

Z106b Galaxy collisions and stellar streams in the Andromeda Galaxy: Chemical evolution of the progenitor galaxy of the Andromeda Giant Southern Stream

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Recent large-scale imaging and spectroscopic observations have shown the spatial distribution of heavy elements in the halo region of M31, including the Andromeda Giant Southern Stream (AGSS). We have also investigated the spatial distribution of heavy elements in the AGSS using the result of N-body simulations assuming the spatial distribution of the metal abundances in the infalling progenitor galaxy. The results nicely reproduce the spatial distribution of heavy elements in the AGSS, where the metallicity distribution orthogonal to the AGSS axis is non-uniform. This result not only allows us to put a limit on the metal gradient of the progenitor galaxy but also provides crucial information on where the galactic centre of the progenitor galaxy is currently located.

Although two models have hitherto been proposed for the formation of the AGSS, such as the major merger model and the minor merger model, our result supports the minor merger model. In addition, to explain the current spatial distribution of heavy elements in the AGSS, we find a constraint that the progenitor may have the metallicity gradient of the power-law index of around -0.4 . This result severely limits the chemical evolution of the progenitor, and we further discuss the star formation history of the progenitor to produce such a metallicity gradient. Comparison of future PFS observations with this theoretical prediction will provide significant insights into the physics of galaxy collisions and the formation of a stellar halo.