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The best place and time to live in the Milky Way: the impact of Gamma Ray Bursts and Supernovae on planetary habitability

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Several factors contribute to the emergence and development of life on planets. In addition to local factors (e.g., intrinsic planetary properties and host star characteristics), planetary habitability can be influenced by the larger-scale radiation environment of the galaxy. Powerful astrophysical transient sources of high-energy radiation, such as Gamma Ray Bursts (GRBs) and Supernovae (SNe), can pose life-threatening risks and potentially cause mass extinctions. Their radiation can directly harm biota or induce extinction by depleting most of the protective atmospheric ozone layer on terrestrial planets. For this reason, nearby high-energy transient astrophysical events have been proposed as possible triggers of mass extinctions on Earth. In this talk, I will present a model that
connects the rate of these high-energy events to star formation and metallicity evolution within the galaxy and accounts for the probability of terrestrial planets forming around FGK and M stars. Using this model, we assessed the habitability of the Milky Way throughout its cosmic history, considering potentially disruptive astrophysical transients, with the aim of identifying the safest places and epochs to live within our galaxy. This model also allows for the evaluation of whether a GRB or an SN may have influenced one of the mass extinction events that have occurred on Earth in the last 500 million years

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