TABLE 1

THE GALACTIC MODELS

Galaxy model	M_g $M_\odot$	M_h $M_\odot$	$v_c(r_{200})$ km s^{-1}	H kpc	$N^a_{\rm ep}$	$N^r_{\rm ep}$
G1	6.2×10^6	4.3×10^8	12	0.044	335	478
G2	3.0×10^7	2.1×10^9	20.8	0.071	530	766
G3	7.0×10^7	4.9×10^9	27.7	0.094	473	573
G4	1.4×10^8	9.4×10^9	34.3	0.118	458	646
G5	2.1×10^8	1.4×10^{10}	39.4	0.135	453	681
G6	3.0×10^8	2.1×10^{10}	44.5	0.153	429	666
G7	4.7×10^8	3.2×10^{10}	51.9	0.178	379	655
G8	7.0×10^8	4.8×10^{10}	59.2	0.203	317	585
G9	1.1×10^9	7.3×10^{10}	68	0.233	255	434
G10	1.5×10^{10}	1.1×10^{11}	76.8	0.263	191	317

where $M_{\rm ej,3H}$ is the total bound mass (including the ISM and the material from the SSCs) that reaches an altitude $\geq 3H$. This mass will be reinserted into the galactic disk at different radii. However, since it includes material both from the SSCs (with high metallicity) and from the ISM around the SSCs (lower metallicity) it is not clear how much the metallicity of the disk will be enhanced by this mixture. For that reason we define the fraction of metallic bound gas that leaves the galactic disk and reaches an altitude between $3H$ and $z_{\rm max}$ as

$$\chi_{b,z} \equiv \frac{M_{c,3H}}{M_c}\,, \tag{14}$$

where $M_{c,3H}$ is the bound mass injected by the stellar cluster that reaches an altitude $3H \leq z \leq z_{\rm max}$, and M_c the total mass injected by the SSC wind. This gives a better measure of the amount of high metallicity material available to spread throughout the disk. Nevertheless, a detailed study of how it will be distributed in the disk is necessary for a complete disk contamination model, which is beyond the scope of this paper.

4. NUMERICAL SIMULATIONS

We have performed adiabatic and radiative 3D N-Body/SPH simulations that model the effect of a central compact starburst, in which mechanical energy is injected by stellar cluster winds, using GADGET-2[3]. All simulations were done with three types of particles: disk, halo, and gas particles, and, unless otherwise stated, each consist of 30000, 40000, and 30000 particles, respectively. Two separate simulations were run for each model, one adiabatic and a second one including radiative losses.

Most simulations (low-resolution simulations) use a timestep $\sim$1–3$\times10^5$ yr and a Plummer softening of 0.25 kpc, 0.5 kpc, and 0.25 kpc, for gas, halo, and disk particles, respectively. We ran a grid of models using different galaxy masses and starburst energies. The parameters of the models are described below.

4.1. *The host galaxies*

We constructed ten isolated galaxies as described in Springel (2000) and in § 2 of this paper. The galaxies are named G1 to G10; they have ISM masses in the range of $\sim5\times10^6 - 10^{10}$ $M_\odot$, similar to those used by MacLow & Ferrara (1999); the total masses are in the $\sim4\times10^8 - 1\times10^{12}$ $M_\odot$ range. The disk masses of the galaxies are given by $M_d = 0.041\ M_{\rm tot}$, and the total mass of the gas is 35% of the galactic visible mass in all of the models.

Table 1 shows the mass of the gas and the halo, the circular velocity at r_{200} and R_0 for all the galactic models.

4.2. *The starburst regions*

In order to reproduce the observed properties of starburst galaxies with young stellar clusters, including M82, NGC 253 and NGC 1569, we use a wide range of SBs masses. We should note that the numbers of these energetic stellar asociations in the host galaxies were detected at optical wavelengths (e.g.,

[3]GADGET-2 is a code for cosmological N-Body/SPH-simulation on serial workstations or massively parallel computers with distributed memory (Springel, Yoshida, & White 2001; Springel 2005).