In the CR bombarding energy range (1-100 GeV/nucleon), reactions are usual described by a succession of processes:

1) the reaction dynamics

« participants » (overlap region) + « spectators » (targ. and proj. remnants)

ex: - string models (high energy)

- Intra Nuclear Cascade models (incoherent nucleon-nucleon interactions)

- Boltzmann-type models (QMD, BUU, LV…)

2) a 'pre-equilibrium' process (high-energy nucleons escaping from the nucleus)

(sometimes neglected)

3) once thermal equilibrium is reached, a statistical decay of the excited nuclei

(assumed to be similar to compound nuclei resulting from fusion reactions):

evaporation of nucleons or light nuclei, emission of gamma-rays, fission.

At high energy, there is a fundamental problem:
the decay time of a highly excited nucleus becomes very short, comparable with the reaction time (« cooling » overlap with « heating ») : the above steps are intermingled…