Can stellar streams retain signatures of early major mergers?

Stellar streams in the Milky Way commonly exhibit morphological distortions indicative of external dynamical perturbations. Numerical studies have shown that such signatures can arise from a wide range of mechanisms, including encounters with dark matter subhaloes and baryonic structures such as the Galactic bar or giant molecular clouds, leading to significant degeneracies in the interpretation of observed stream perturbations.

In the context of hierarchical galaxy formation, the Milky Way is known to have experienced a major merger approximately 10 Gyr ago. The impact of such an event on stellar streams remains unexplored and may add an additional layer of complexity to their interpretation. A key question is whether streams formed prior to a major merger could survive the event and retain observable signatures, potentially allowing stellar streams to trace the early assembly history of the Galaxy.

In this talk, I will first present an N-body simulation of a Milky Way–type galaxy experiencing a major merger and show how such an event can perturb stellar streams and generate long-lived signatures in terms of morphology, asymmetry, and energy-angular momentum. This experiment demonstrates that these merger-induced features in stellar streams can survive for several gigayears, well beyond the merger epoch itself. I will then generalize these conclusions to other merger configurations and discuss how comparisons with observed Milky Way streams can be used to constrain or exclude past merger scenarios.

- Claire Guillaume