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# The chemical evolution of alpha-elements in the Milky Way

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The galactic chemical evolution (GCE) describes how the composition of a galaxy changes over time. This variation of the interstellar medium is due to the nuclear reactions in stars and supernovae that enrich the interstellar gas with heavy elements, as well as the inflowing gas from the extragalactic space. This field may be the most exciting when we study the history of the Milky Way, being such a debated area of astronomy.
Fortunately, stars enclose and preserve the composition of the interstellar gas when they are born. Thus when we analyze the composition of stars now visible across our galaxy, we can take a look back in time, how the elements in the interstellar gas formed and evolved. The APOGEE sky survey provides spectral abundances for many elements all across the Milky Way for almost 700 000 stars, creating an ideal dataset for this challenge.
The alpha-elements, produced in core-collapse supernovae are clear tracers of star formation in galaxies. APOGEE stars show a peculiar bimodality when plotting alpha-element abundances versus metallicities, which is a clear sign of two distinct star formation events, in accordance with the old thick and the young thin disk of the Milky Way. This can be most easily explained by two major gas infall events.
Many GCE models have been developed to follow the evolution of galaxies, out of which we used the open-source OMEGA+. By finetuning the model and its input parameters, we were able to match the observed chemical bimodality, for the first time with OMEGA+. This could only be done by assuming two infalls and by crucially constraining some key parameters, that can be of a big help to understand the history of our galaxy better.

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