# Nearby kinematic wiggles from LEGUE

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In its first two observing seasons, the LEGUE (LAMOST Experiment for Galactic Understanding and Exploration; Deng *et al.*, Zhao *et al.* 2012) survey has obtained ∼ 1.7 million science-quality spectra. We apply corrections to the PPMXL proper motions (PMs; Roeser *et al.* 2010) as a function of position, as determined from the measured PMs of extragalactic objects discovered in LAMOST spectra (see Fig. 1, left and center panels). LAMOST radial velocities and corrected PMs are used to derive 3D space velocities for ∼ 480, 000 F-stars (assuming $M_V = 4$ to derive distances). The right panel of Fig. 1 shows the radial component of Galactic cylindrical velocities (V_R) for stars between $7.8 < R_{GC} < 9.8$ kpc (with $R_{\odot,GC} = 7.8$ kpc) as a function of height (Z) and angle (θ) from the Galactic X-axis. Each dot represents the average position of stars in a 200x200 pc box, color-coded by the mean V_R of those stars. Assuming circular rotation, V_R should be zero. This is true on average for $\theta > 0°$ (3rd Galactic quadrant), but not for $\theta < 0°$. The velocities are also asymmetric across the Galactic plane for $\theta < 0°$ (2nd quadrant), with most positions $\langle V_R \rangle > 0$ above the disk (radially outward), and $\langle V_R \rangle < 0$ below the disk. Similar structure to this apparent "shearing" motion has been seen in RAVE (e.g., Williams *et al.* 2013; Siebert *et al.* 2012), and SDSS (Widrow *et al.* 2012).
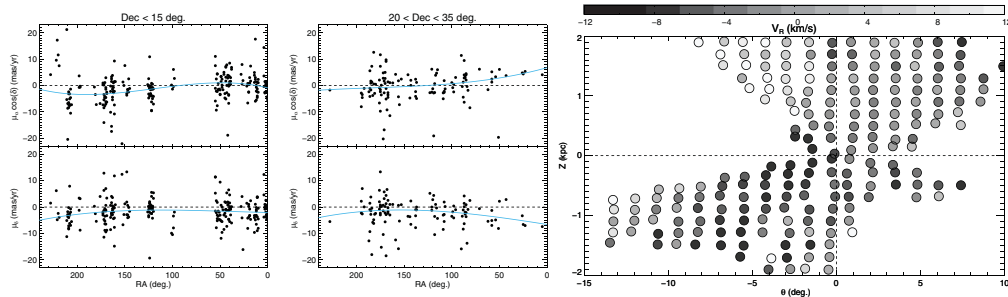
Figure 1. *Left, center panels:* Proper motion residuals, which should be zero, for extragalactic objects identified with LAMOST spectra, as a function of RA along two declination stripes. Blue curves show a polynomial fit used to correct the PPMXL PMs. *Right panel:* Average V_R velocities (color-coding of points) for the selected stars as a function of (Z, θ) position. For $\theta < 0°$; stars above the plane are predominantly moving away from the Galactic center, while those below are moving inward (i.e., $V_R < 0$).

References

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