The Galactic habitable zone with detailed chemical evolution models

E. Spitoni[1], F. Matteucci[2], A. Sozzetti[3]

The galactic habitable zone is defined as the region with sufficient abundance of heavy elements to form planetary systems in which Earth-like planets could be born and might be capable of sustaining life, after surviving to close supernova explosion events. Galactic chemical evolution models can be useful for studying the galactic habitable zones in different systems. We apply detailed chemical evolution models including radial gas flows to study the galactic habitable zones in our Galaxy and M31. We compare the results to the relative galactic habitable zones found with 'classical' (independent ring) models, where no gas inflows were included. For both the Milky Way and Andromeda, the main effect of the gas radial inflows is to enhance the number of stars hosting a habitable planet with respect to the 'classical' model results, in the region of maximum probability for this occurrence, relative to the classical model results. These results are obtained by taking into account the supernova destruction processes. In particular, we find that in the Milky Way the maximum number of stars hosting habitable planets is at 8 kpc from the Galactic Centre, and the model with radial flows predicts a number which is 38 per cent larger than what was predicted by the classical model. For Andromeda we find that the maximum number of stars with habitable planets is at 16 kpc from the centre and that in the case of radial flows this number is larger by 10 per cent relative to the stars predicted by the classical model. Moreover, we present preliminary results concerning the effects of the stellar migration on the Galactic habitable zone of the Milky Way.

[1] Trieste University, Trieste, Italy
[2] Trieste University, Trieste, Italy
[3] INAF – Osservatorio Astrofisico di Torino, Pino Torinese, Italy