A new reference catalogue for the very metal-poor Universe: +150 OB stars in Sextans A

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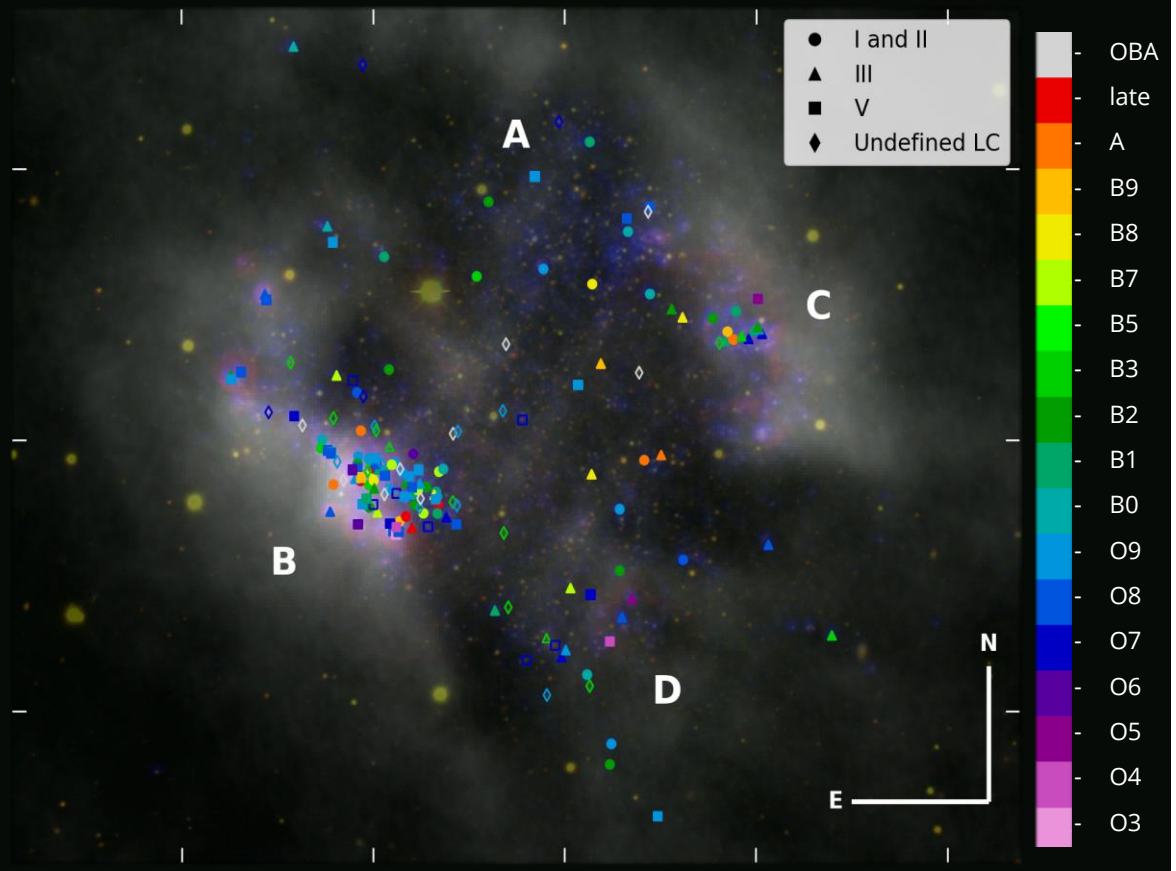

RGB image of the galaxy Sextans A where we identify the regions with ongoing star formation (A, B, C and D) and highlight the stars of our catalogue with colours and symbols indicating their spectral classification.

The first stars of the Universe were born in clouds composed of H and He, devoid of other elements. Simulations predict that this lack of metals made the stars hugely massive and forced them to undergo unknown evolutionary pathways. However, they are so far away that we cannot confirm these theories. Even the powerful James Webb Space Telescope and the upcoming Extremely Large Telescope are unable to resolve them. Only the observation of massive stars in nearby, metal-poor galaxies can give us a clue about their properties, lives and deaths.

Due to its proximity to our galaxy, the Small Magellanic Cloud (SMC) has been for years the low-metallicity standard. However, its metal content is too high to represent the early epochs of the Universe. To extend our metallicity frontiers, our group targeted Sextans A, a dwarf irregular galaxy located at the edge of our Local Group. This galaxy presents only one-tenth of the current average metal content of the Universe, similar to the ambient conditions when the Universe was only four billion years old.

Using the 10.4-m Gran Telescopio Canarias, we assembled a spectroscopic collection of more than 150 massive stars in this galaxy. The catalogue covers stars in different evolutionary stages, some still in the H-fusion phase and others already burning He in their cores. In addition, we identified for the first time potential binary systems in the galaxy and provided the first list of candidates to undergo exotic evolutionary channels. Our sample mainly overlaps the high concentrations of neutral gas of Sextans A. However, we find massive stars in isolation and in very-low gas density regions. Finding these stars here represents a challenge to the current theories of star formation, as massive stars are thought to form in vast masses of gas and in associations.

This is **the first large catalogue of massive stars that breaks the metallicity frontier of the SMC**. This sample constitutes a fundamental first step to unveiling the evolutionary pathways and fates of very metal-poor massive stars, leading to a better understanding of the first billion years of our Universe.

LORENZO M. ET AL. 2022, MNRAS, 516, 4164 (HTTPS://DOI.ORG/10.1093/MNRAS/STAC2050)