SPH Flux-Limited Diffusion

$$dn^i_{\nu_l}/dt = \sum_j \min(c, D^{ij}_{\nu_l}/r^{ij})(n^i_{\nu_l} b^{i\to j}_{\nu_l} - n^j_{\nu_l} b^{j\to i}_{\nu_l}) \nabla W^{ij} \; m^j/\rho^j$$

$$de^i_{\nu_l}/dt = \sum_j \min(c, D^{ij}_{\nu_l}/r^{ij})(\epsilon^i_{\nu_l} n^i_{\nu_l} b^{i\to j}_{\nu_l} - \xi^{j\to i}\epsilon^j_{\nu_l} n^j_{\nu_l} b^{j\to i}_{\nu_l}) \nabla W^{ij} \; m^j/\rho^j$$

where $D^{ij}_{\nu_l}$ is the harmonic mean of the diffusion coefficients of particles i and j, r^{ij} is the distance between particles i and j, and $b^{i\to j}_{\nu_l}$ are the fermion blocking factors:

$$b^{i\to j}_{\nu_l} = \exp(\xi^{i\to j}\epsilon^j_{\nu_l}/T^j_{\nu_l} - \eta^j_{\nu_l})/[1+\exp(\exp(\xi^{i\to j}\epsilon^j_{\nu_l}/T^j_{\nu_l} - \eta^j_{\nu_l})].$$

ξ is the correction for gravitational redshift, ϵ is the mean neutrino energy, T and η are the neutrino temperature and degeneracy, and $e^i_{\nu_l}$ pis the mean neutrino energy.

This works suprisingly well!