From the spatial distribution of elements in galaxies, it is possible to pinpoint the physical processes that govern galaxy formation and evolution. In my first paper Barbillon et al. 2024, using the General Stellar Parametrizer from Spectroscopy (GSP-spec) data from the Radial Velocity Spectrographe (RVS) of Gaia released in the last DR3, we aim at understanding the impact of the spiral arms structure on Galactic chemical evolution, detecting their signatures in other stellar abundances than metallicity, like calcium and magnesium. More generally, we explored radial and azimuthal chemical variations in the disc.

In a circle of 4 kpc diameter around the Sun, we have produced 2D chemical abundance maps in the Galactic disc for two α-elements and for different samples of young and old giant stars. These maps, based on the [Ca/Fe] and [Mg/Fe] abundances, show evidence of considerable radial and azimuthal inhomogeneities, which are accompanied by metallicity fluctuations (c.f. Poggio et al. 2022). Moreover, the observed inhomogeneities in α-abundances at once for young and old populations, are spatially coherent with the litterature contours of the spiral arms (c.f. Poggio et al. 2021, Palicio et al. 2023). Our understanding of the disc chemical trends is changing from a simplistic 1D radial view, to a more complete 2D perspective combining radial trends, azimuthal tendencies, and small scale variations. In the global picture that is emerging, the stars within the spiral arms are globally 1) more metal-rich and calcium-rich, 2) more [Ca/Fe]-poor and [Mg/Fe]-poor, than the stars in the inter-arms regions. Waiting for the DR4, created maps and this work will be further developed with a higher spatial coverage and more data in other individuals abundances. This work can be interpreted in the light of the 2D chemical evolution model of Spitoni et al. (2023), and extend to zoom-in (c.f. Dubois et al. 2021) or idealised galaxies simulations (c.f. Tepper-García et al. 2024) where we are crossing simulations and observational data in order to refine our understanding of the spiral arm structures and way to study them.

Finally, in Barbillon et al. (in prep), we derived the interstellar absorption of individuals stars in the disc derived from the last DR3 of Gaia GSP-Spec spectroscopic survey including high quality astrometric parameters. We created new 2D and 3D extinction maps linking constraints on interstellar medium structure (through the dust) and stellar chemistry that we compared to published works such as Vergely et al. 2022, Edenhofer et al. 2024, Dharmawardena et al. (2024), etc.