Characterising a population of metal-poor stars with disc kinematics in the Milky Way with the Pristine survey at the CFHT

To deepen our knowledge of the early Milky Way, it is of particular interest to investigate the orbital and chemical properties of the most metal-poor stars, associated with the oldest stars in our Universe.
The Pristine survey is a narrow-band photometric survey based at the CFHT, focused on metallicity-sensitive Ca H&K lines. They are perfectly suited to infer photometric metallicities down to ~ -4 dex, as demonstrated by the successful discovery of large samples of EMP, VMP and UMP stars by the Pristine collaboration.
The recent publication of the Pristine-Gaia synthetic (PGS) metallicity catalogue, an all-sky catalogue of metallicities for ~ 52M stars based on Gaia DR3 BP/RP spectro-photometry, is a perfect opportunity to answer crucial questions related to disc formation, which still remains today a puzzling assembly process.
In a paper that is being submitted, after validating and curating the PGS sample for our use with the help of spectroscopic surveys, we identify an asymmetric angular momentum distribution within our sample, down to the lowest metallicities ([Fe/H] < -1.7), in favour of a prograde component. We then investigate whether the population could be due to the tail of a zero-rotation or a prograde halo. After probing spatial distributions, as well as Vφ and action space distributions and comparing them with a mock model, we conclude that:

- this population cannot be the tail of distribution of a stationary halo
- from a view of the Vφ distribution alone, this population could be the tail of a slightly prograde halo (Vφ ~ 30-40 km/s); however, this does not erase the signature of the population in the action space
- the [Fe/H] lower limit of this population with a 2σ confidence interval is located at ~ -3 dex, about twice as low as the classical limit

Finally, we discuss the potential origins of this population (in/ex-situ) in light of recent papers.