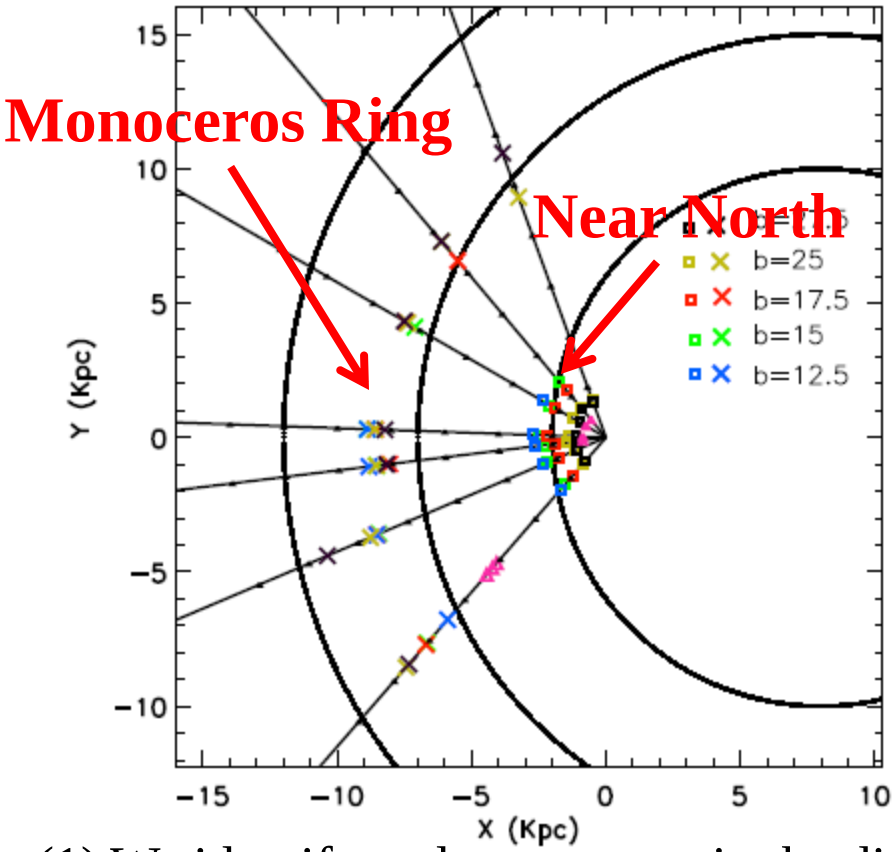
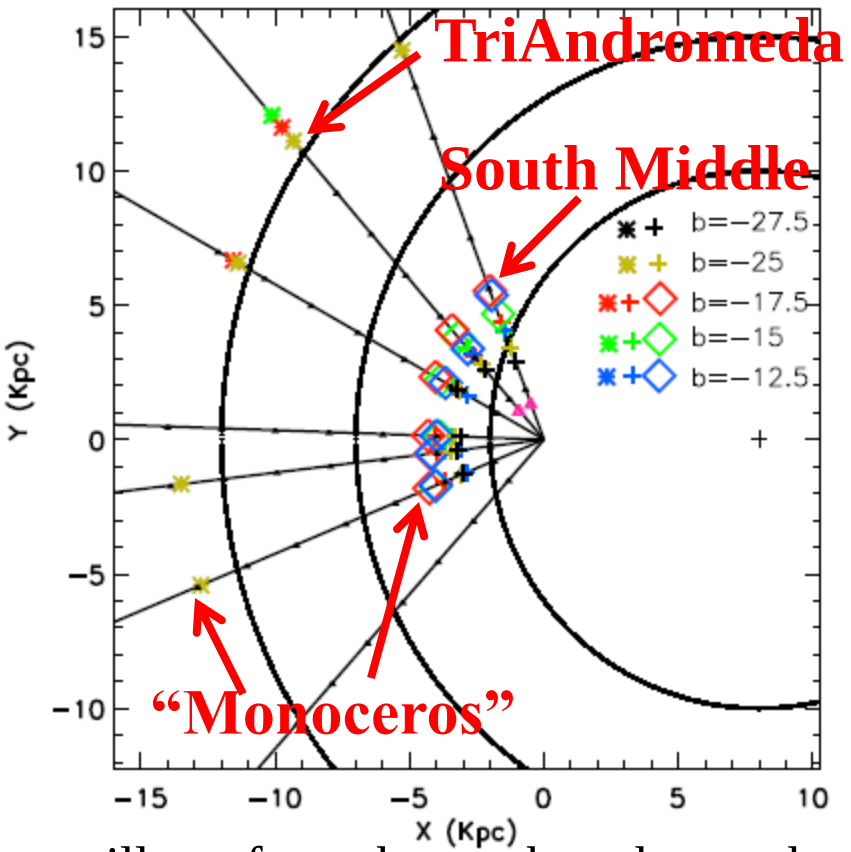
Direction of reddening vector

Northern overdensities

Southern overdensities





(1) We identify and asymmetry in the disk that oscillates from the north to the south to the north to the south.

(2) The "Near North" structure is 10.5 kpc from the Galactic center, and is perturbed approximately 70 pc above the plane.

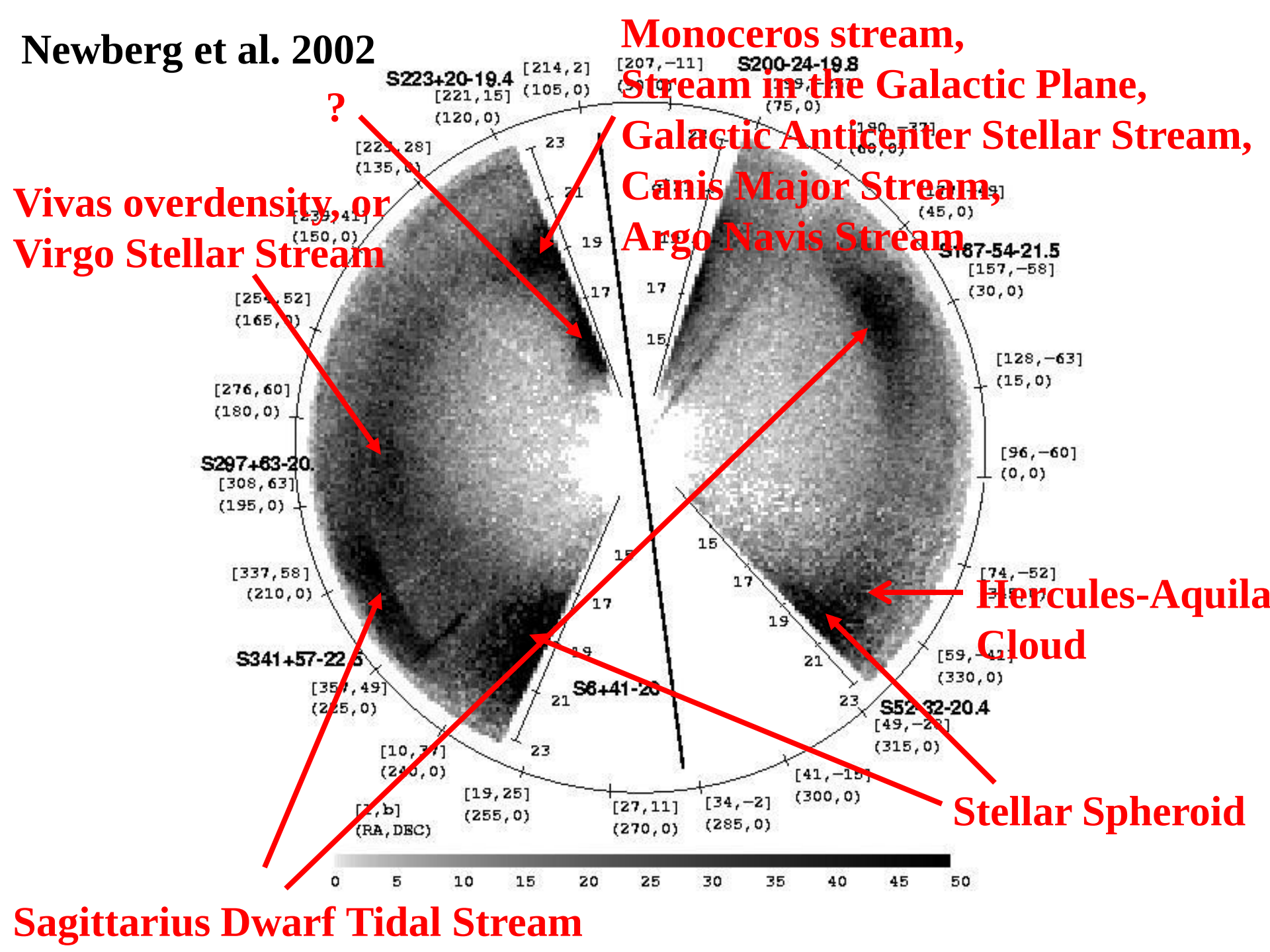
(3) The "South Middle" structure is 14 kpc from the Galactic center and 170 pc below the plane

(4) The next two oscillations coincide with the Monoceros and TriAnd "Rings."

Conclusions

- We identify and asymmetry in the disk that oscillates from the north to the south to the north to the south.
- The “Near North” structure is 10.5 kpc from the Galactic center, and is perturbed approximately 70 pc above the plane.
- The “South Middle” structure is 14 kpc from the Galactic center and 170 pc below the plane
- The next oscillations coincide with the Monoceros and TriAnd “Rings.”
- The rings open in the direction of the Milky Way’s spiral arms, but star formation regions are displaced in the “z” direction opposite to the stellar oscillation (note Yanny& Gardner 2013 show that the stellar oscillation is a function of height above the plane).
- Oscillations induced by the light infalling Sgr dwarf galaxy model of Gomez et al. (2013) are in rough agreement with our observations.

Newberg et al. 2002



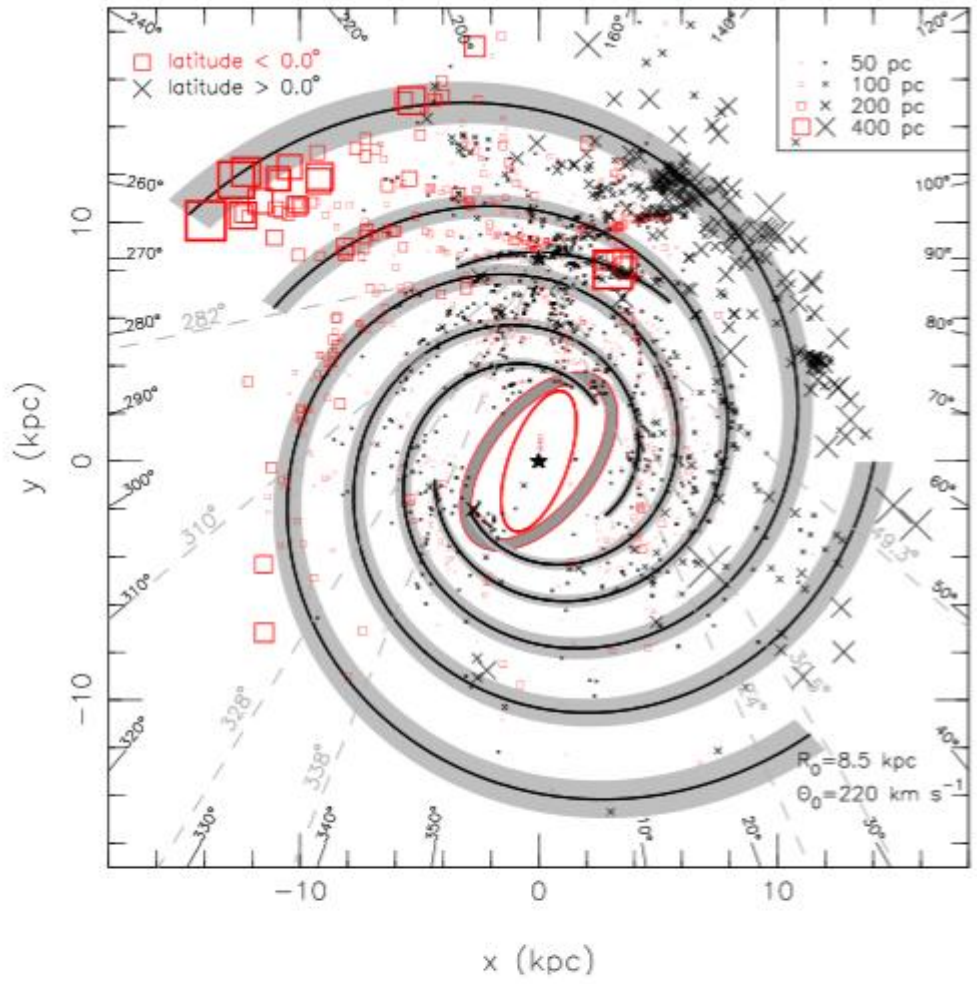


Fig. 16. Evidence of Galactic warp as shown by the distributions of HII regions, GMCs, and 6.7-GHz methanol masers. Note that the open squares here indicate the tracers of $b < 0.0°$, and the crosses indicate the tracers of $b > 0.0°$, different meaning from symbols in other figures. The symbol size is proportional to the offset from the Galactic plane. The outlines are the best-fitted four-arm model (see the upper right panel of Figure 10).

Hou and Han (2014)

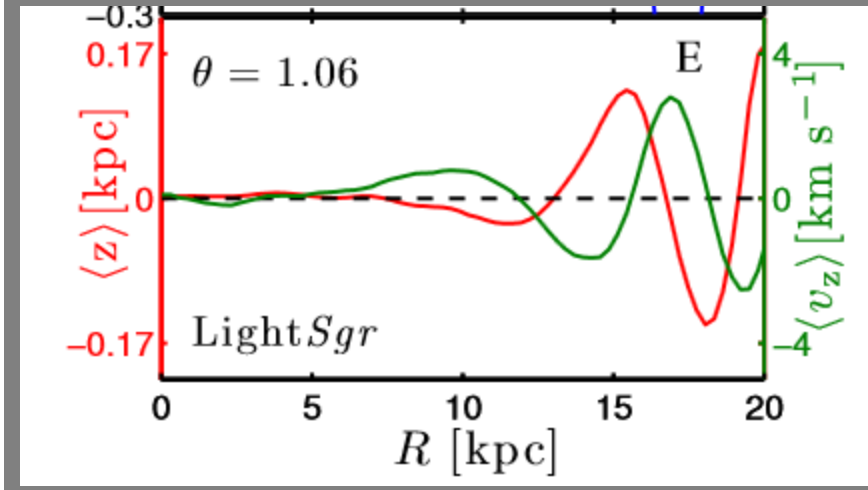


Figure 6. Panel E: Comparison of the mean height (red) and vertical velocity (green), as a function of galactocentric radius obtained from the Light Sgr simulation

Gomez et al. (2013)