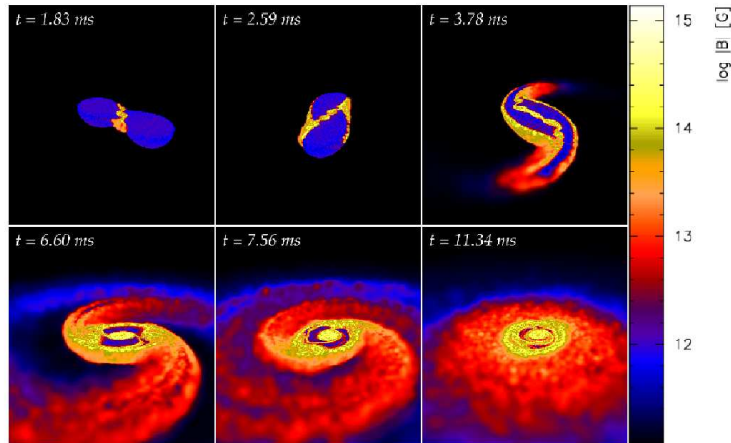









Physical sketch

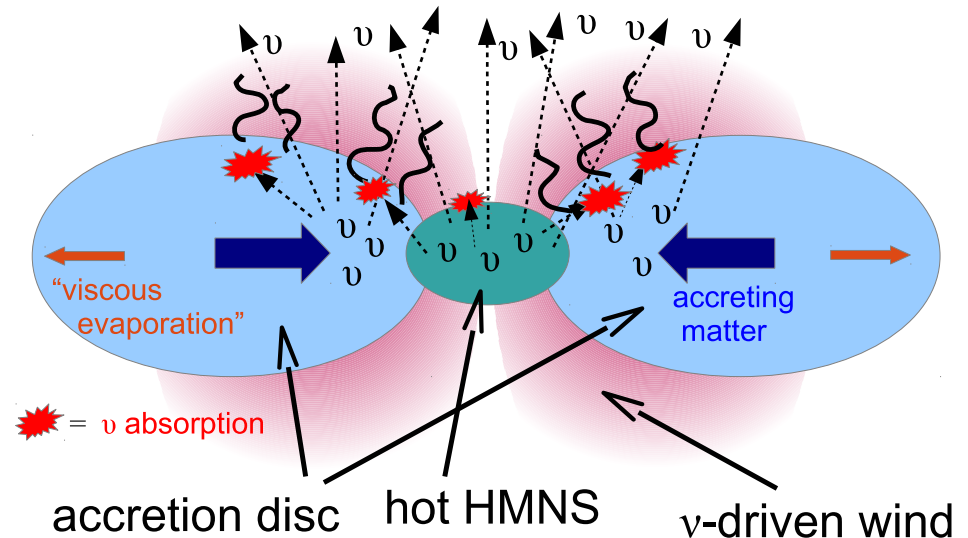


Final stages of a binary NS ($2 \times 1.4M_{\odot}$) system evolution

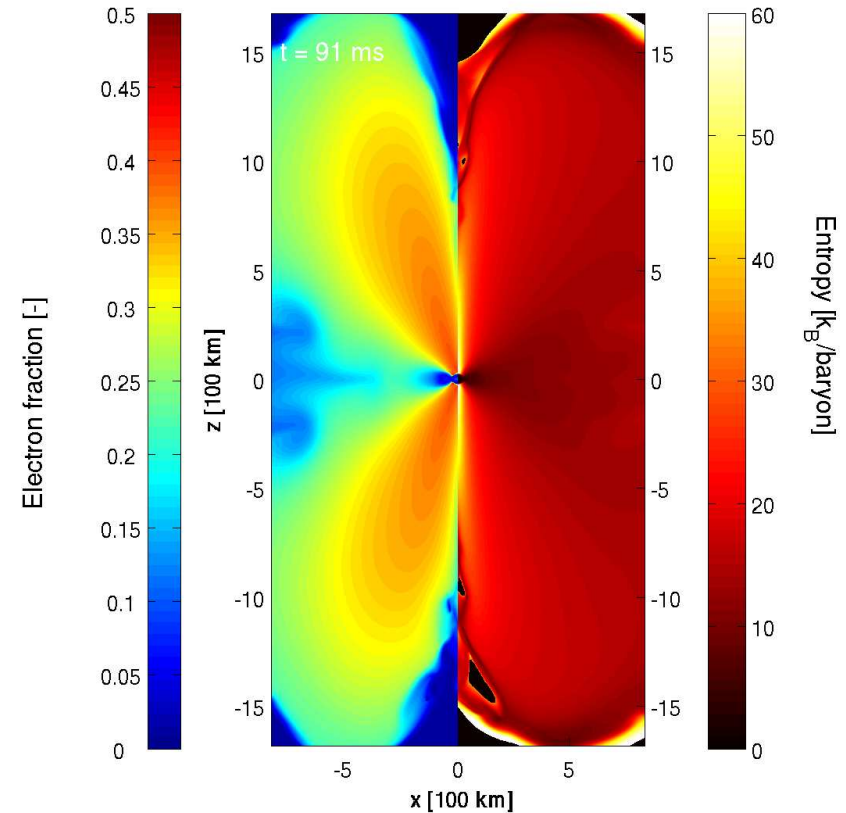
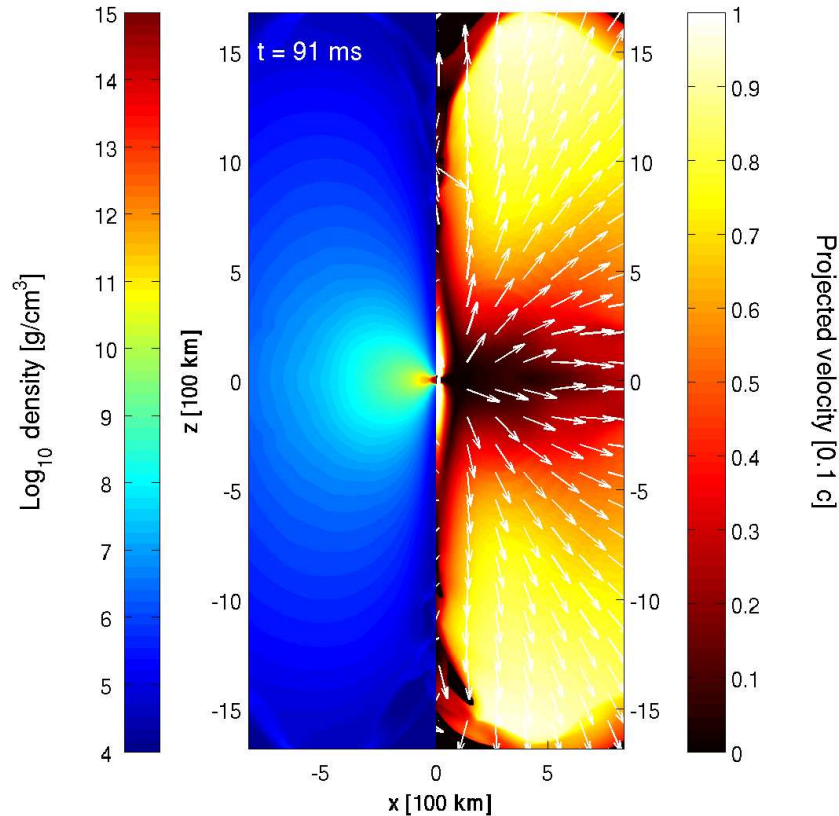
-  inspiral
-  merger
-  hypermassive NS (HMNS) + disc

Credit: Price&Rosswog 06

-  HMNS (\rightarrow BH)
 $\sim 2.55M_{\odot}$
-  thick accreting torus
 $\sim 0.17M_{\odot}$, $Y_e \lesssim 0.05$
-  intense ν emission
 $L_{\nu, \text{tot}} \sim 10^{53} \text{erg s}^{-1}$
-  ν -disc interaction: wind



Disc and wind dynamics



Picture I

left: matter density

right: projected velocity

Perego, Rosswog, Cabezón, Korobkin, Käppeli, Arcones, Liebendörfer 2014

Picture II

left: electron fraction

right: entropy

Ejecta

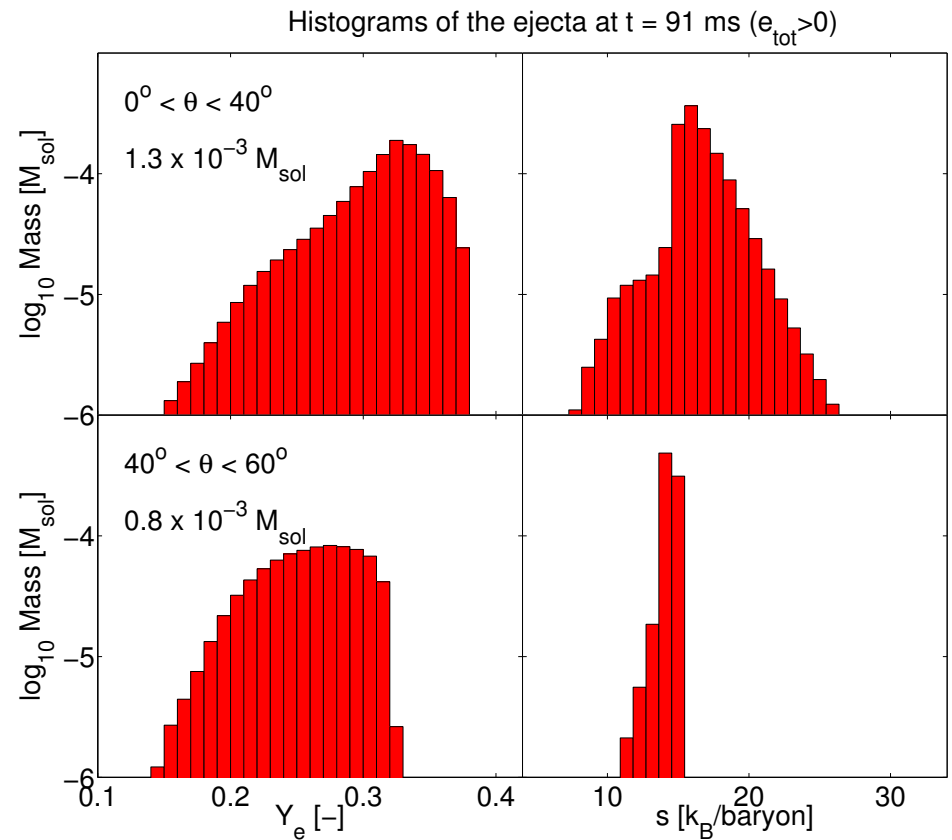
- criteria: 1) $e_{\text{tot}} = e_{\text{kin}} + e_{\text{th}} + e_{\text{pot}} > 0$ & 2) $v_r > 0$ & 3) $\theta < 60^\circ$
- nuclear recombination energy included

high latitudes ($0^\circ < \theta < 40^\circ$)

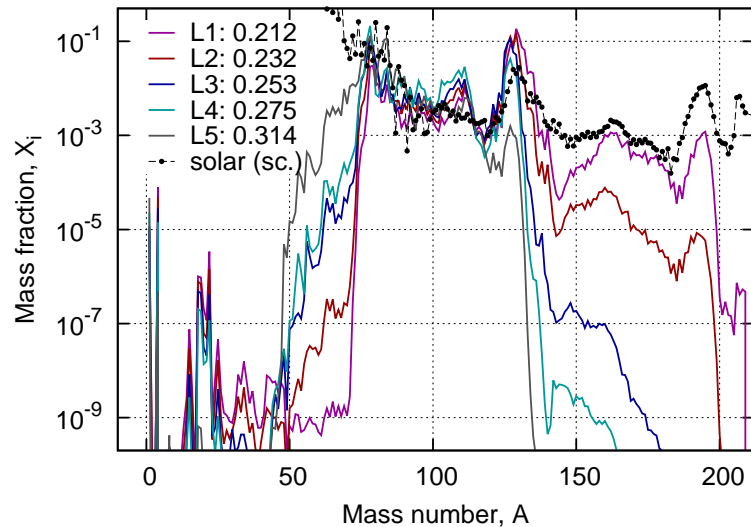
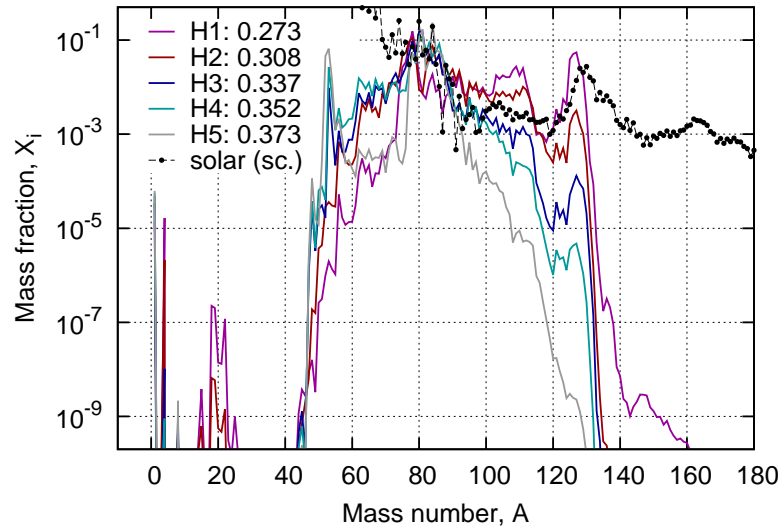
- $m_{\text{ej}}(t = 91 \text{ ms}) \approx 1.3 \times 10^{-3} M_\odot$
 $m_{\text{ej}}(t = t_{\text{disc}}) \lesssim 5 \times 10^{-3} M_\odot$
- Y_e : 0.31-0.35
 s : 15-20 $k_B \text{ baryon}^{-1}$
 v_r : 0.08-0.09 c

low latitudes ($40^\circ < \theta < 60^\circ$)

- $m_{\text{ej}}(t = 91 \text{ ms}) \approx 0.8 \times 10^{-3} M_\odot$
 $m_{\text{ej}}(t = t_{\text{disc}}) \lesssim 4 \times 10^{-3} M_\odot$
- Y_e : 0.23-0.31
 s : 14-15 $k_B \text{ baryon}^{-1}$
 v_r : 0.06-0.07 c



nucleosynthesis: representative tracers

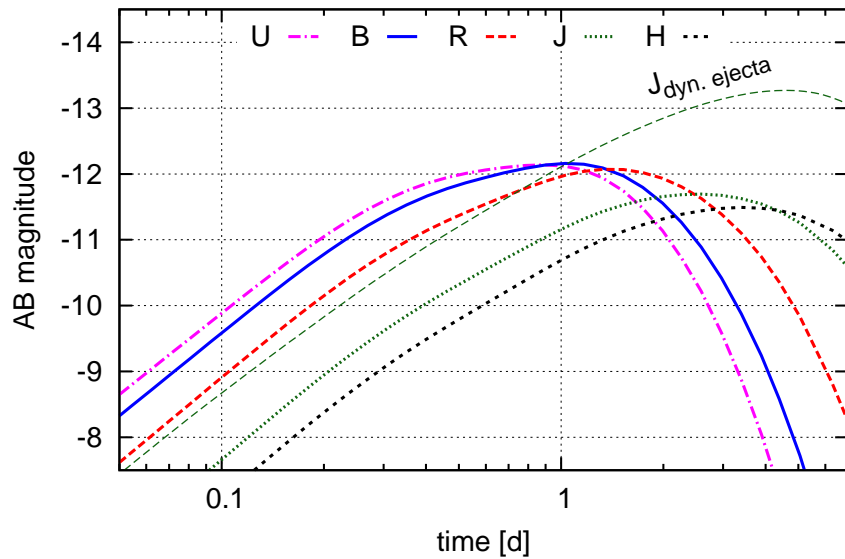


Tracer	Y_e	s [k_B /baryon]	$\langle A \rangle_{\text{final}}$	$\langle Z \rangle_{\text{final}}$	$X_{\text{La,Ac}}$
L1	0.213	12.46	118.0	46.2	0.04
L2	0.232	11.84	107.1	42.5	0.009
L3	0.253	12.68	98.0	39.2	$7 \cdot 10^{-5}$
L4	0.275	12.73	90.2	36.4	$1 \cdot 10^{-7}$
L5	0.315	13.68	81.7	33.0	$3 \cdot 10^{-12}$
H1	0.273	13.57	93.0	37.4	$8 \cdot 10^{-7}$
H2	0.308	14.69	83.3	33.7	$6 \cdot 10^{-11}$
H3	0.338	15.36	79.4	32.1	$< 10^{-12}$
H4	0.353	16.40	78.4	31.7	$< 10^{-12}$
H5	0.373	18.35	76.8	31.0	$< 10^{-12}$

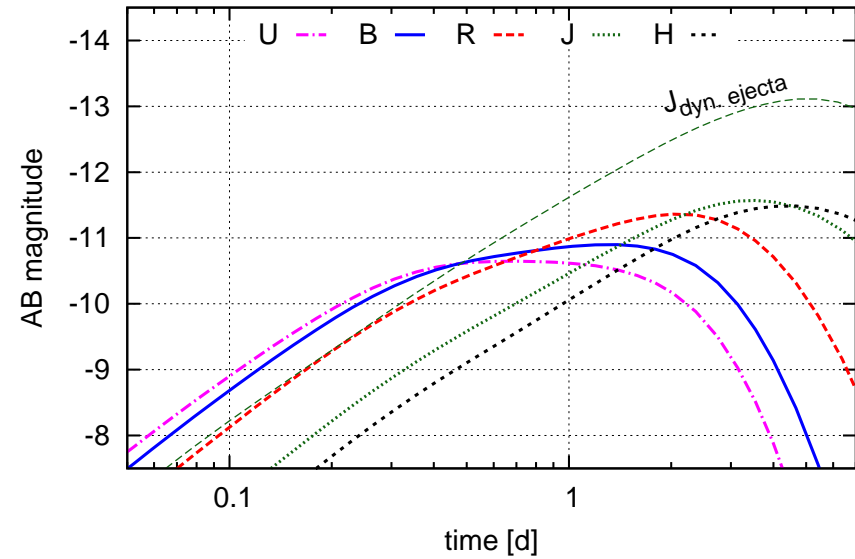
- post-processed with *WinNet*
 - no robust r-process
 - weak r-process ($70 \lesssim A \lesssim 110$)
 - significant differences between high and low latitudes
- Winteler et al (2012)

credit to O. Korobkin

e.m. transient: broadband lightcurves



top/on-axis view



side/off-axis view

credit to O. Korobkin

- AB broadband lightcurves
- high latitude: peak in B band at $t \sim 1.3$ d
low latitude: dimmer, redder and delayed
- comparison with dynamical ejecta ($m_{\text{dyn}} \approx 1.3 \times 10^{-2} M_{\odot}$)

Open questions

- HMNS timescale and impact of BH formation
- wind evolution over t_{disc} : m_{ej} , Y_e
- impact of nuclear physics on wind properties (Y_e) and observables (nucleosynthesis and lightcurves)
- influence of EOS: NS radius and its influence on merger dynamics
- ν -annihilation and implication for short GRBs
- baryonic pollution and implication for short GRBs
- combination with other ejection channels (dynamical + viscous ejecta)