Hints of recent star formation from WD kinematics

by ***Daniel Mikkola***

Unlocking Gaia EDR3 without RVs

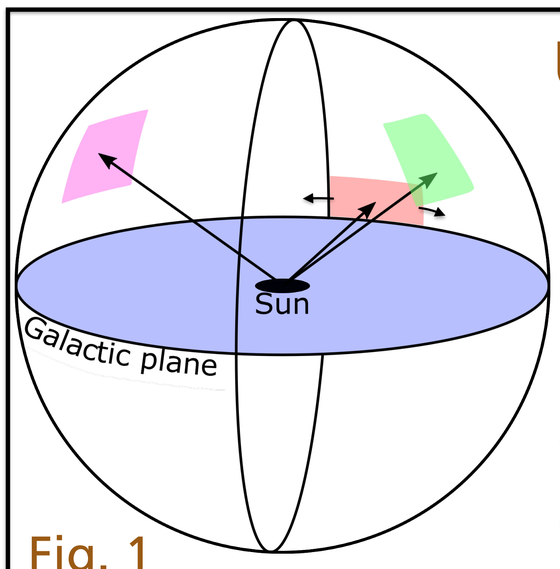


Fig. 1

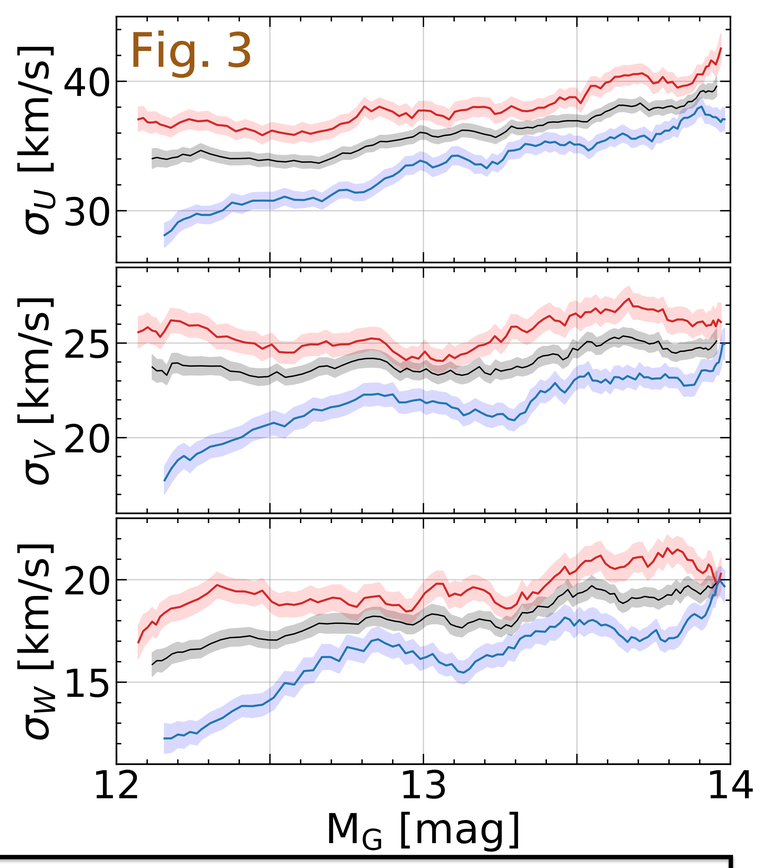
~99.5% of EDR3 sources do not have radial velocity measurements. If the on-sky positions of a sample of stars are uncorrelated with their velocities, we can determine a sample's:

mean motion $\langle \mathbf{v} \rangle$ · dispersions σ · velocity distribution $f(\mathbf{v})$

To illustrate this, consider the sphere in Fig. 1. If the assumption holds, stars moving along the longitude of the red square will compensate for the missing radial velocities of the pink & green, and vice versa

Dissecting the WD CMD

- The WD colour-magnitude diagram has been shown to have dual sequences which are seen clearly in Fig. 2.
- Dual sequences can be explained by different atmospheric compositions or WD masses, or a mixture of both.
- Different atmospheric composition would not affect the kinematics, but different masses would.
- We apply our method to the two sequences separately and determine their dispersions σ.

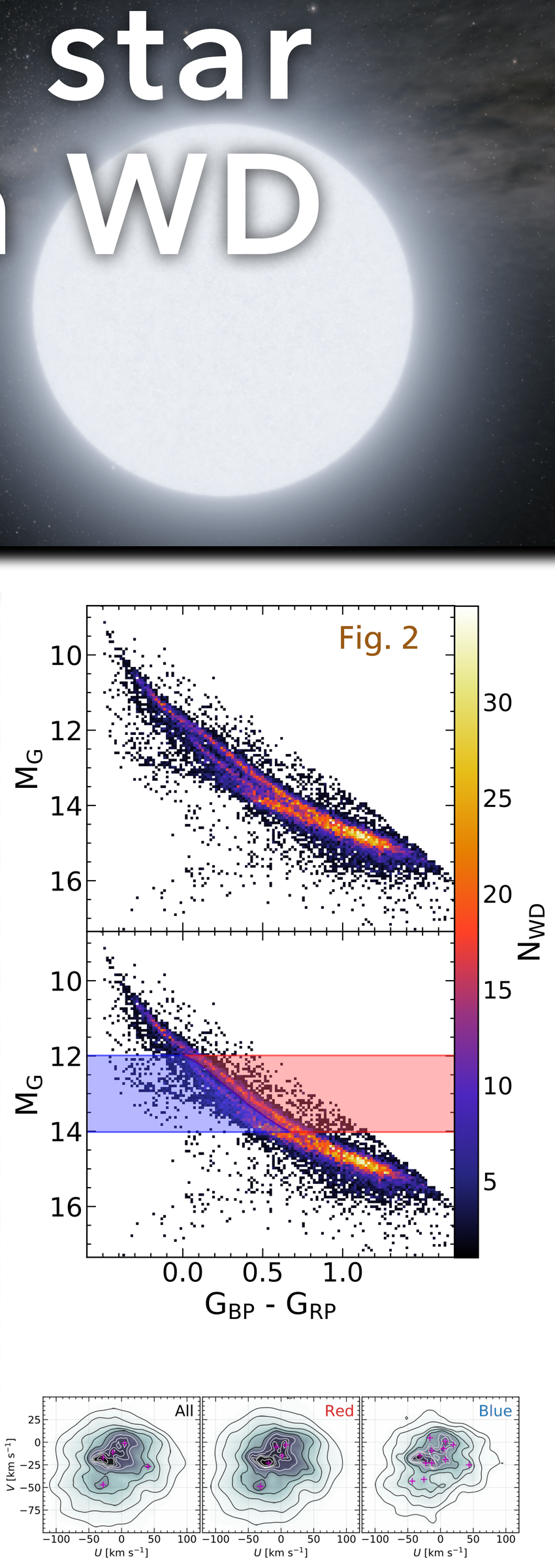


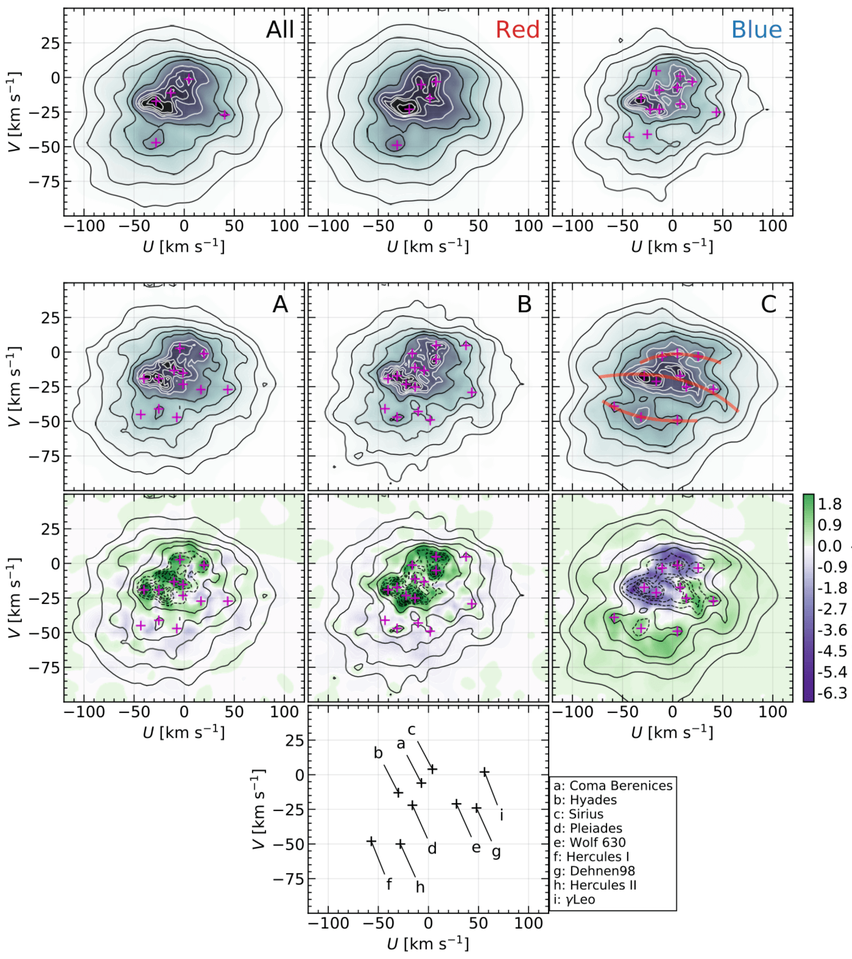
Two kinematically distinct populations

The velocity dispersion in Galactic velocities U, V, W are shown in the central poster figure for the blue, fainter sequence; the red, brighter sequence; and the complete WD sample.

The red sequence is clearly more dynamically heated than the blue at all magnitudes. This means the blue sequence is dynamically younger. This can be explained if it consists of more **massive WDs,** which, due to their quicker formation time, **must have formed in recent Galactic history**. This could coincide well with increased star formation from a passing by the Sagittarius dwarf galaxy.

In conclusion, we find that the dual sequences of the WD CMD **cannot** be explained **purely by atmospheric composition**.





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