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INAF ISTITUTO NAZIONALE DI ASTROFISICA
GAPS GLOBAL ARCHITECTURE OF PLANETARY SYSTEMS
SPECOLA PANORMITANA MDCCXC
Ariel

The quest of life-as-we-know-it outside the solar system

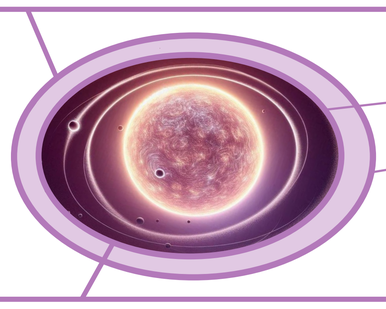
The time-evolution of the ultraviolet habitable zone

Riccardo Spinelli with F. Borsa, G. Ghirlanda, G. Ghisellini, F. Haardt, F. Rigamonti

✉ riccardo.spinelli@inaf.it

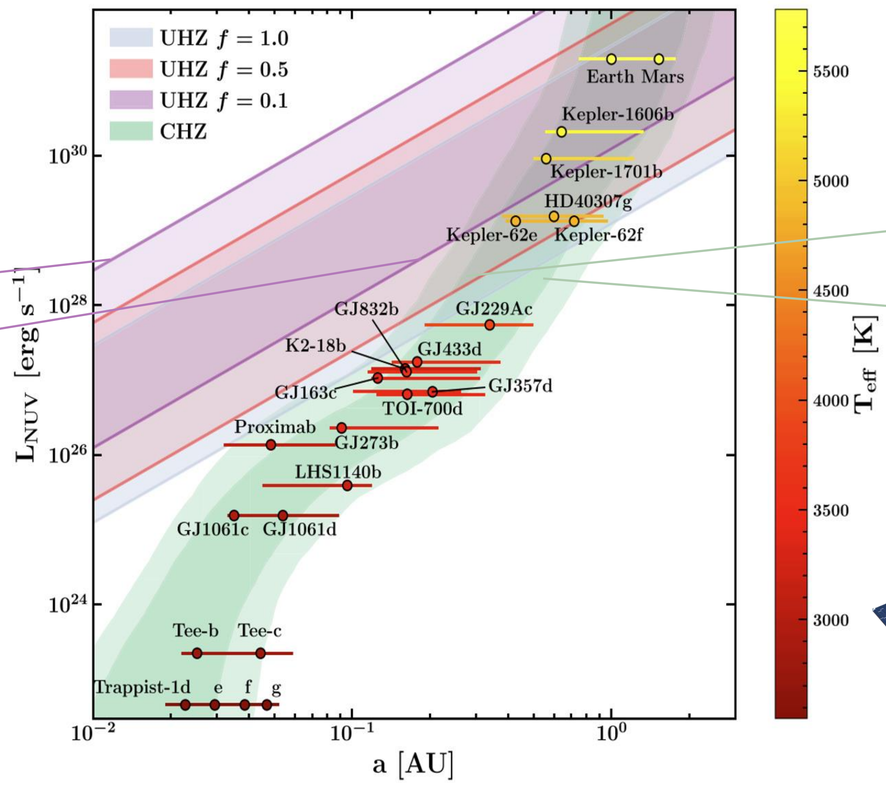
Are Habitable Zone (CHZ) planets in the Ultraviolet Habitable Zone (UHZ)?

The minimum near UV flux needed for the chemical synthesis of complex molecules (amino acids, lipids nucleosides and RNA precursors)



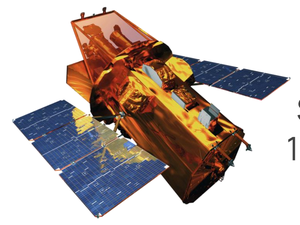
The maximum tolerable dose of near UV radiation for biological systems

UHZ is defined for different near UV transmissivity (100%, **50%**, **10%**) of the exoplanetary atmosphere



Early Mars

Recent Venus



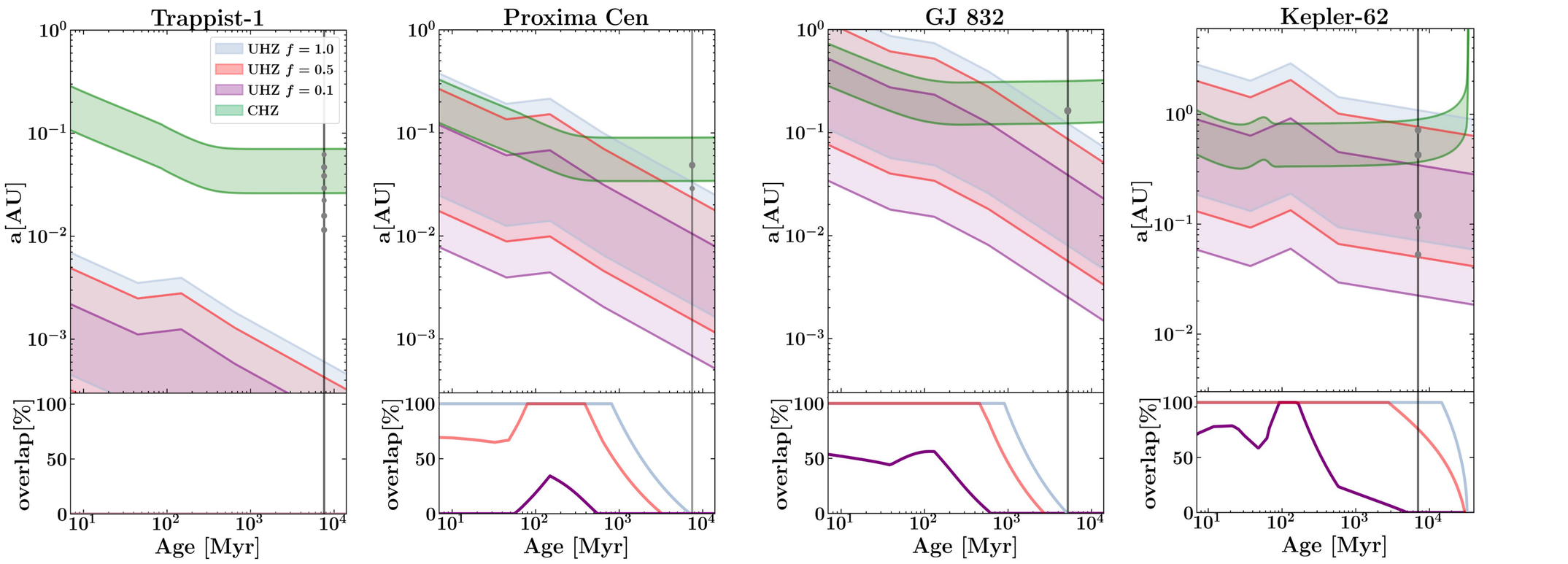
Swift-UV/Optical Telescope: 17 stars harbouring 23 planets in their CHZ

The ultraviolet habitable zone of exoplanets, Spinelli, R., Borsa, F., Ghirlanda, G., Ghisellini, G., Haardt, F. et al. 2023, MNRAS, 522, 1411.

Only stars with T_{eff} > 3900 K illuminate their CHZ planets with enough NUV radiation to trigger RNA formation through cyanosulfidic chemistry (Rimmet et al. 2018)

The time evolution of the ultraviolet habitable zone

Our sample = old stars (age > 2.4 Gyrs): could RNA precursors formation be triggered during the early stages of stellar evolution? We evolved backwards the CHZ and the UHZ through the MESA Stellar Tracks (Dotter 2016; Choi et al. 2016) and GALEX near UV observations of young moving groups (Richey-Yowell et al. 2023).



T_{eff}=2550 K T_{eff}=3050 K T_{eff} =3601 K T_{eff} =4842 K

- An intersection between CHZ and UHZ exists or has existed around all stars of our sample at different epochs, except for the coldest M-dwarfs (T_{eff} < 2800 K).
- The radial-extension and time-duration of the CHZ-UHZ intersection increase with the stellar T_{eff} and atmospheric transmissivity at near-UV.
- Proxima Centauri (3050 K) had a long-lasting and more extended CHZ-UHZ intersection compared to similar M-dwarfs.