SNEC: The SuperNova Explosion Code

Version 1.01 – Changelog

Changes between `SNEC-1.01` and `SNEC-1.00` are related to the performance of the code only, while all the physics is the same. `SNEC-1.01` is about a factor ~ 2 faster than `SNEC-1.00`.

The technical improvements making the code faster include:

- Constructing opacity tables for each grid point from the OPAL tables once at the beginning of the simulation, instead of calling the OPAL routine at each time step. This is justified by the fact that in the current version of `SNEC` the composition of the profile does not change with time;
- Optimization of matrix element calculation in `arrays.F90`. Thanks go to Brian W. Mulligan (University of Texas, Austin);
- Optimization of `nickel.F90` and `simple_saha.F90` routines.

Other small changes and fixes include:

- Fix in the mean lifetime and yield of ^{56}Co, the current values are taken from Nadyozhin, ApJS 92, 527 (1994);
- Error message in the case when the number of grid points is not equal to the number of lines in `GridPattern.dat` (note that some machines require a blank line at the end of the file to count the number of lines correctly);
- Adding (optional) parameters `bomb_mode` and `Ni_by_hand`.

  In the case when `bomb_mode=1` (default), the parameter `final_energy` corresponds to the asymptotic energy of the system, as in `SNEC-1.00`. In the case when `bomb_mode=2`, the parameter `final_energy` corresponds to the thermal bomb energy.

  In the case when `Ni_by_hand=1` (default), the mass fraction of ^{56}Ni is calculated from the parameters `Ni_mass` and `Ni_boundary_mass` as in `SNEC-1.00`. In the case when `Ni_by_hand=0`, the mass fraction of ^{56}Ni is taken from the composition profile.