Evolution of Super Star Cluster Winds with Strong Cooling

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We study the evolution of Super Star Cluster (SSC) winds driven by stellar winds and supernova (SN) explosions. Time-dependent rates at which mass and energy are deposited into the cluster volume, as well as the time-dependent chemical composition of the re-inserted gas, are obtained from the population synthesis code Starburst99. These results are used as input for a semi-analytic code which determines the hydrodynamic properties of the cluster wind as a function of cluster age. Two types of winds are detected in the calculations. For the quasi-adiabatic solution, all of the inserted gas leaves the cluster in the form of a stationary wind. For the bimodal solution, some of the inserted gas becomes thermally unstable and forms dense warm clumps which accumulate inside the cluster. We calculate the evolution of the wind velocity and energy flux and integrate the amount of accumulated mass for clusters of different mass, radius and initial metallicity. We consider also conditions with low heating efficiency of the re-inserted gas or mass loading of the hot thermalized plasma with the gas left over from star formation. We find that the bimodal regime and the related mass accumulation occur if at least one of the two conditions above is fulfilled.

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