The r-process in core-collapse supernovae driven by the magneto-rotational mechanism

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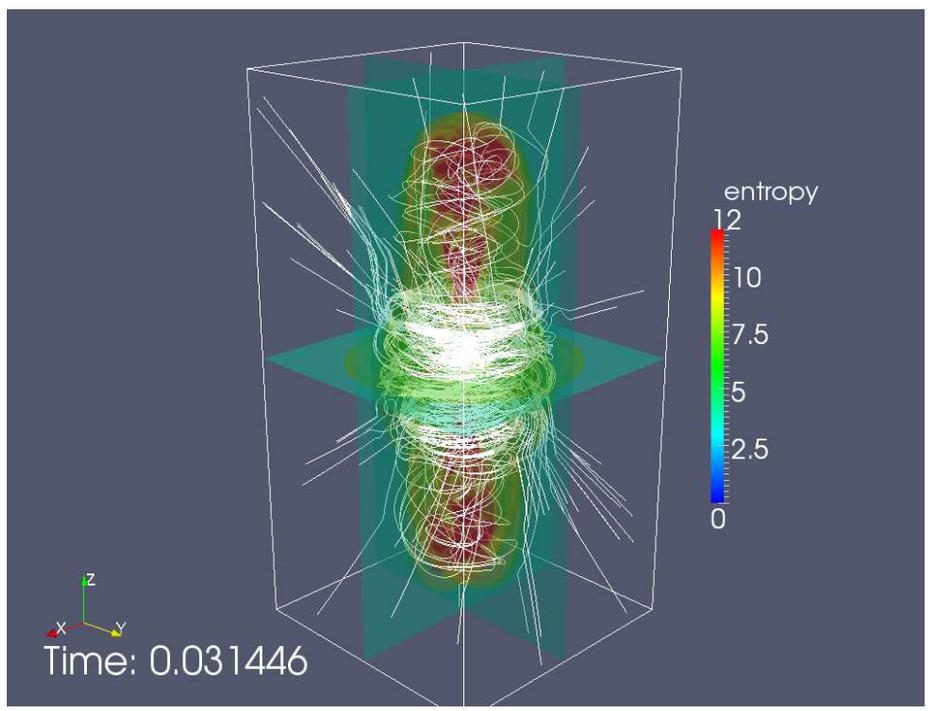
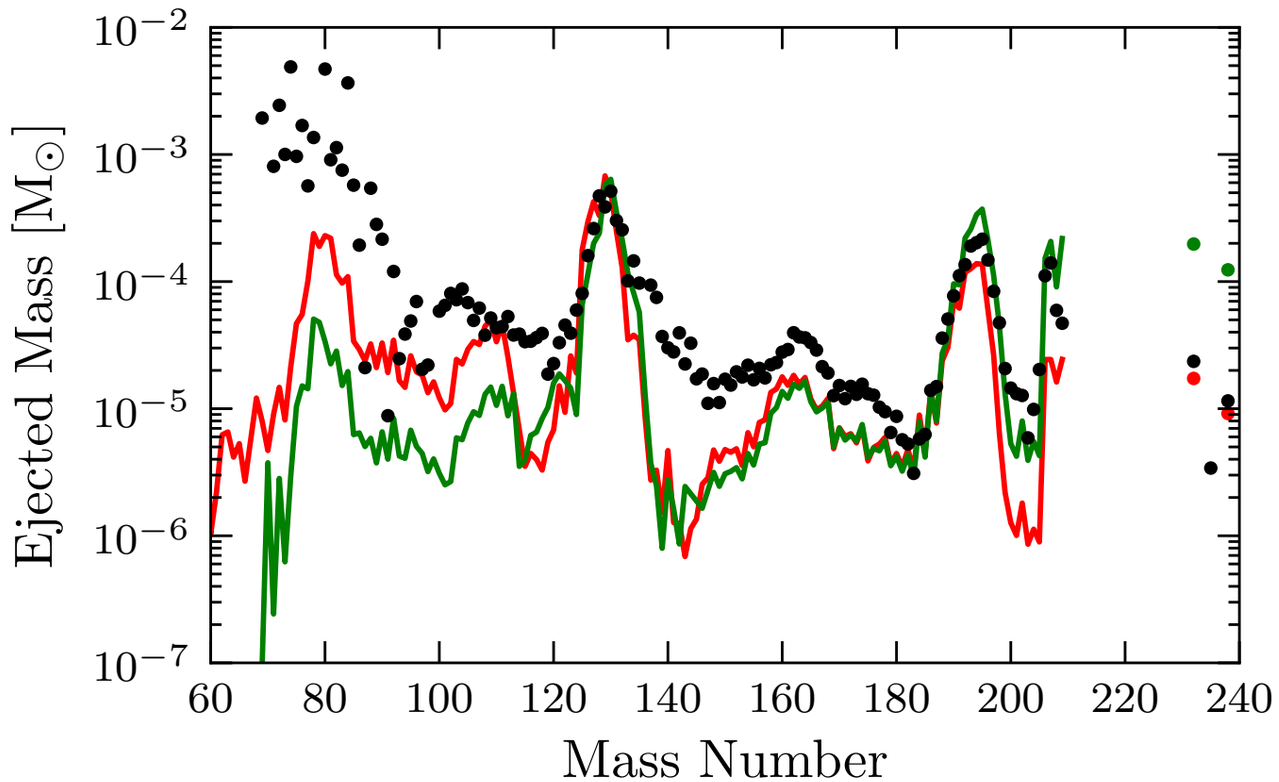
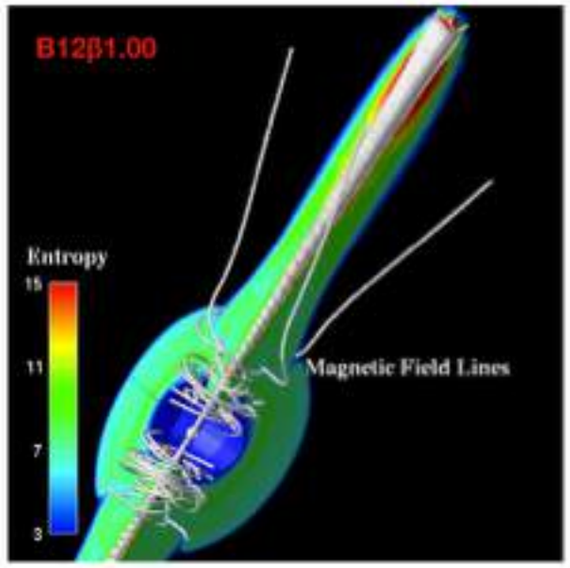
C. Winteler et al. (2012) based on Basel collaboration

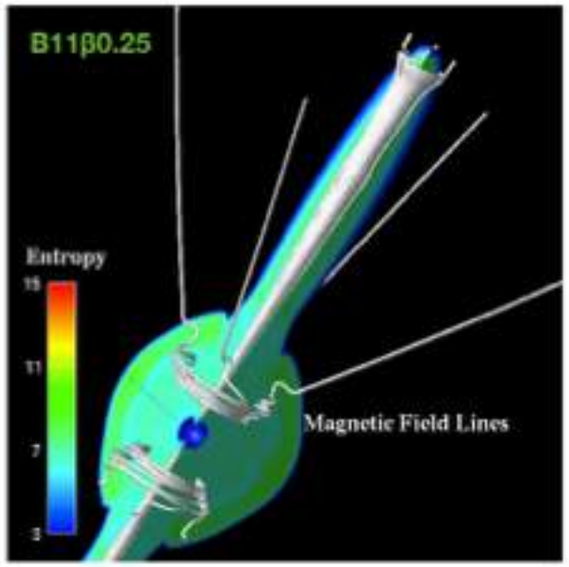


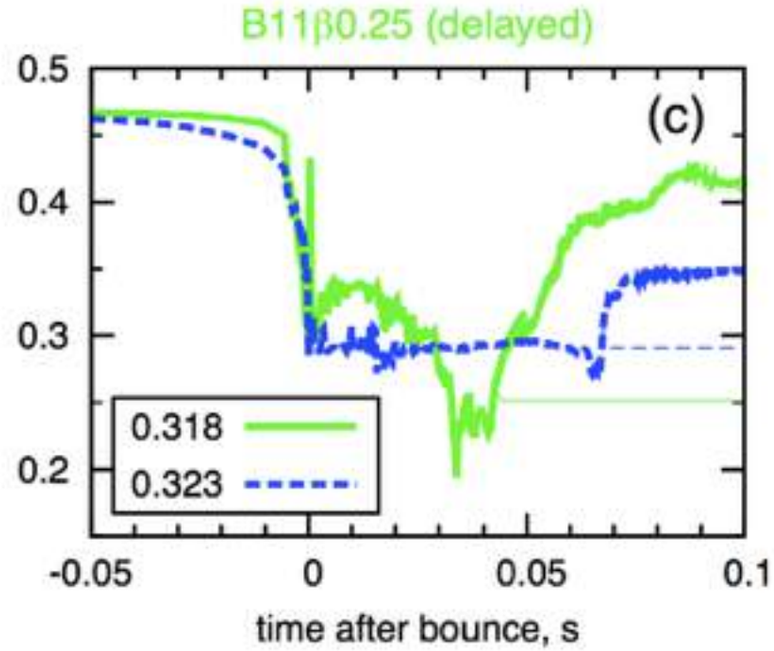


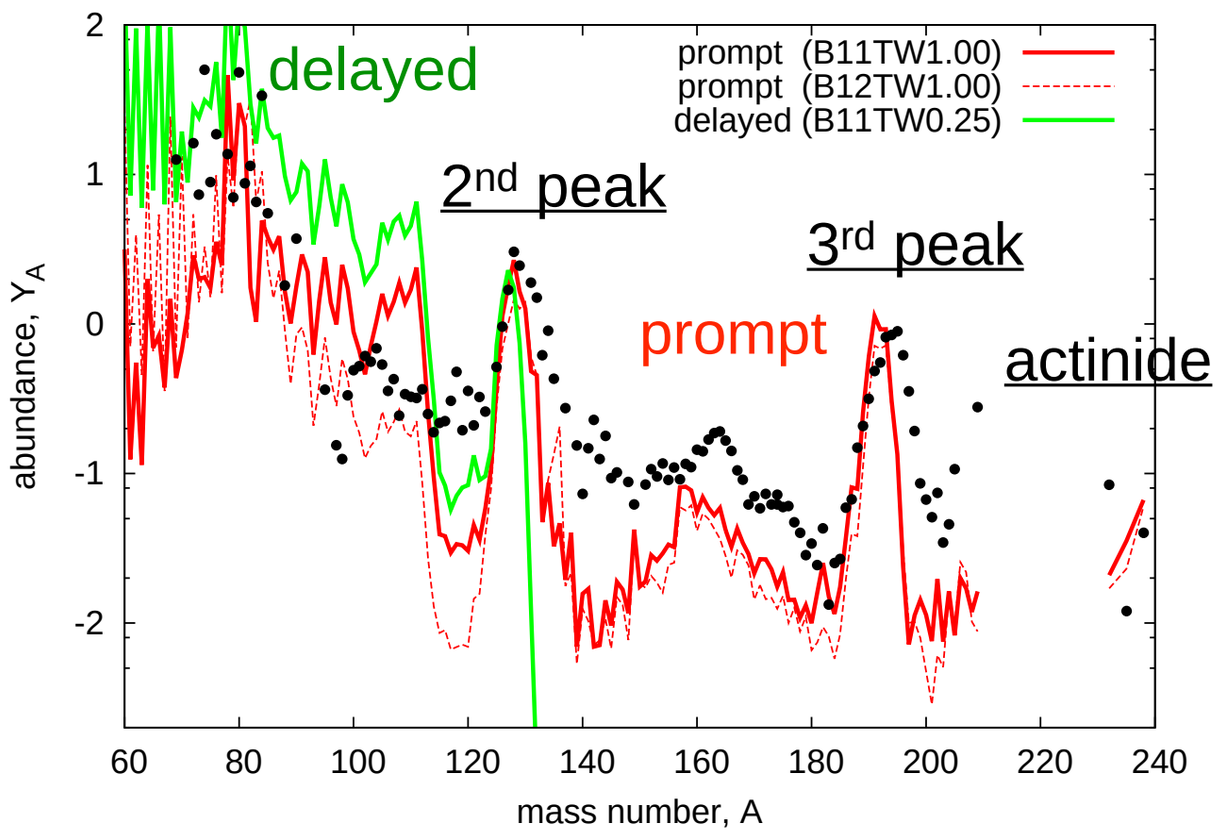
“weaker" pre-collapse magnetic fields

Based on Takiwaki and Kotake + (2009, 2011)









New hydro simulation with MRI

Sawai and Yamada (2014)

initial B-fields

(dipole-like)

no MRI

plasma beta p/p_B

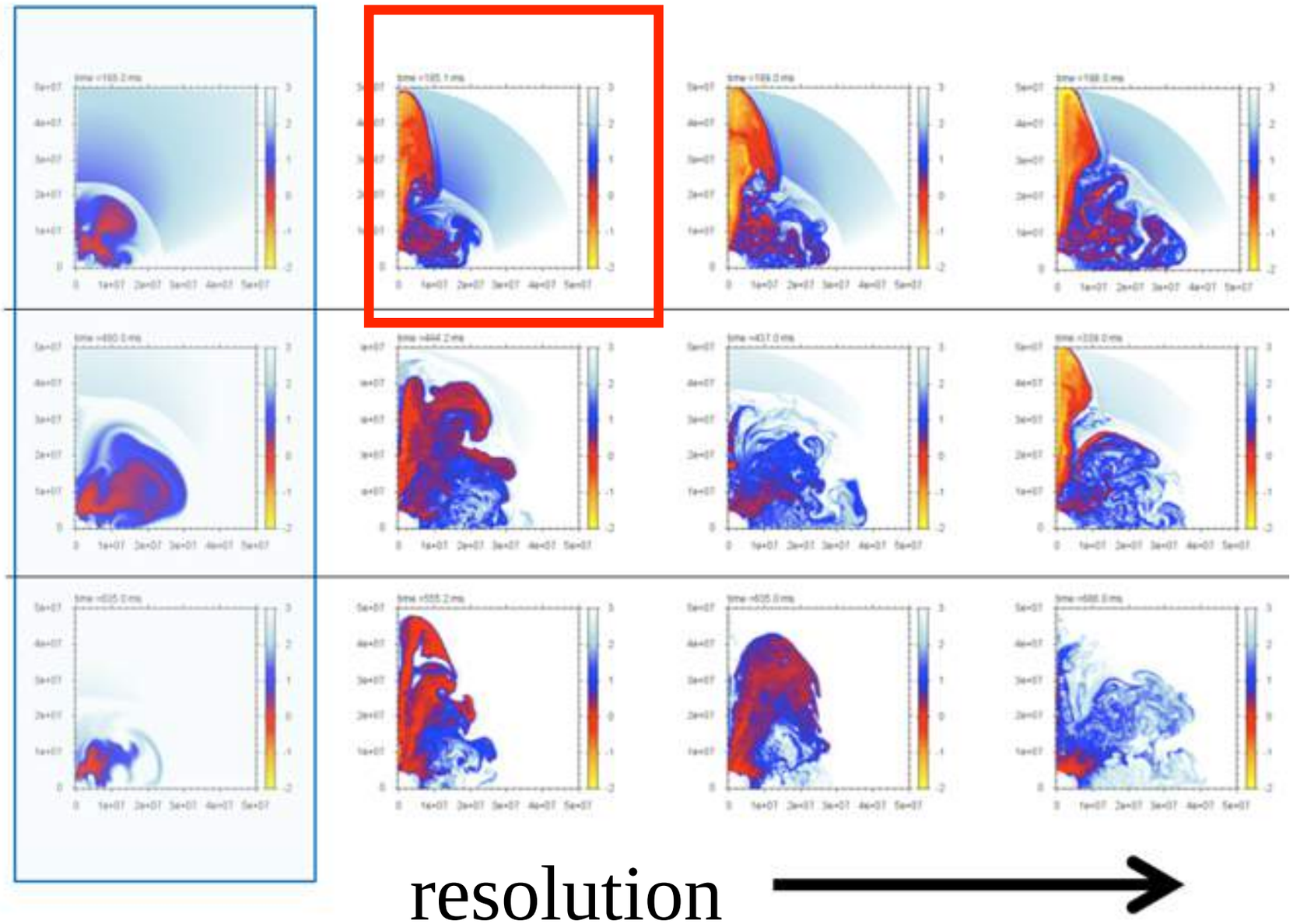
Log[β]

2×10^{11} G

1×10^{11} G

5×10^{10} G

magnetic fields

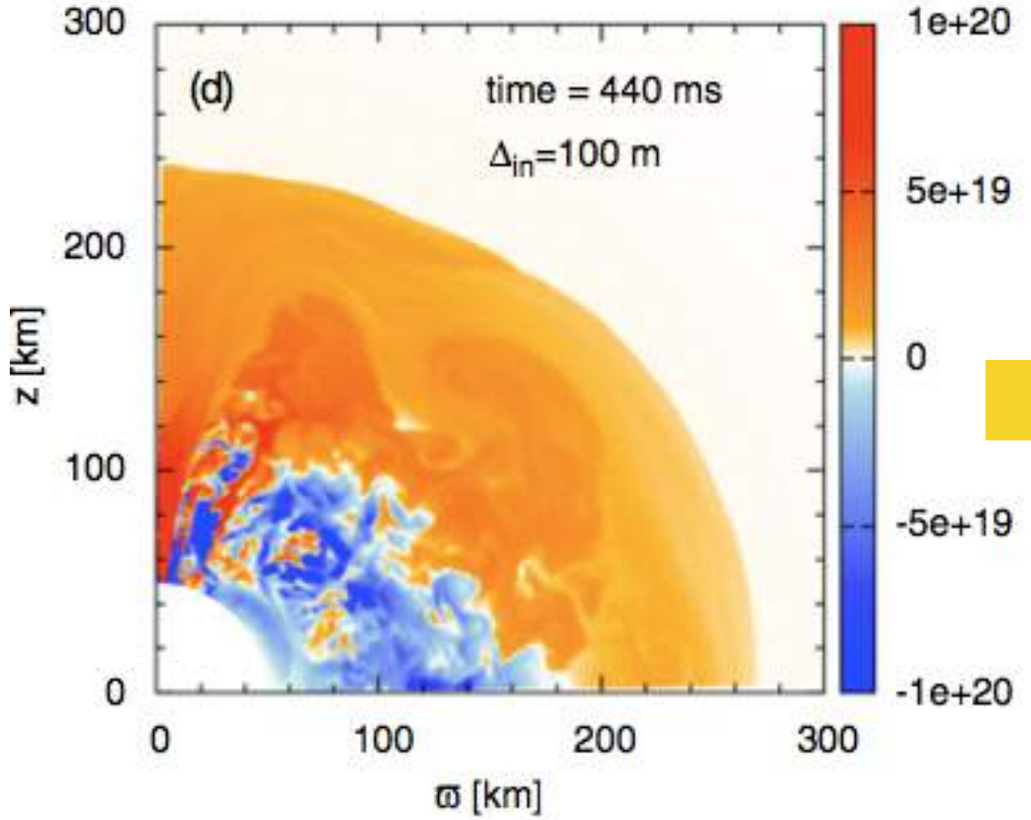


resolution

Neutrino-heating with rotation and mag.-fields

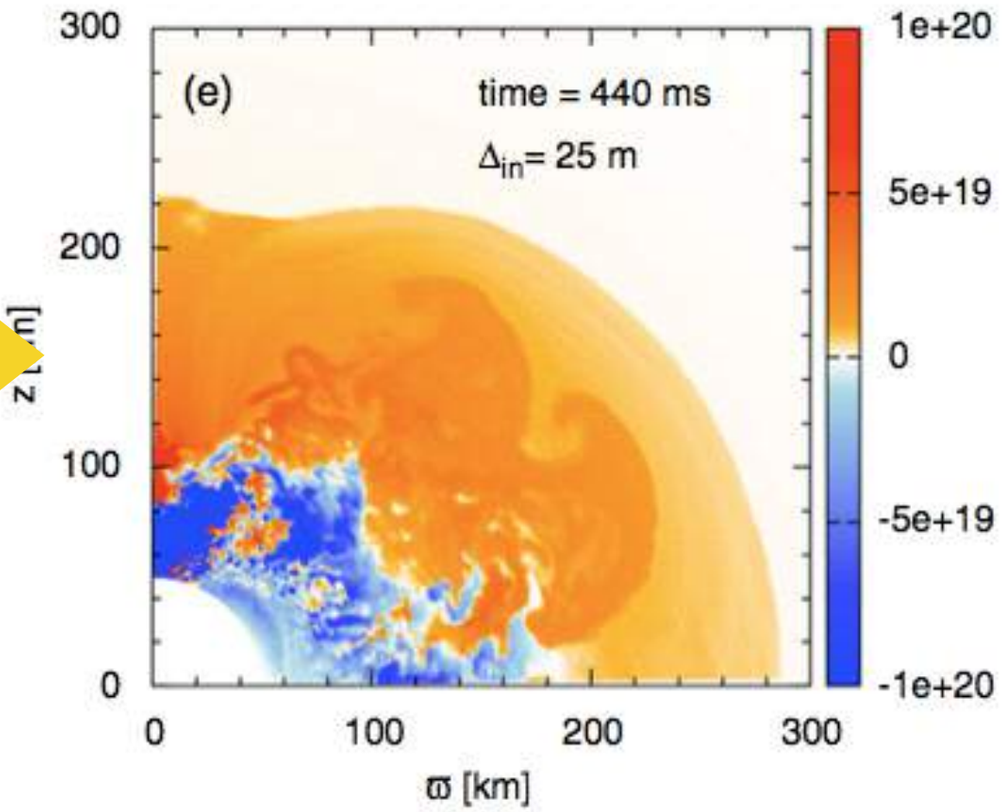
heating rate /volume

lower resolution



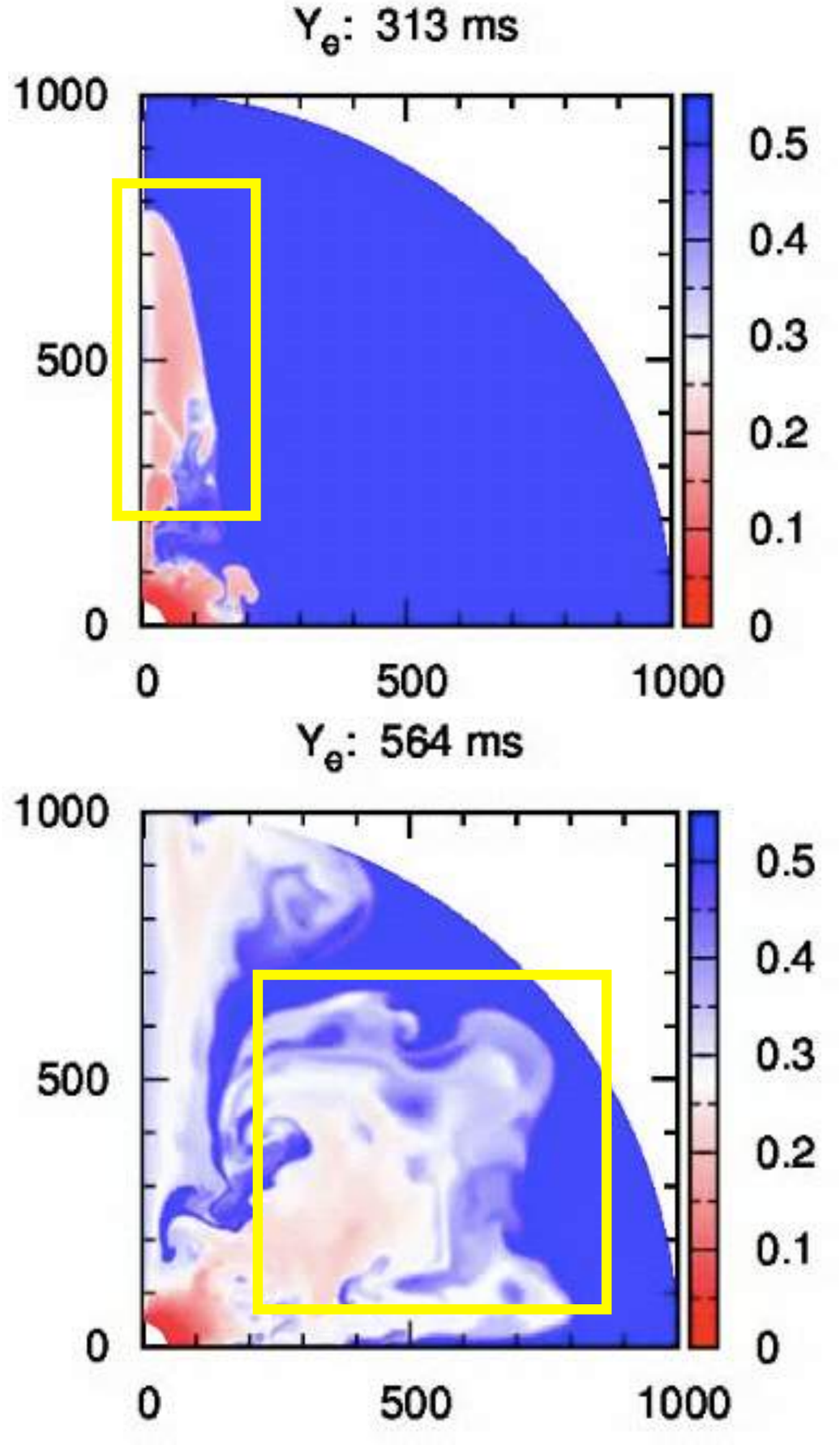
Sawai & Yamada (2014)

finer resolution

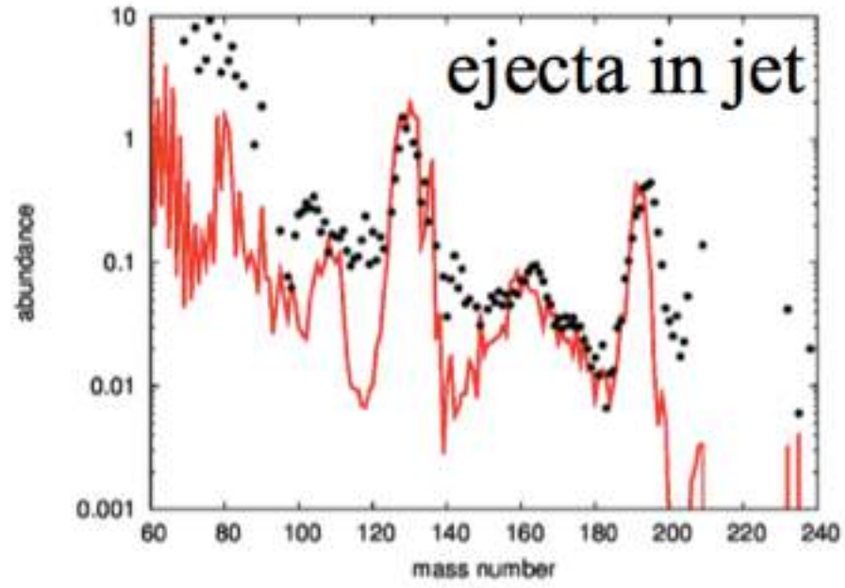


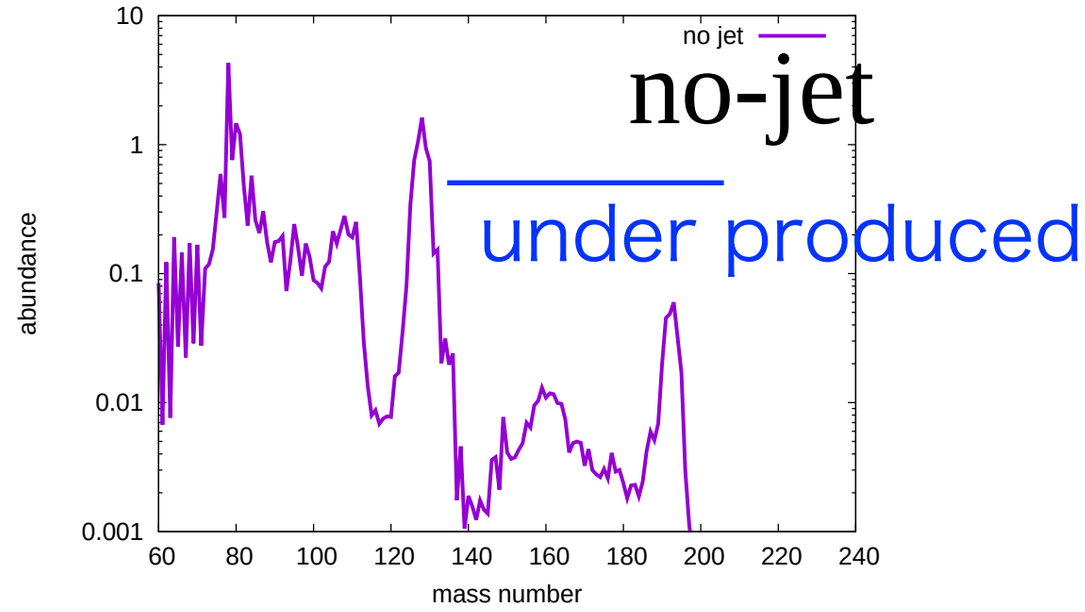
- outflow due to neutrino heating
  - active angular momentum transport by MRI
    (angular momentum transfer ∝ $B_{pol} \times B_{tor}$)
  - by centrifugal force
- final yields? : needs longer time-scale simulation

nucleosynthesis in jet and ν-heating via MRI



ejected mass by jet = 2.0×10^{-3} $M_\odot$ (only Jet)





ejecta is less neutron-rich