THE EFFECT OF RADIAL GAS FLOWS ON THE CHEMICAL EVOLUTION OF GALAXIES (THE MILKY WAY AND M31)

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The majority of chemical evolution models assumes that the galactic disk forms by means of infall of gas and divides the disk into several independent rings. However if the infall is important, then radial gas flows should be taken into account as a dynamical consequence of infall. We present detailed chemical evolution models for the Milky Way and M31 in presence of radial gas flows. These models follow in detail the evolution of several chemical elements (H, He, CNO, α elements, Fe-peak elements) in space and time. The contribution of supernovae of different type to chemical enrichment is taken into account. We find that an inside-out formation of the disks, coupled with radial gas inflows of variable speed can reproduce very well the observed abundance gradients in both galaxies. We also discuss the effects of other parameters, such as a threshold in the gas density for star formation and efficiency of star formation varying with galactic radius. Moreover, for the first time we compute the galactic habitable zone in our Galaxy and M31 in presence of radial gas flows. The main effect is to enhance the number of stars hosting a habitable planet with respect to the models without radial flow, in the region of maximum probability for this occurrence. In the Milky Way the maximum number of stars hosting habitable planets is at 8 kpc from the Galactic center, and the model with radial flows predicts a number which is 38% larger than that predicted by the classical model.