Systematic studies of core-collapse supernovae:

BLACK HOLE FORMATION IN FAILING CORE-COLLAPSE SUPERNOVAE

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PROGENITOR-EXPLOSION CONNECTION AND REMNANT BIRTH MASSES FOR NEUTRINO-DRIVEN SUPERNOVAE OF IRON-CORE PROGENITORS

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SYSTEMATIC FEATURES OF AXISYMMETRIC NEUTRINO-DRIVEN CORE-COLLAPSE SUPERNOVA MODELS IN MULTIPLE PROGENITORS

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These numerical simulations cover

10-~100Mo progenitors (of solar metallicity),

collapse - bounce- shock revival - breakout of iron core,

wide variety of CCSN properties such as explosion energy.

2D CCSN simulations of 101 progenitors (KN et al. 2014)

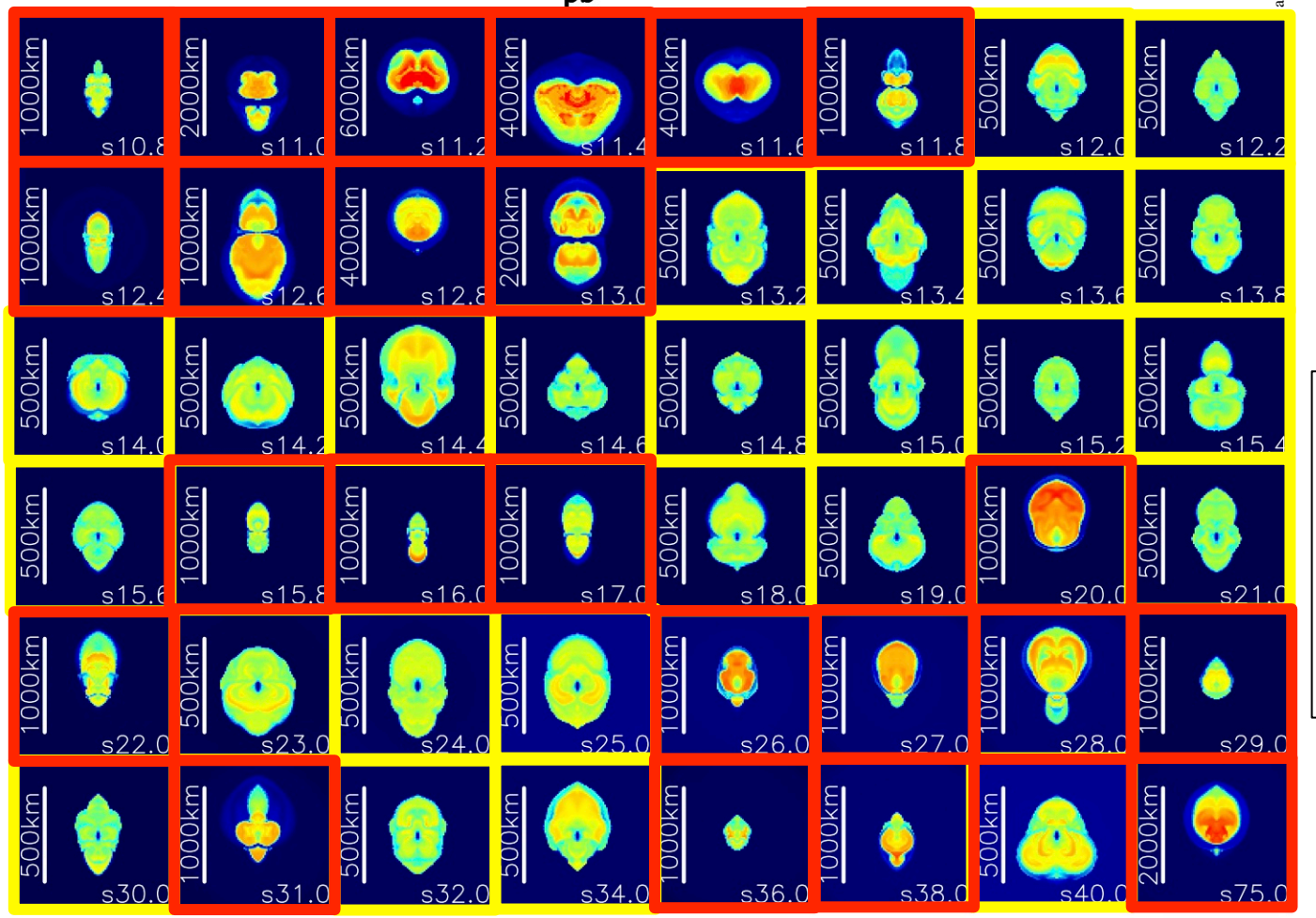
LS220 EOS, IDSA scheme, Newtonian, WHW02 progenitors

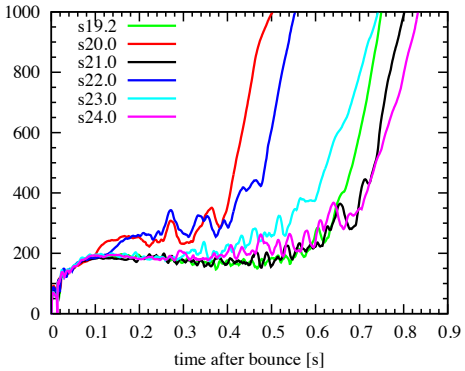
Entropy profiles showing expanding/stalling shock.

T_{pb}= 400ms

... expanding

... stalling





Some guys explode EASILY.

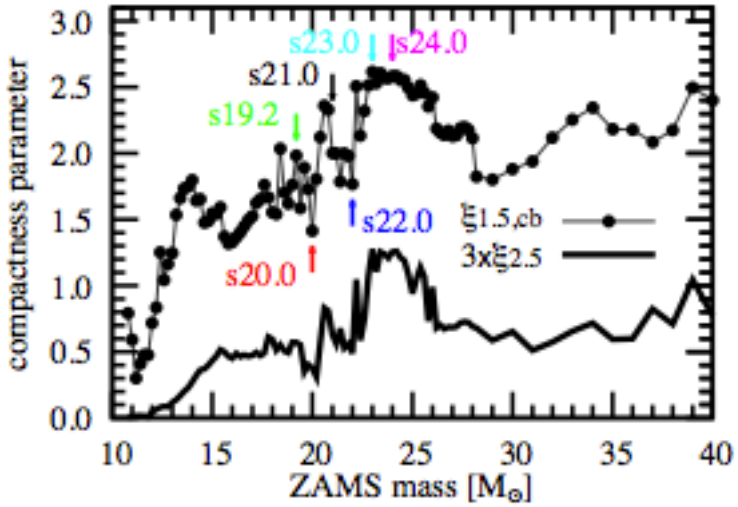
Question 1.
What determines "explodability" ? (and other CCSN properties such as Eexp, M_Ni, etc. ?)

Progenitor mass is NOT good.

Compactness parameter ξ (O'Connor & Ott '11): Ratio of enclosed mass M to radius R.

$$\xi \equiv \frac{M/\ M_\odot}{R(M)/1000\mathrm{km}}$$

Compactness of
WHW02 progenitors



Question 2.
This "zig-zag structure" is real?

a) Mass accretion rate
b) electron-neutrino luminosity
c) time of shock revival
d) growth rate of explosion energy
e) mass of central remnant
f) mass of ejected nickel
as a function of "compactness".

Question 3.
The "compactness parameter" is really a good criterion?