

Peer Review

Review of: "Untangling Magellanic Streams"

O. J. Katime Santrich¹

1. Departamento de Ciências Exatas DCEX, Universidade Estadual de Santa Cruz, Brazil

The paper presents a comprehensive study of the Magellanic Stream (MS), a long HI structure associated with the Magellanic Clouds. The authors aim to investigate the properties and origins of the different gas filaments in the MS, as well as their relationship with detectable stellar populations. The study has several strengths, including its robust methodology and significant contributions to our understanding of the MS. The identification of dominant and subdominant strands and their theoretical relevance to studies of galactic interactions are noteworthy. However, the paper has some limitations, including gaps in the available observational data and uncertainties in certain explanations, which require further clarification. While the paper deserves publication, I recommend addressing the following points before final acceptance:

1. Discussion on the Lack of H3-Selected Stars in the Archipelago

The authors suggest that the archipelago might represent a continuation of the subdominant strand, extending tidal material farther along the MS. However, the association remains tentative due to the lack of H3-selected stars to confirm the connection kinematically. A deeper discussion is needed to address the reasons for the lack of H3-selected stars in this region. Additionally, the authors should elaborate on the implications of confirming the stellar population through spectroscopy in the nearby regions of the archipelago.

2. Absence of Stars in the Dominant Strand

The absence of stars in the dominant strand is attributed to observational limitations, such as insufficient sensitivity to detect stars at distances greater than 55 kpc. However, the analysis relies heavily on theoretical assumptions, including hydrodynamic origins, without robust observational evidence. The current explanation for the lack of stars in the dominant strand is vague and ambiguous.

The authors should provide a more detailed discussion of the computational and observational hypotheses from the sources cited in the text.

3. Clarification on the Absence of Stellar Clusters in the MS

The absence of stellar clusters in the MS is explained as a consequence of tidal forces and hydrodynamic interactions, which are unlikely to strip bound stellar clusters from their host galaxies. While this may seem obvious, the authors should explicitly clarify this point. Section 2.1, in particular, gives the impression that stellar clusters were arbitrarily excluded. A clear explanation will strengthen the paper's arguments.

4. Details on $[\alpha/\text{Fe}]$ vs. $[\text{Fe}/\text{H}]$ in Figure 7

In Figure 7, the authors present $[\alpha/\text{Fe}]$ versus $[\text{Fe}/\text{H}]$. While common elements like C, O, Mg, Si, and Ca are often used to determine $[\alpha/\text{Fe}]$, other species like Ne, S, Ar, and Ti may also contribute. These depend on the stellar evolutionary state, and not all lines are observable in all stars. Given the limited spectral range of the H3 survey ($[5150, 5300] \text{ \AA}$), the authors should explicitly list the elements and lines used to determine $[\alpha/\text{Fe}]$ for the 17 H3 stars.

5. Clarification on "GSE" in Figure 7

The figure's legend refers to "tracks in abundance space for the stellar populations of three MW satellites." However, it appears that "GSE" refers to the Gaia-Sausage-Enceladus. If so, the authors should clarify whether GSE is considered one of these satellites or if additional satellites are included. Ambiguities in the legend need resolution.

6. Signal-to-Noise Ratio (SNR) Details in Section 2.1

The paper provides the SNR per pixel for the H3 stars, but readers also need the SNR per resolution element (SNR-pre) for the sample of 17 stars. This information is crucial to assess whether the $[\alpha/\text{Fe}]$ ratios were derived from reliable spectra. While the focus of the paper is on kinematics and spatial distributions, SNR-pre details are essential for evaluating the quality of the chemical abundance measurements.

7. Table for the 17 H3 Stars

Section 2.1 should include a table summarizing key information for the 17 stars, such as ID, Galactic coordinates, proper motions, V_{GSR} , and SNR-pre. This will enhance the transparency and reproducibility of the study.

8. Vague Sentence on an "Unknown Progenitor" (Page 6)

The phrase "Alternatively, they could come from an unknown progenitor with chemical properties comparable to those of the SMC" is vague and raises questions. What would this "unknown progenitor" be? The authors should provide more detail or rephrase this statement to clarify their hypothesis.

By addressing these minor issues, the paper will be significantly improved, offering clearer insights into the properties and origins of the MS.

Declarations

Potential competing interests: No potential competing interests to declare.