Joint Institute for Nuclear Astrophysics

Detecting signatures of galaxies merging into the Milky Way

Theoretical studies have shown that collisions between small satellite galaxies and the disk of the Milky Way could generate patterns in the distribution of stars located in the neighborhood of our Sun. Like a stone dropping into a pond, these galactic collisions are capable of generating density waves that tend to cluster stars in both position and velocity space. Looking for signatures of these events, we have analyzed a local sample of Milky Way stars from the Sloan Digital Sky Survey's SEGUE (Sloan Extension for Galactic Understanding and Exploration) survey. As a result of this study we have obtained, for the first time, observational evidence that these kinds of "vibrations" exist in our own Galaxy.

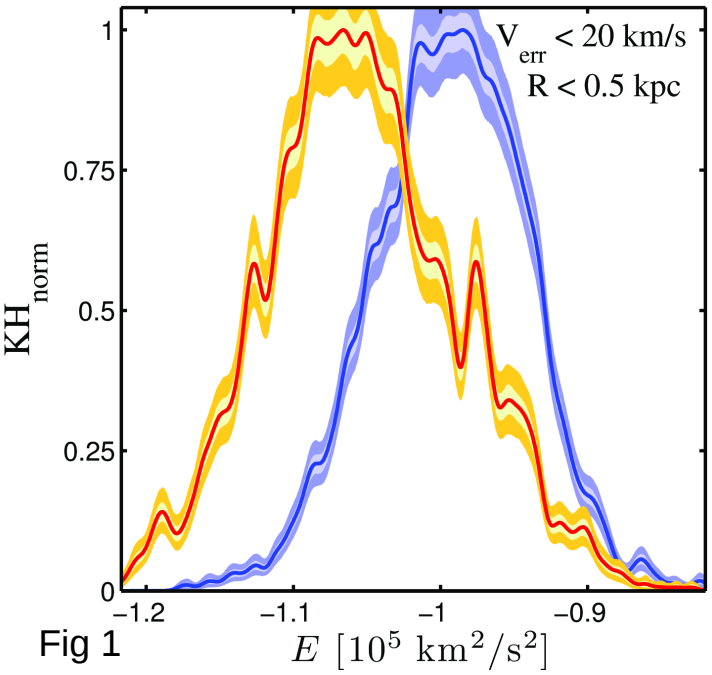

Fig 1

These ripples have been identified as peaks in the energy distribution of stars (as shown in Figure 1), which is simply a function of their current positions and velocities. Furthermore, we have used numerical simulations to show that the origin of the observed perturbations could be the Sagittarius dwarf galaxy, a small satellite galaxy that is currently being disrupted by the Milky Way (see Figure 2 for an image). Our results are important because it allows us to both constrain properties of the merging dwarf galaxy (such as it's total mass and the time since it first started merging into the Milky Way), and it also sheds some light on the role that this merger mechanism may play in shaping the observed distribution of the Milky Way's stellar disk.

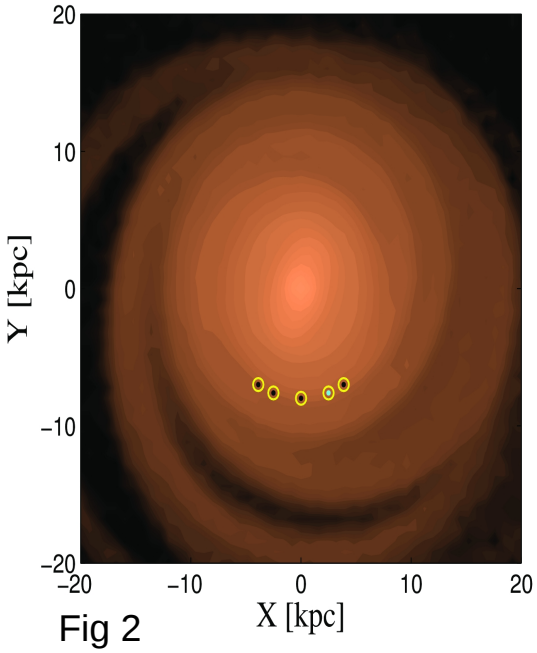

Fig 2

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http://adsabs.harvard.edu/abs/2012arXiv1201.5898G