HST Proper Motion Kinematics of Milky Way Globular Clusters

Globular clusters are far more complex than we once believed; proper motions are crucial if we are to fully understand their internal dynamics. Proper-motion studies provide two-dimensional velocities of tens of thousands of individual stars, which simultaneously constrain the velocity anisotropy, equipartition, and mass profile of the cluster. To that end, the HST Proper Motion (HSTPROMO) collaboration has constructed large, high-quality proper-motion catalogues for 22 globular clusters in the Milky Way. The datasets are both large and, thanks to the stability of HST, of exceptional accuracy. Such datasets demand similarly high standards in the modelling machinery used to analyse them, so we have developed state-of-the-art statistical modelling techniques that fully exploit the discrete nature of the datasets and can assess model fits on a star-by-star basis, avoiding the pitfalls inherent in analyses that require binning and averaging. In this talk, Dr. Watkins will discuss the HSTPROMO datasets, with particular focus on our recent and ongoing studies of the internal cluster kinematics, dynamical estimates of their distances, and analysis of their blue-straggler populations.