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Looking for the most metal-poor stars with large surveys

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In the Big Bang Nucleosynthesis (BBN), hydrogen, helium, and small traces of lithium and beryllium, were produced. A few million years after BBN, the first stars were born. Important questions about star formation, galactic evolution, and the yields of the first supernovae can be answered from the study of these first stars and their descendants. The most chemically primitive stars in the Milky Way are invaluable to understand the early universe, but they are extremely rare and hard to find.

Over the past few years we have been digging in the SDSS and LAMOST spectroscopic surveys and identified tens of halo stars with estimated metallicities [Fe/H] < -3. We have obtained follow-up spectroscopic observations with the 4.2m William Herschel Telescope and the 10.4m Gran Telescopio Canarias, which were subsequently analyzed using the FERRE code. From this work, we have recently discovered two dwarf stars with extremely low iron content, SDSS J0815+4729 and SDSS J0023+0307, both at [Fe/H] < -5. In addition to it, in the context of the Pristine collaboration, we have selected and followed-up metal-poor candidates identified from narrow-band photometry. A brief description of the methodology used in all of these programs will be provided, summarizing the most important results.

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