Collision tomography: the progenitor of the Andromeda stellar stream and the metallicity gradient

Yohei Miki

 Universidad de Tsukuba

M. Mori\textsuperscript{1}, M. Rich\textsuperscript{2}

\textsuperscript{1} Universidad de Tsukuba

\textsuperscript{2} Universidad de California at Los Angeles

The stellar populations of galaxies hold a fossil record of their formation and evolution. The mass-metallicity relation and the metallicity gradient play a significant role to explore the galactic evolution. The observations of dwarf elliptical galaxies (dEs) in the local universe revealed that their metallicity gradients are both negative and positive, but the origin is still unclear (Spolaor et al. 2009; Koleva et al. 2009). Here we show that the collision tomography using minor merger is effective to investigate the metallicity gradients of dwarf galaxies.

Recent progress in observational studies of the Andromeda galaxy (M31) revealed a wealth of substructures: a giant stellar stream to the south of this galaxy, as well as giant stellar shells to the east and the west of M31’s center (Ibata et al. 2001, 2004, 2005; Ferguson et al. 2002; McConnachie et al. 2003, 2009; Guhathakurta et al. 2006). In addition, the metallicity [Fe/H] distributions have been also observed (Ibata et al. 2007). So far, theoretical studies using N-body simulations of the interaction between the progenitor of those structures and M31 demonstrate that the stream and shells are the tidal debris formed in the last pericentric passage of a satellite on a radial orbit (Fardal et al. 2007; Gilbert et al. 2007; Mori and Rich 2008). Using the results of our N-body simulations, we have analyzed the metallicity distribution of the progenitor. By comparing our analysis and the observations, we will discuss about the origin of the metallicity gradient of dEs.