Research Assignment 1: Stellar Streams and Tidal Transformation of M33

Animesh Garg

February 25, 2025

1 Research Topic Heading

The proposed research topic is a combination of the following:

- **Stellar Streams of M33**
- **Tidal Transformation of Satellites (M33)**

2 Research Questions

This project will investigate the evolution of M33's internal structure and its tidal interactions with the Milky Way (MW) and Andromeda (M31), focusing on the formation of stellar streams. The key research questions are:

1. How does M33 lose stellar and dark matter mass over time, and how do close encounters with M31 and MW correlate with mass loss?
2. Where do M33's stellar streams form, and do multiple streams emerge at different epochs during the MW-M31 merger?
3. How does M33's disk structure evolve through these interactions? Specifically:
    - Does the disk thicken or warp due to tidal forces?
    - How does the rotation curve change with each major passage?
4. What are the kinematic properties of M33's streams? Do they remain dynamically cold, or do they show velocity dispersion increases over time?

By **attempting** to address these questions, we aim to link M33's structural evolution to the formation of tidal streams, providing insight into how satellite galaxies interact with their hosts in hierarchical galaxy formation.