Driven by this motivation, we explored the dynamics of dissipationless collapse in the presence of non-vanishing initial total angular momentum. We present here the preliminary results of an extended survey of N-body simulations of the inhomogeneous initial conditions. The initial (non-rotating) configurations have been generated from homogeneous and inhomogeneous initial density distributions with different amounts of total angular momentum and pressure support.

Evidence of internal rotation in star clusters

New high precision spectroscopic observations and HST proper motion studies of thousands of stars in selected Galactic globular clusters are beginning to reveal detailed information about the three-dimensional kinematics of this class of stellar systems. Such a complete view of their velocity space calls for more realistic dynamical modeling, in which the effects of internal rotation are fully taken into account.

Method and initial conditions

We designed a survey of N-body simulations to investigate the effects of non-vanishing total angular momentum on the dynamics of dissipationless collapse (see also [9],[11],[12],[13]). The initial configurations are characterized by homogeneous and inhomogeneous density distributions and uniform rotation, with different values of \( Q_m = 2 N \sigma v / W \) and \( Q_m = 2 \sigma v / W \), where \( K \) and \( W \) denote the kinetic and potential energy, respectively. All models (\( N = 65536 \) equal-mass particles) have been followed during the collapse phase, until the configurations have reached equilibrium conditions (typically, at least \( T = 20 \) N-body units). All simulations have been performed with \texttt{starlab} [13].

\begin{table}[h]
\centering
\begin{tabular}{c|cccc|cccc}
\hline
\( Q_v \) & \hline
\hline
0.00 & H1a & H1b & H1c & H1d & 0.00 & F24,1a & F24,1b & F24,1c & F24,1b \\
0.05 & H1a & H1b & H1c & H1d & 0.05 & F24,2a & F24,2b & F24,2c & F24,2c \\
0.10 & H1a & H1b & H1c & H1d & 0.10 & F24,3a & F24,3b & F24,3b & F24,3b \\
0.15 & H1a & H1b & H1c & H1d & 0.15 & F24,4a & F24,4b & F24,4b & F24,4b \\
0.20 & H1a & H1b & H1c & H1d & 0.20 & F24,5a & F24,5b & F24,5b & F24,5b \\
\hline
\end{tabular}
\caption{Properties of the homogeneous (H) initial conditions. The degree of rotation increases from 1 (none) to 4 (maximum pressure). The pressure support increases from \( 1 \) (cold) to \( 4 \).}
\end{table}

An increase of the number of star clusters is being observed to have significant evidence of internal rotation. In this respect, it is crucial to understand the role of angular momentum during the initial stages of star cluster dynamical evolution.

we have explored the dynamics of dissipationless collapse in the presence of non-vanishing initial angular momentum. We present here the preliminary results of an extended survey of N-body simulations of the inhomogeneous initial conditions. The initial (non-rotating) configurations have been generated from homogeneous and inhomogeneous initial density distributions with different amounts of total angular momentum and pressure support.