

Molecules and planets in the outer Galaxy: is there a boundary of the Galactic Habitable Zone?

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Unveiling the cradles of life in the Local Group

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The formation of environments on the galactic scale that are suitable for the presence of life requires a sufficient amount of metals in the interstellar medium to trigger planet formation, but at the same time low rates of potentially life-harmful events such as Supernovae and Gamma-ray bursts.

Although evolved and massive galaxies, like our Milky Way, are expected to form stars with habitable planets, this is expected to occur relatively late in the cosmic evolution, and most likely around stars with chemical abundances similar to the Sun. On the other hand, local dwarf spheroidal and ultra-faint dwarf (UFD) galaxies are among the most ancient and most metal-poor galaxies known.

Is it possible that these galaxies were the first to develop life-suitable environments in the Local Group?

Here, we estimate the time when Local Group dwarfs reached the conditions to potentially host life, as well as the duration of such conditions through cosmic time, by using their measured star formation histories and metallicity distribution functions.

We demonstrate that UFDs, due to their early and short star formation activity might have evolved as sterilization-free environments for more than 12 Gyr. Furthermore, our analysis shows that the metal enrichment is the most critical process to determine when galactic environments suitable for the presence of life could have formed in general.

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