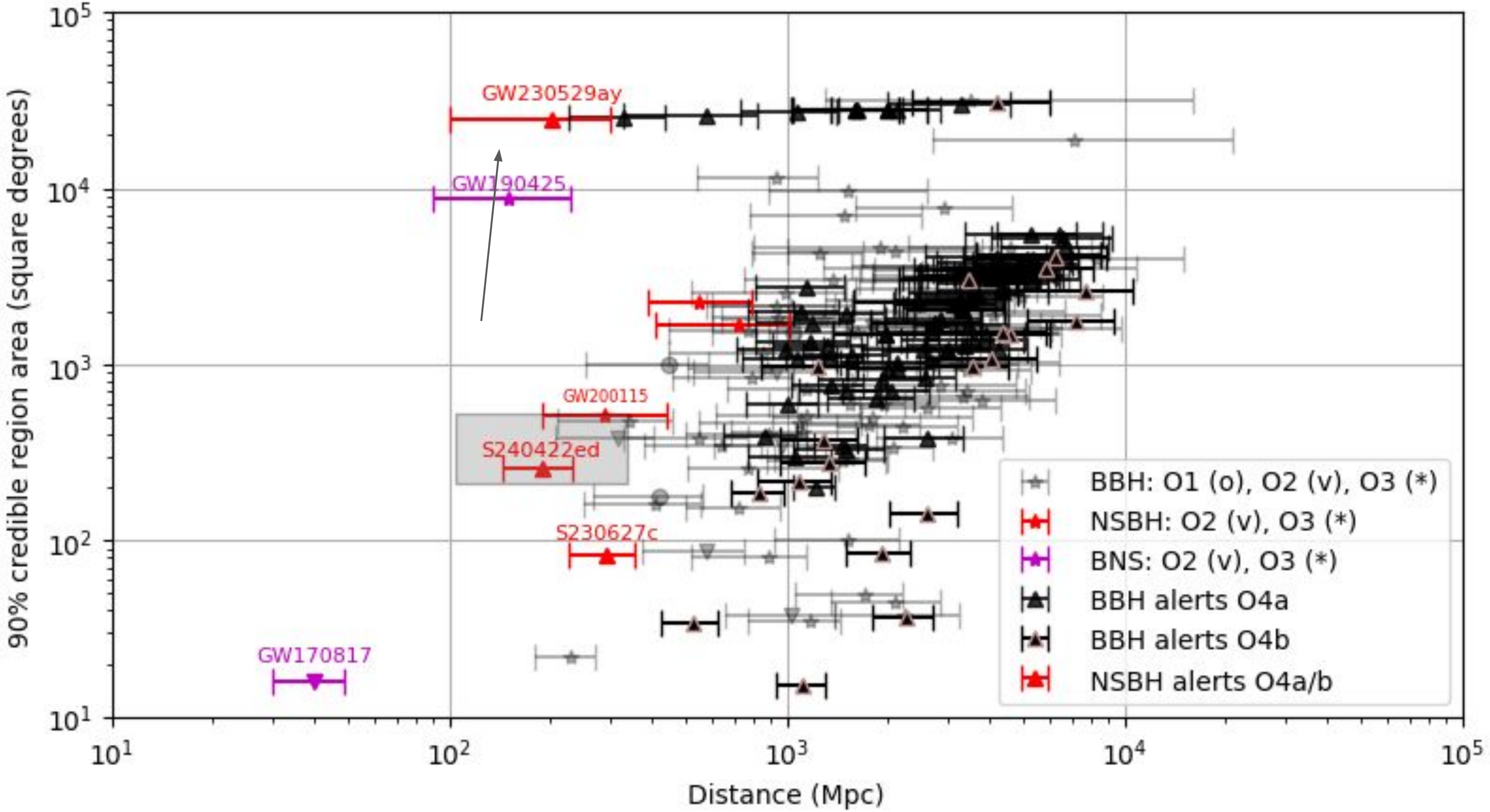
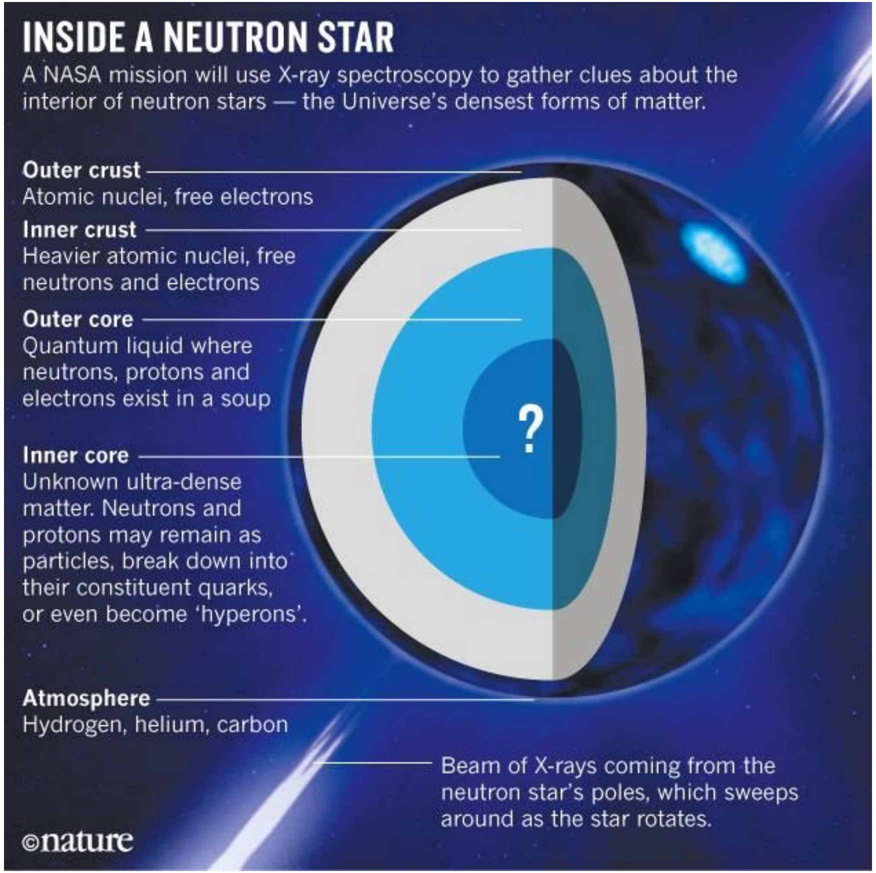
Quantity of ejectae for NS-BH mergers

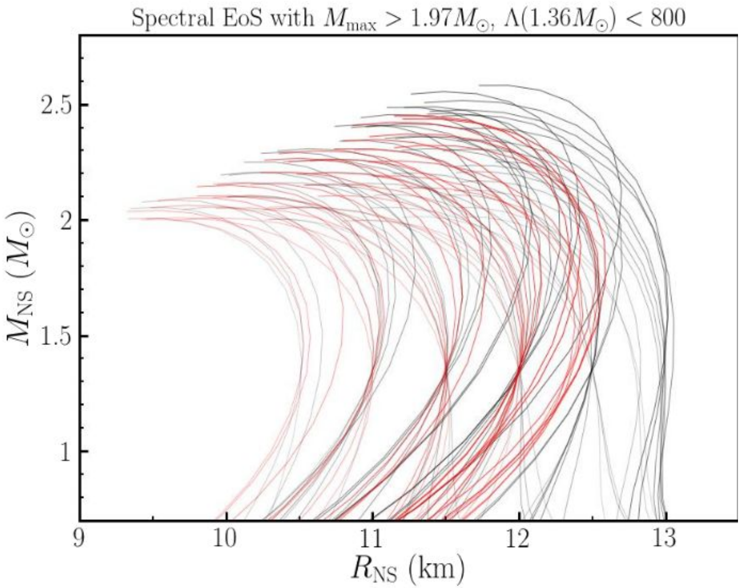
S. Antier (OCA)

Where we are in terms of alerts in O4



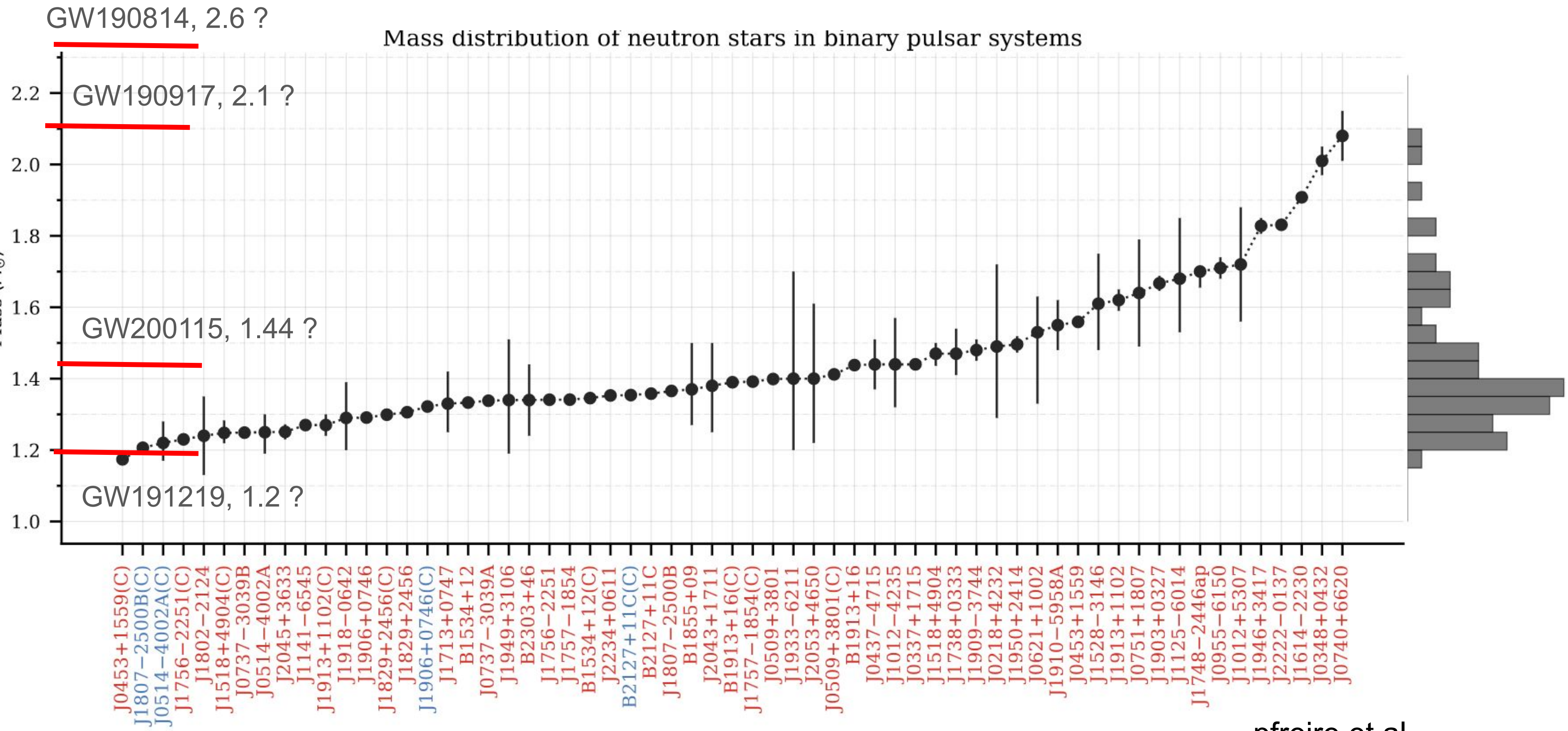
Neutron star composition





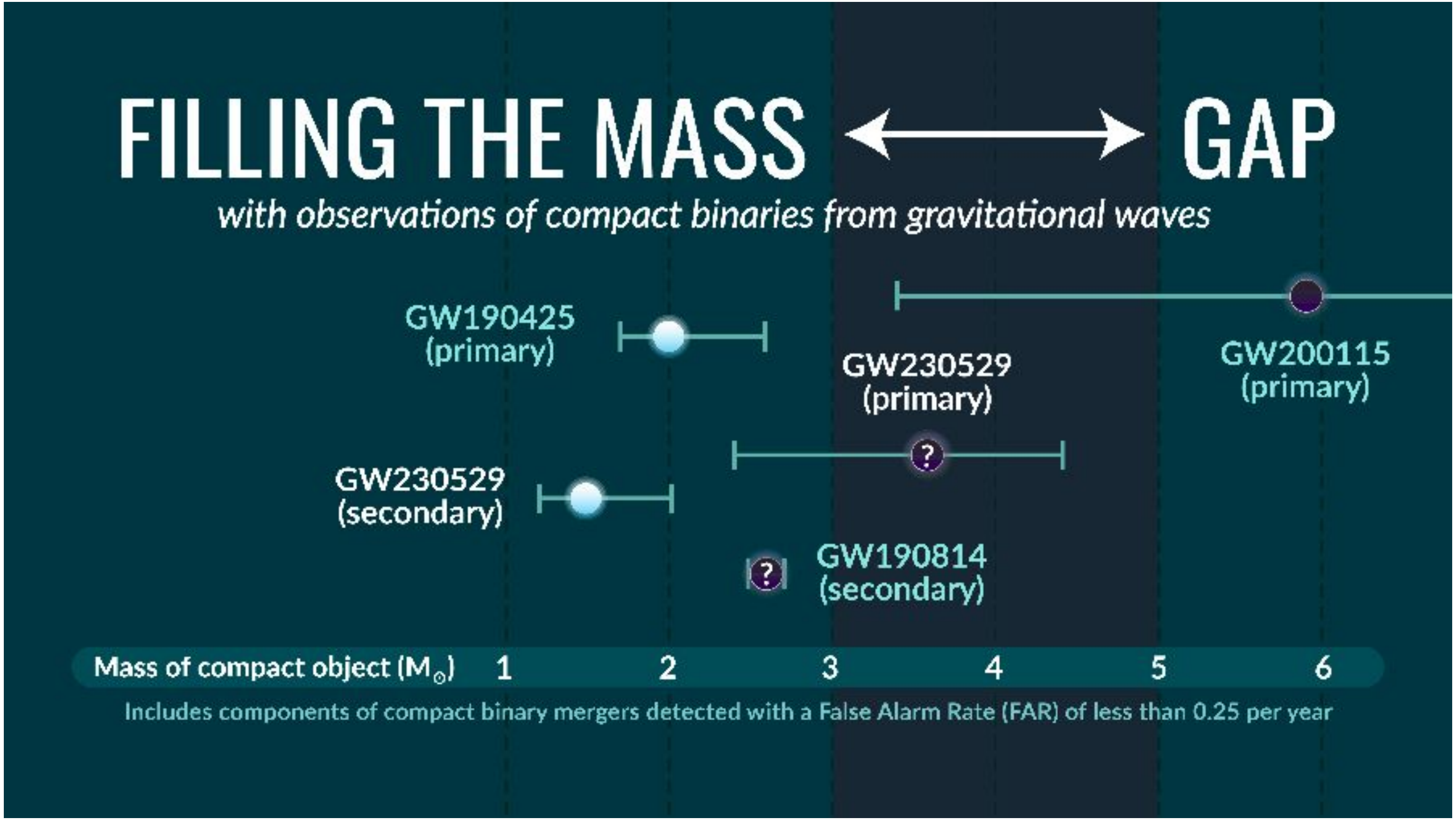
Size and maximum mass of neutron stars are important observables to constrain the properties of dense nuclear matter!

Neutron star masses

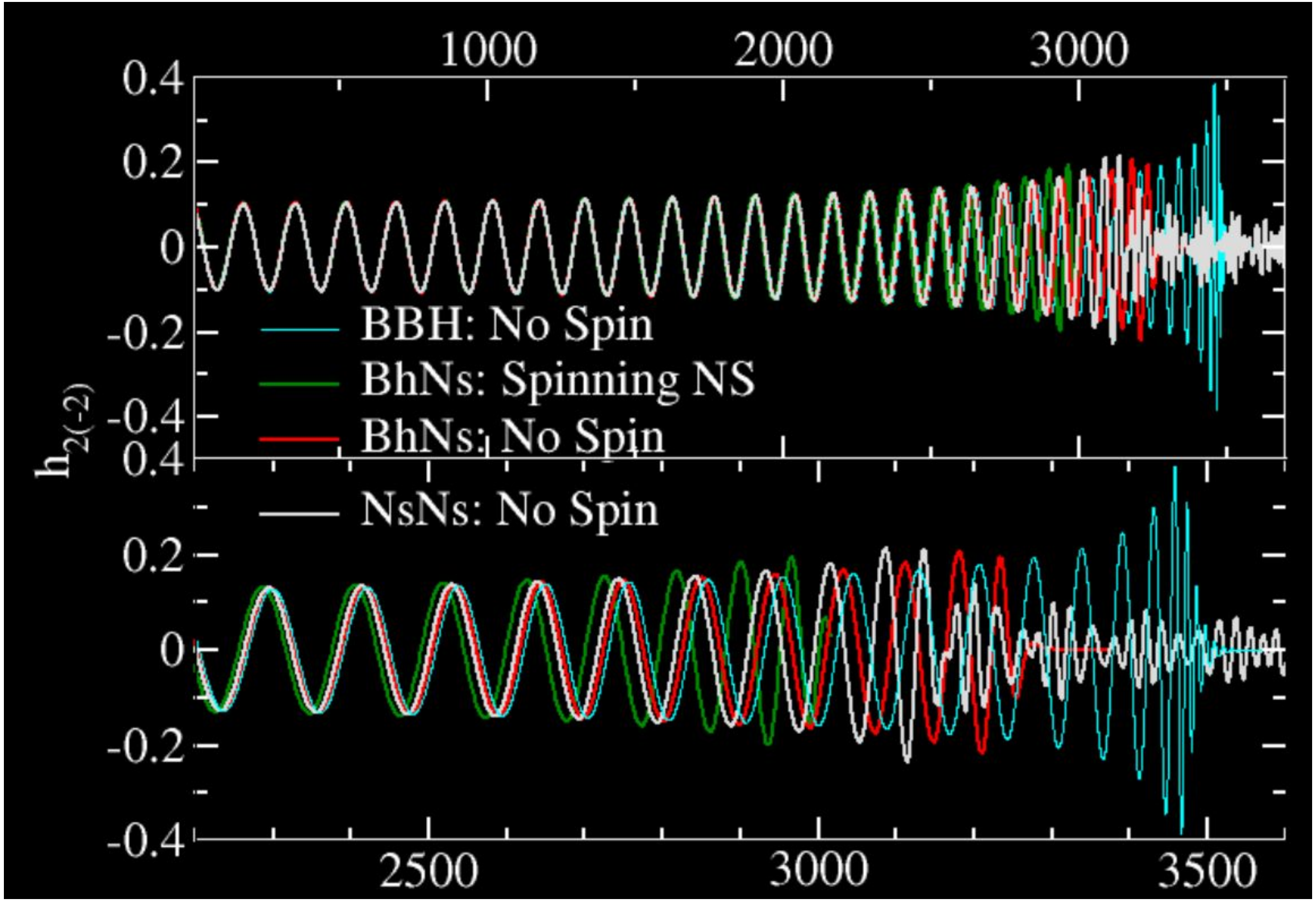


pfreire et al.,

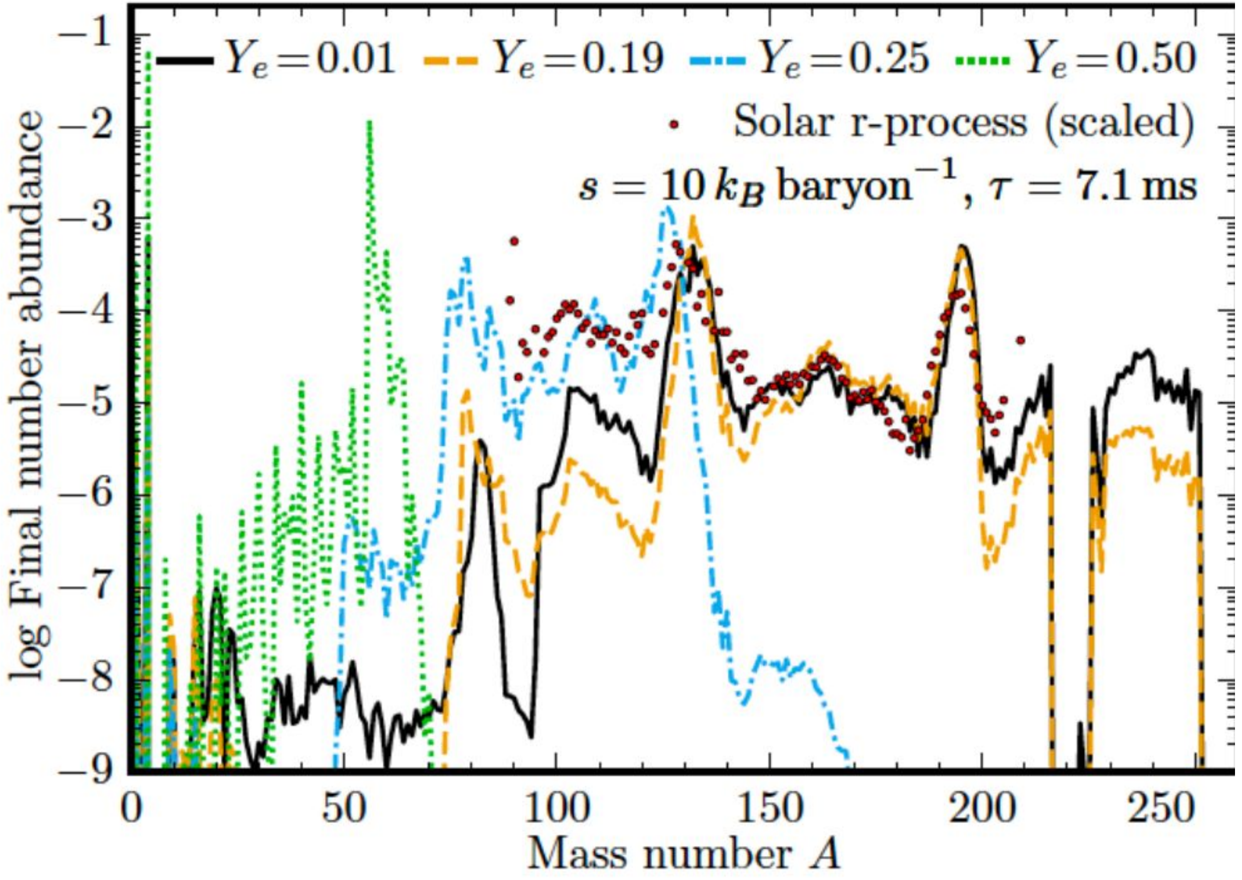
The less impact BH



Finite size effects in **gravitational waves**



r-process: Importance of outflow composition

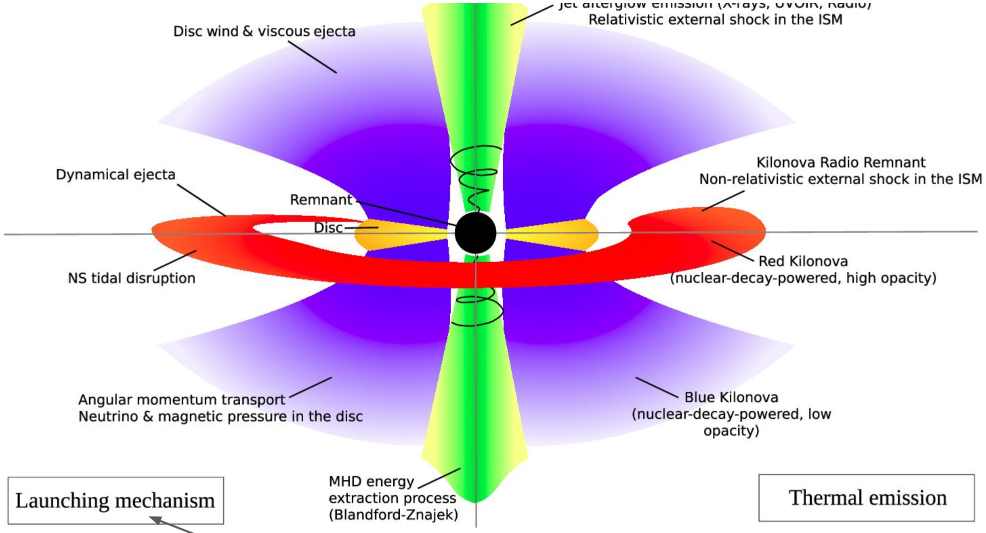


$Y\ e$ = Electron Fraction
= (#protons)/(#nucleons)

NS disruption by the BH

On certain conditions (NS enough deformable, the ratio between the NS and the BH, the spin of the BH), we may have tidal disruption of the NS

Dynamical ejecta



Salafia et al.,

Disk wind ejecta

Initial conditions

Aspect	Details
Source Properties of NS-BH Event	
NS Mass	$1.3 - 1.4 M_{\odot}$
BH Mass	$3.0 - 5.0 M_{\odot}$
Spins	• BH Spin: $Spin1z_{\mathrm{BH}} \in [-0.8, 0.8]$ • NS Spin: None
Equation of State of matter	SLy
Compatness of the binary	$C < 0.14$
Ejecta from the NS disruption (M_{dyn})	
Mass Range	$0.001 - 0.15 M_{\odot}$
Ejecta from the accretion disk ($M_{disk,wind}$)	
Mass Range	$0.001 - 0.15 M_{\odot}$
Outflow	5% – 40% not accreted
Kilonova Light Curves	
Models	• 2D model (blue and red) • 1D bolometric

Dynamical ejecta

$$M_{ej,rem} = m_{dyn} + m_{wind} = m_{dyn} + \xi \times m_{disk}$$

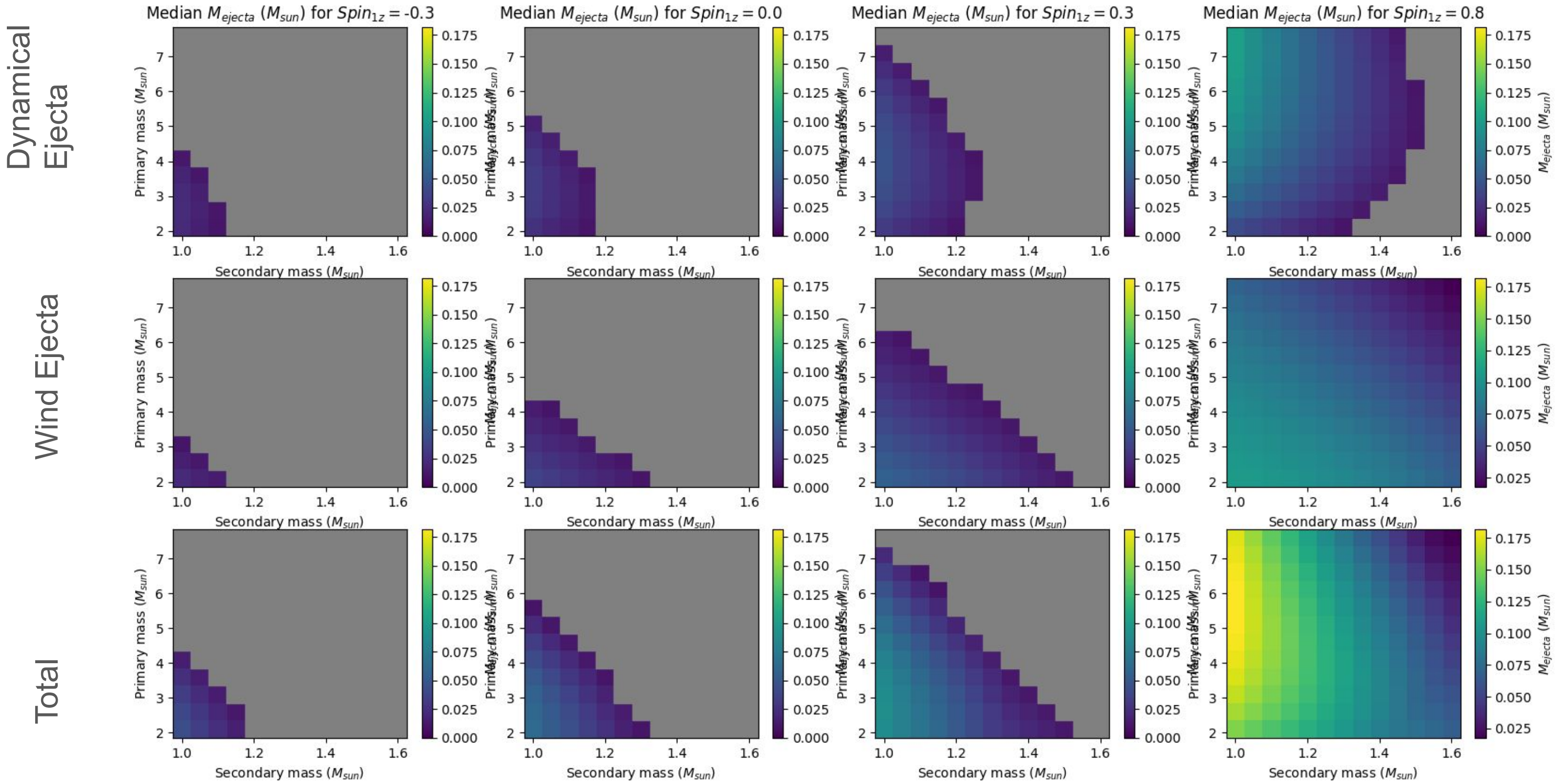
where $M_{ej,rem}$ is the ejecta from the NS disruption by the BH, m_{dyn} the dynamical ejecta, m_{wind} the disk wind ejecta, m_{disk} the disk mass and ξ the proportion of unbound material from the disk. In our study, we cal-

Disk wind ejecta

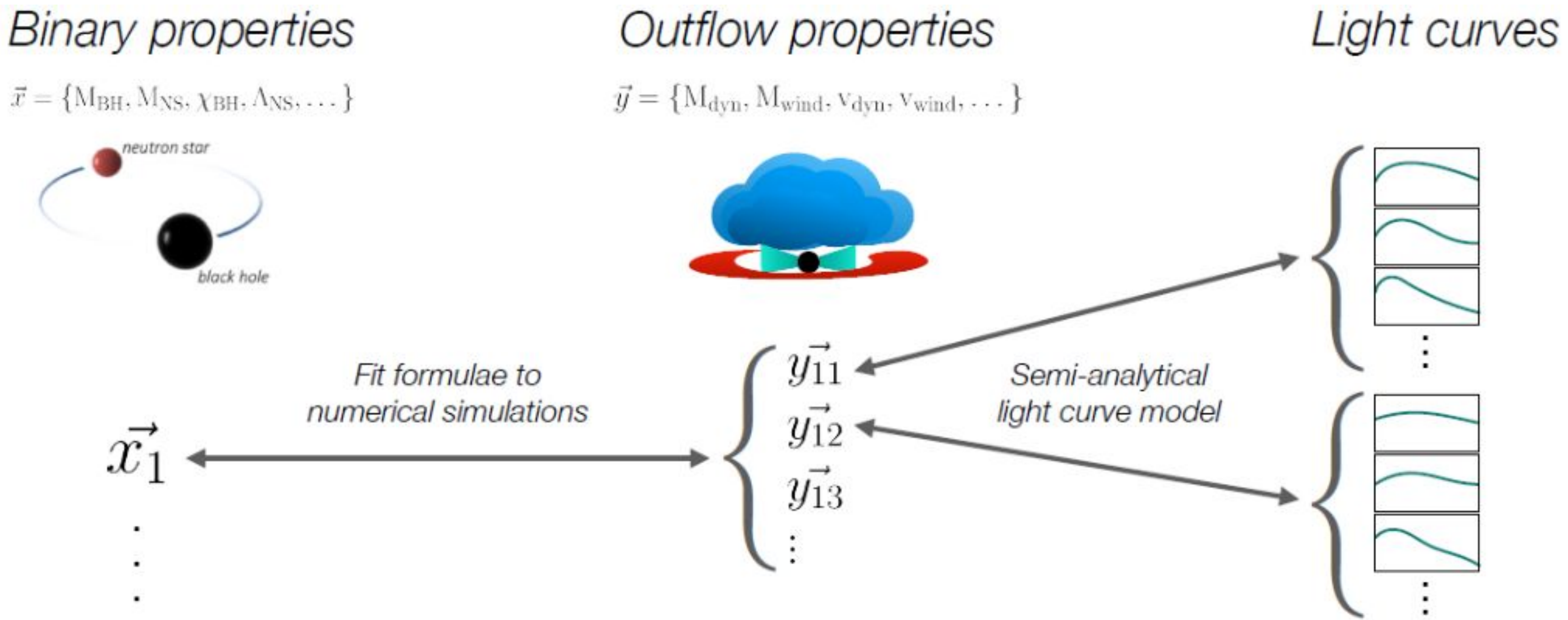
Use of Foucart, 2018, Krugel 2020 and Raaijmakers 2020

Ejectae Mass, Equation of state SLy

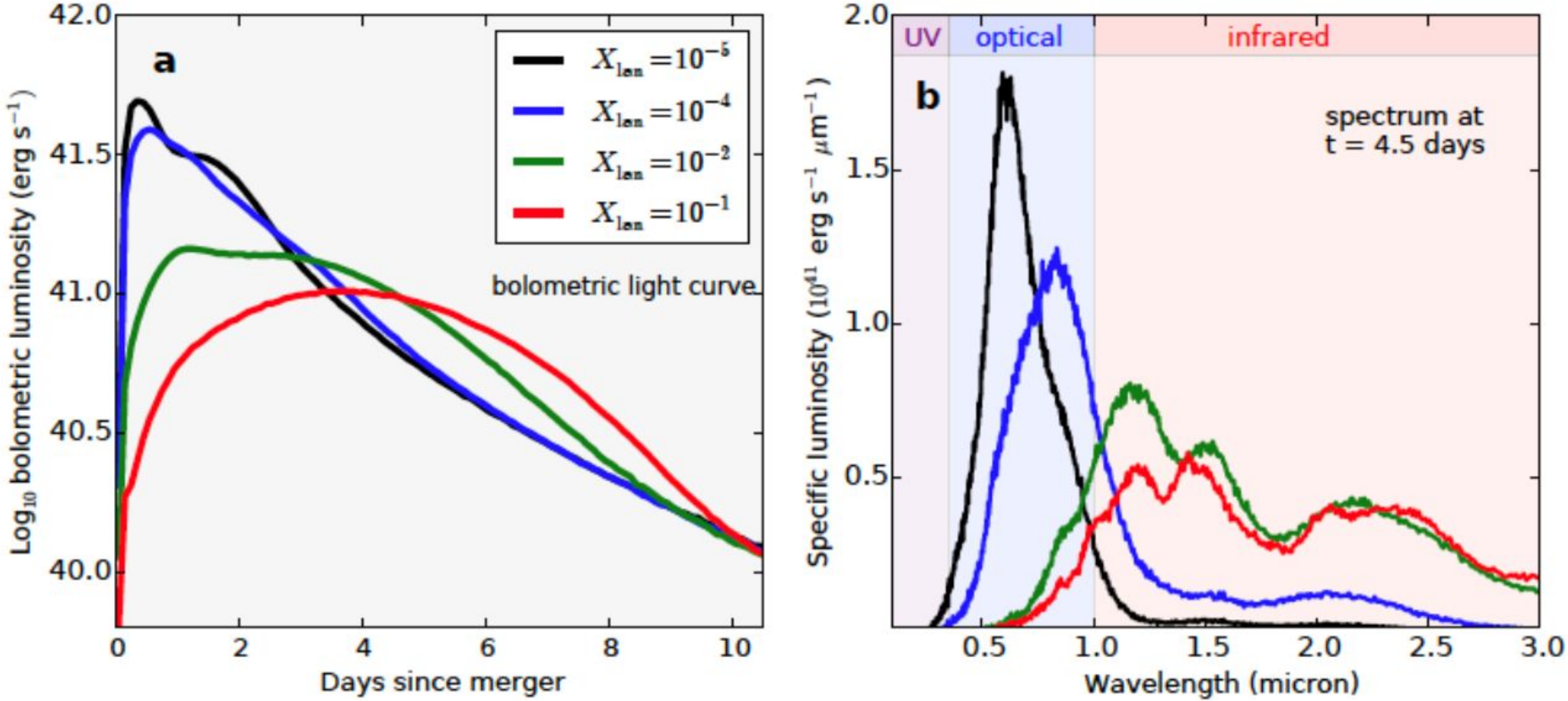
Dynamical Ejecta, Wind Ejecta, and Total, xi 0.3



What is happening next ? From ejectae quantities to Kilonova lightcurves !



What is happening next ? From ejectae quantities to Kilonova lightcurves !



See Bulla et al., as comparison

Conclusions

Observations in multi-wavelength

↓

Kilonova constraints

↓

Ejecta masses

↓

This talk

Binary system properties

↓

Ultra-dense matter properties