Z105a Galaxy collisions and stellar streams in the Andromeda Galaxy: Once and future in Andromeda

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Hierarchical structure formation based on the ΛCDM model has long been considered the standard paradigm for galaxy formation, and much observational evidence has been accumulated so far. In this century, observations around the Andromeda Galaxy (M31) have revealed numerous traces of past mergers with satellite galaxies. The Andromeda Giant Southern Stream (AGSS) is a vast stellar stream of more than 100 kpc, and there are currently two opposing hypotheses for the formation of the AGSS: the major merger model with a colliding galaxy mass of $10^{11} M_{\odot}$ and the minor merger model with that of $10^{9} M_{\odot}$. Our N–body simulation of major mergers indicated that the stellar disc of M31 became significantly thicker, far from the observations and failed to reproduce the observation of the M31 disc. On the other hand, minor merger simulations successfully reproduced not only the features of the AGSS but also the 10 kpc ring in the M31 disc. The results clearly show that the minor merger favours the simultaneous formation of the AGSS and the 10 kpc ring. We will present theoretical predictions about the spatial distribution of line–of–sight velocities obtained from the simulation, as well as the spatial distribution of stellar metallicities and their gradients. Comparison with future PFS observations will provide insight into not only the formation of the AGSS but also the chemical properties of the progenitor and the formation of stellar haloes in the Andromeda Galaxy. It would provide significant improvements in understanding the dynamical evolution of galaxies under the hierarchical structure formation.