**The effect of galactic kinematics on exoplanet systems and their potential habitability**

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Recent studies show that galactic kinematics could affect planetary system architectures [1,2]. Planetary systems that reside in phase-space overdensities, corresponding to ripples and streams in the galactic disk, have been shown to have lower planetary multiplicity [3], much shorter planetary orbits [1,3], and an excess of Hot Jupiters in comparison to systems in the field [1,2]. The findings indicate that habitable worlds could be preferentially found in low-phase-space density environments. The main challenges that these studies faced were (a) the limited sample size due to the small proportion of exoplanet hosts with their radial velocities (required to calculate phase-space density) available in Gaia Data Release (DR) 2, (b) controlling for selection effects in the exoplanet population, and (c) controlling for correlations with host star properties. Since then, TESS has added hundreds of confirmed exoplanets to the NASA Exoplanet Archive, and with the release of Gaia DR3, we have been able to calculate the phase-space densities of a substantially more significant number of host stars. Optimisation of the code using Cuda has allowed us to calculate phase-space densities more accurately, and by using well-constrained stellar parameters from the California Kepler Survey and Sweet-Cat, we can better control for the dependence of exoplanet properties on those of their host star. In this talk, I will present our latest findings and relate them to the implications that phase-space density clustering and galactic dynamics could have on exoplanet habitability. Our work will have applications in target selection for habitable exoplanet searches, such as HabEx and LUVOIR, and in understanding planetary system evolution.

[1] A. Winter et al., Nature 2020, 586, 7830, p.528-532.

[2] D. Kruijssen et al., ApJ (submitted) 2021.

[3] S. N. Longmore et al., ApJL 2021, 911, 1, L16.

[4] M. Chevance et al., ApJL 2021, 910, 2, L19.