

GW170817 / AT2017gfo

Electromagnetic follow-up

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OSSERVATORIO ASTRONOMICCO DI PADOVA

EM Follow-up

> 80 telescopes > 80 papers

Earth

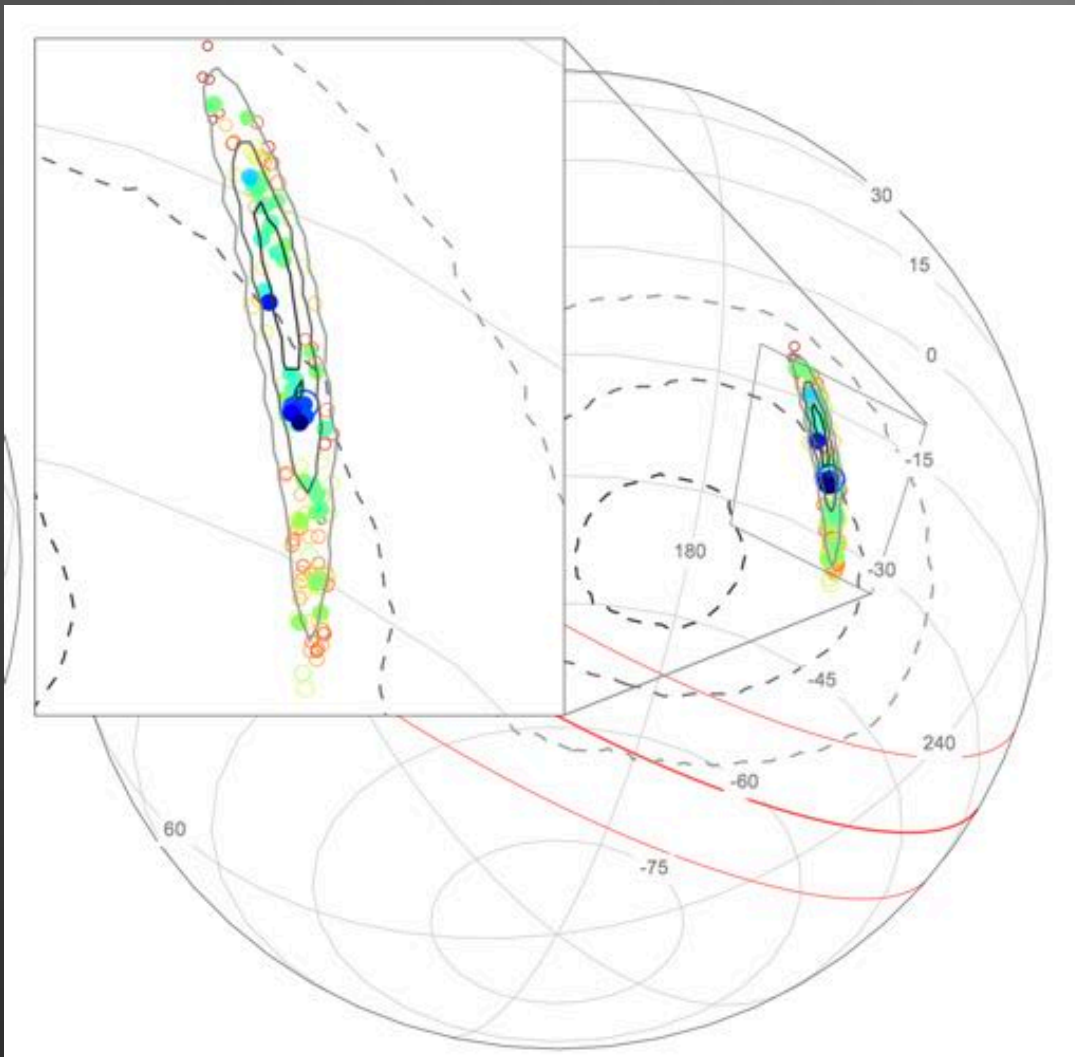
Space



10 days to read15 min talk ...

Discovery of the kilonova

Arcavi et al. 2017

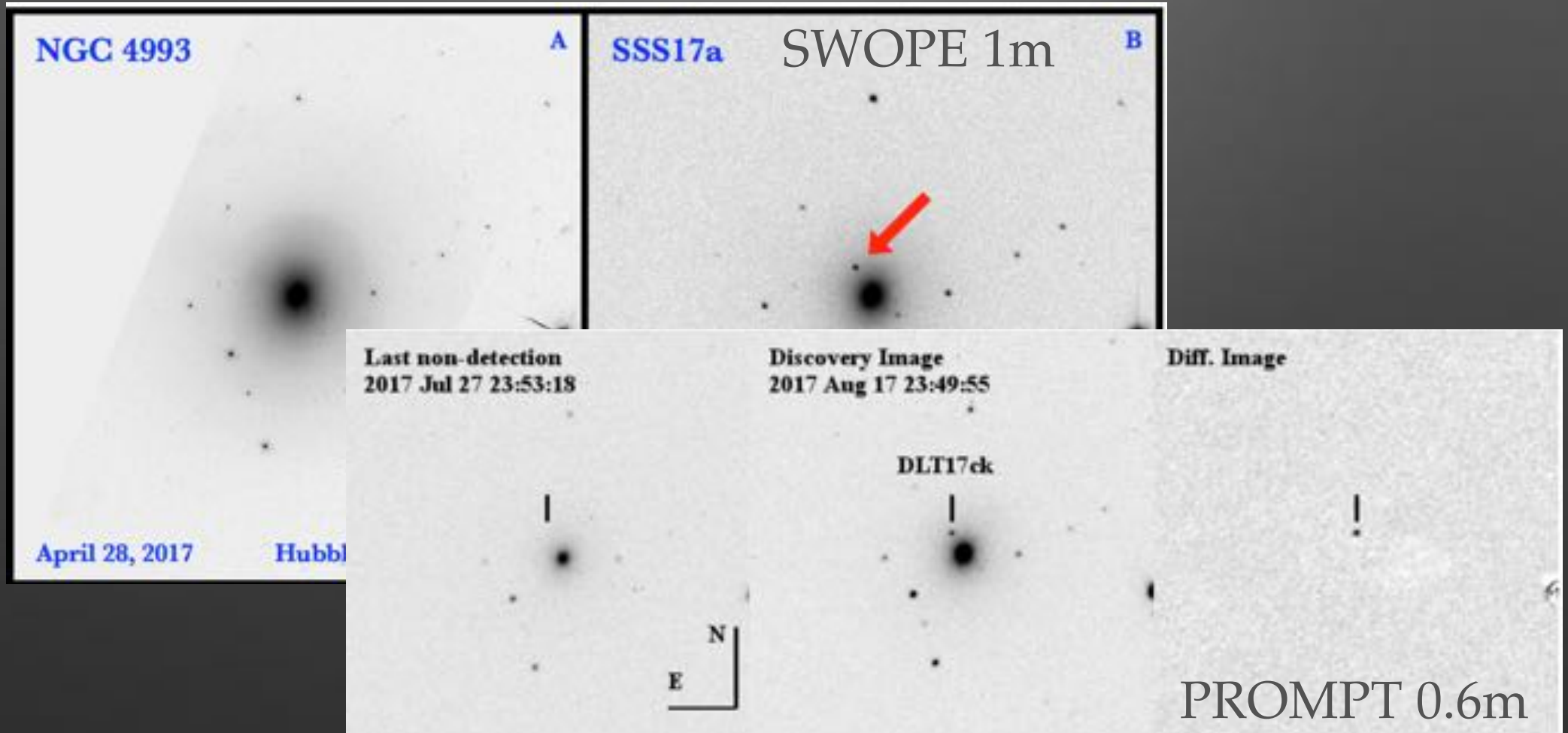


~60 galaxies in the Ligo/Virgo errorbox account for 85% of the total stellar content in the volume (<60 Mpc)

Discovery of the kilonova

SSS17a = DLT17ck = AT2017gfo

Coulter et al. 2017

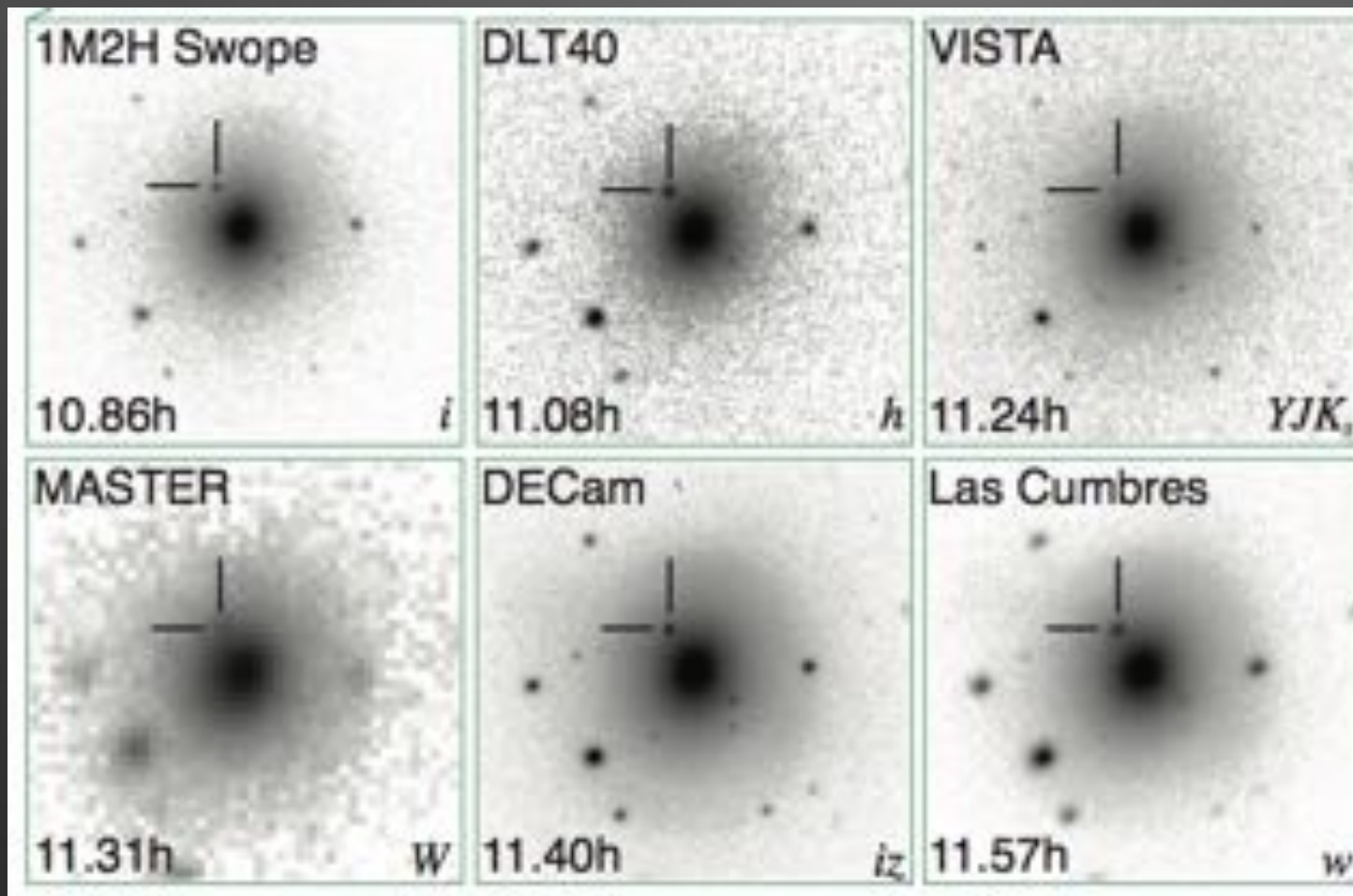


Valenti et al. 2017

Discovery of the kilonova

SSS17a = DLT17ck = AT2017gfo

GCN discovery's announce: 12.40h



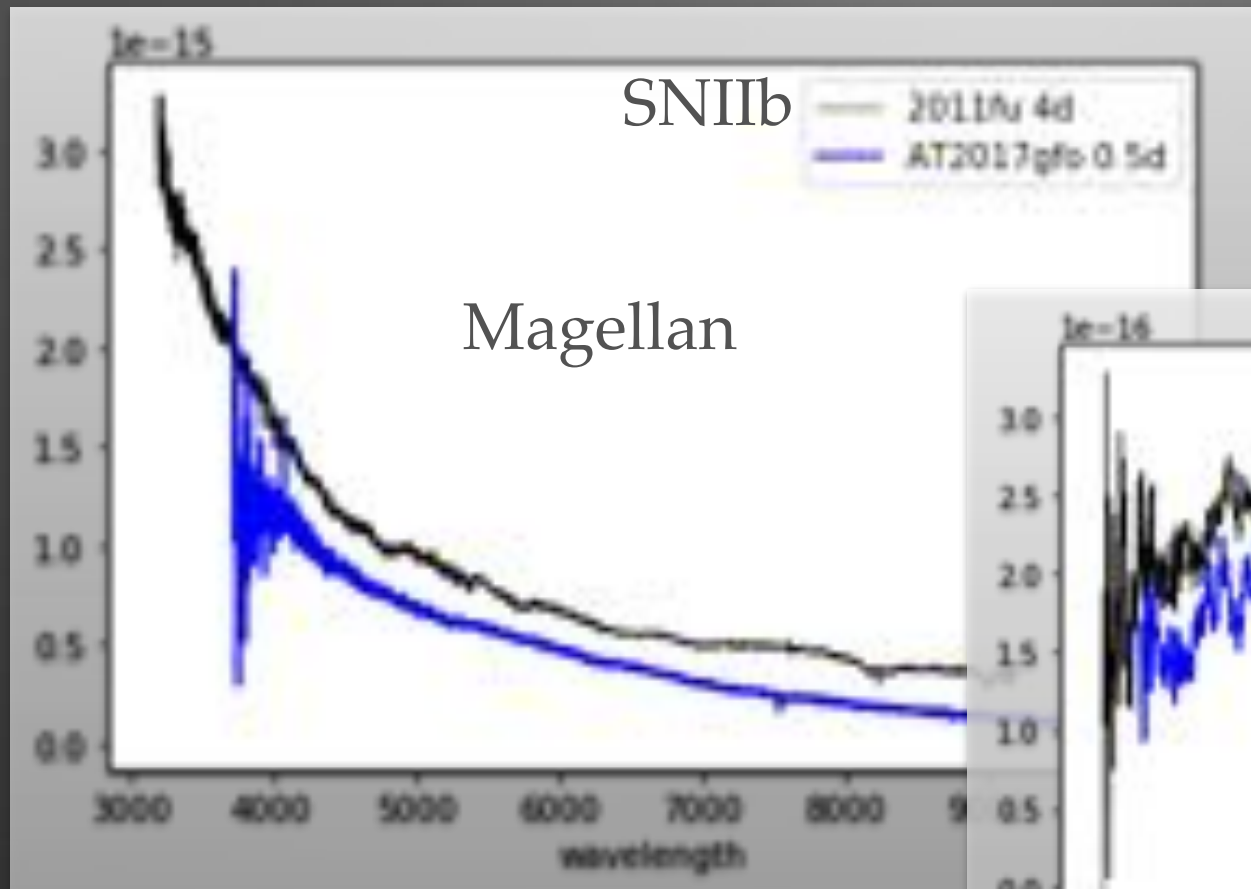
5% probability
to find a SN
with mag <18 in
30 sq. degrees



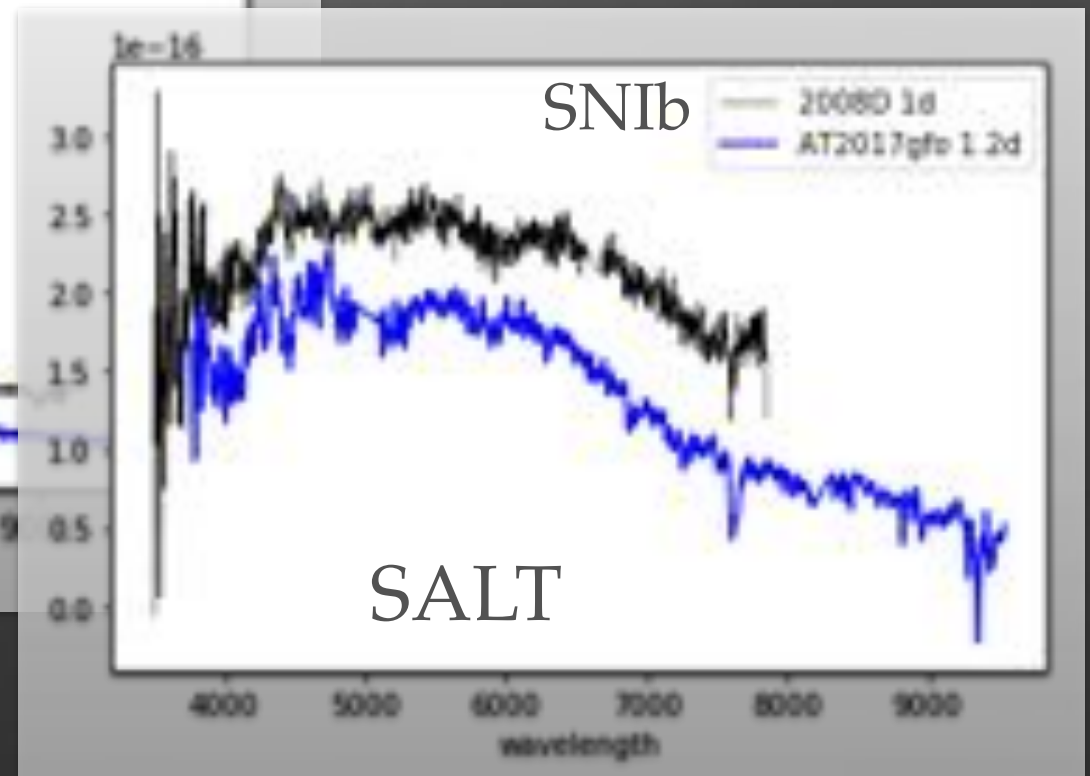
Discovery of the kilonova

When we recognise the kilonova ?

Shappee et al. 2017

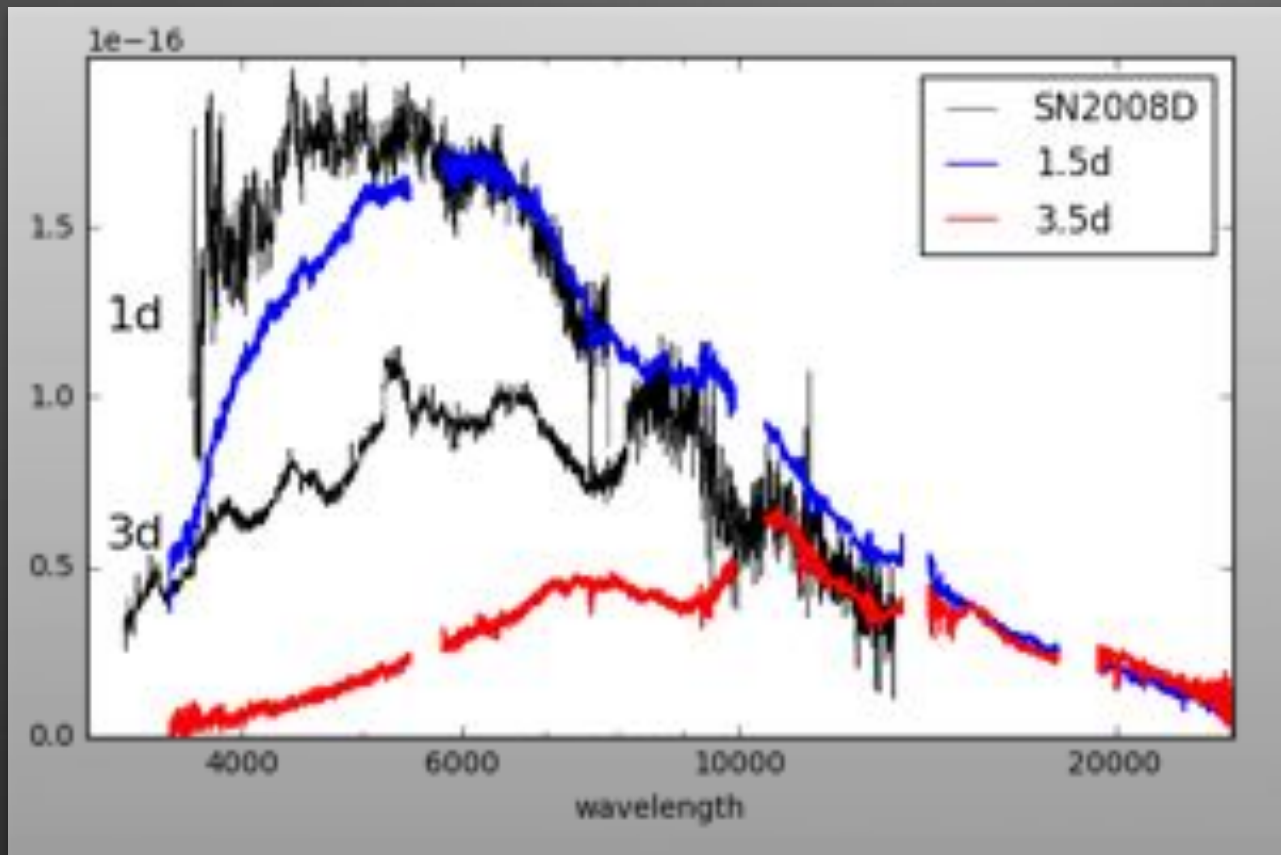


Buckley et al. 2017



Discovery of the kilonova

Why temporal and spectral sampling (+ good Signal to Noise) are important



In a few of days the peak of the spectral energy distribution shifts to the near infrared. The broad spectral features are completely different from that of all know SN types

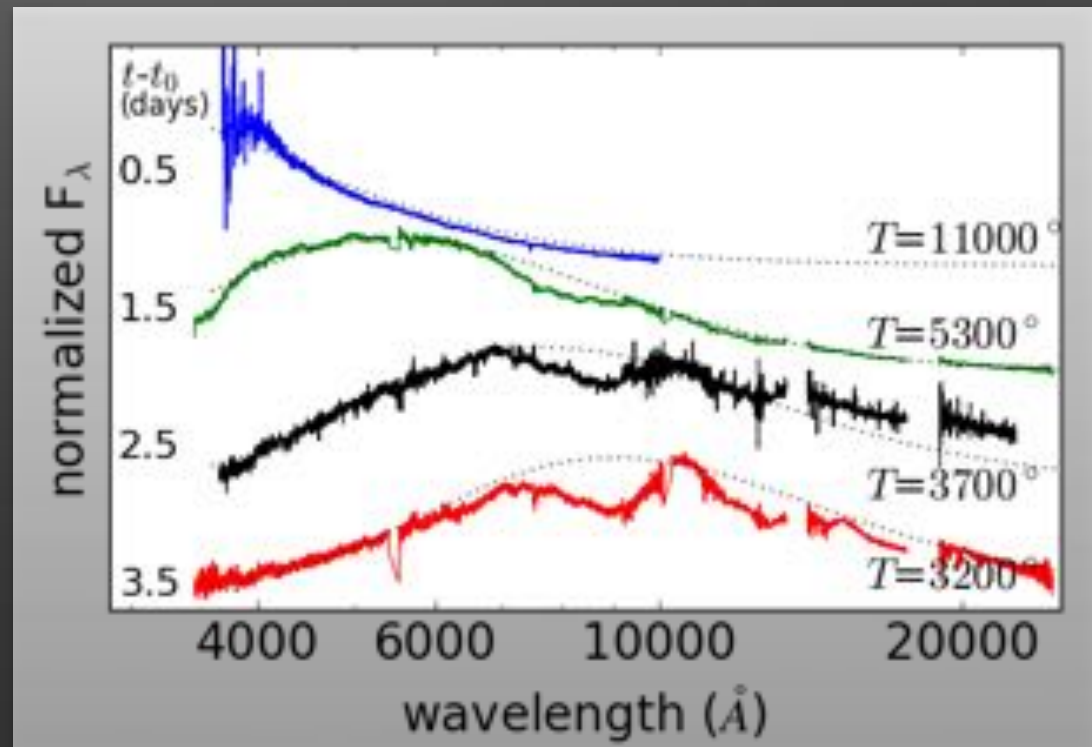
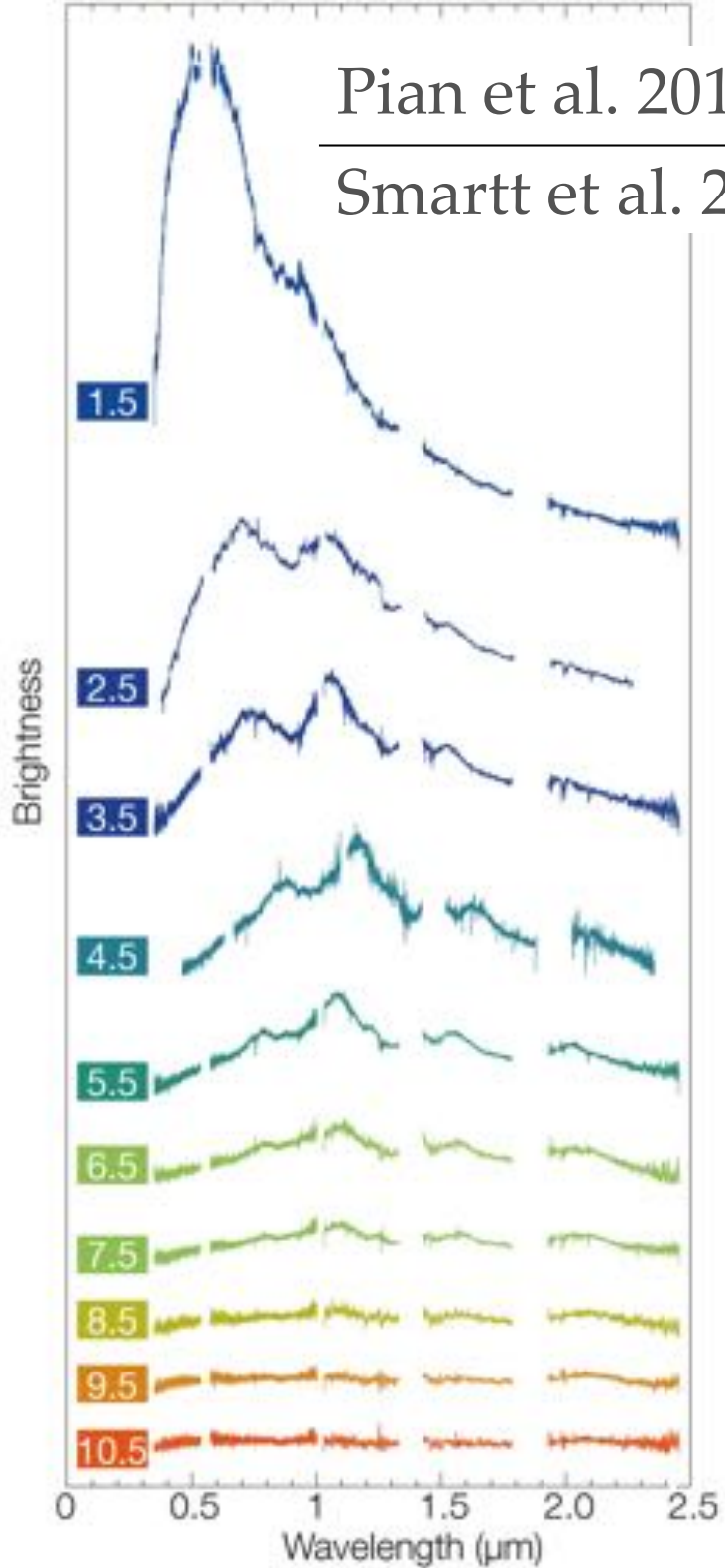
Pian et al. 2017

Pian et al. 2017

Smartt et al. 2017

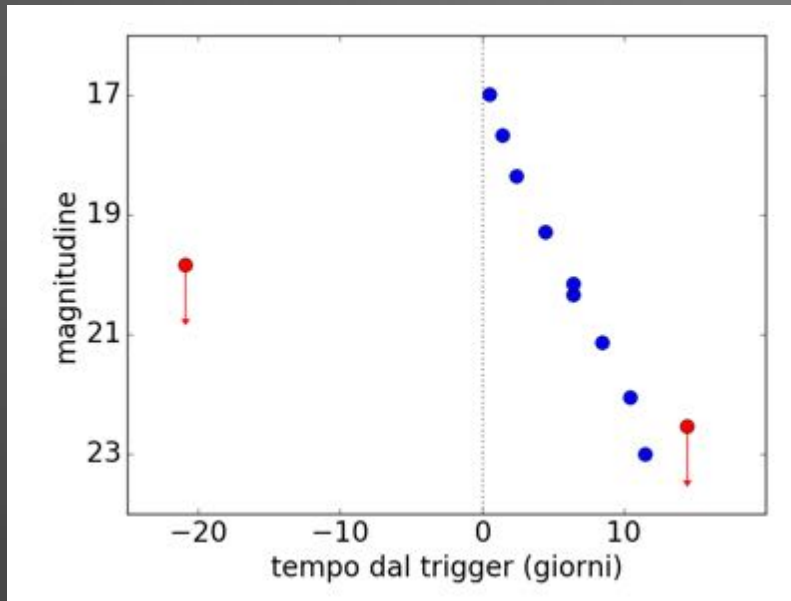
Follow-up: spectroscopy

Simultaneous
optical-infrared spectral
monitoring at ESO with
VLT-XShooter

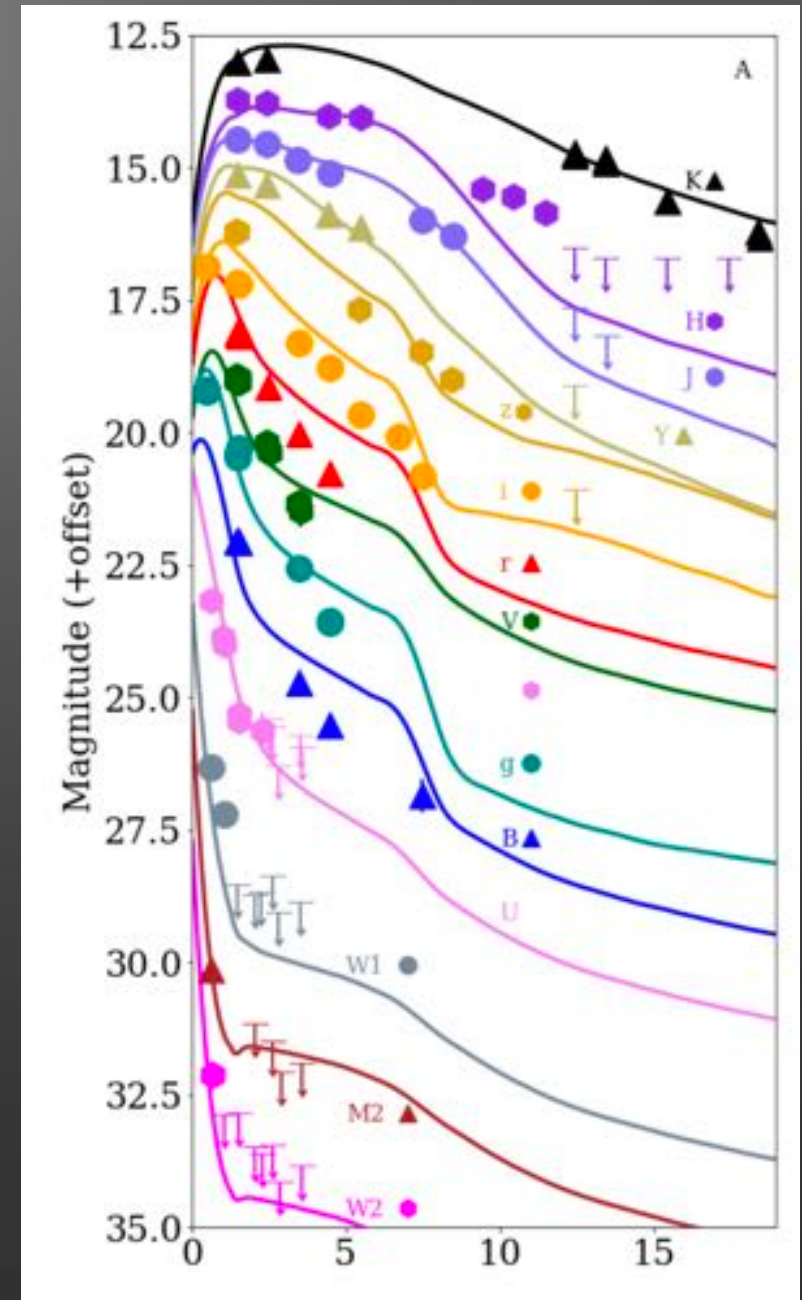
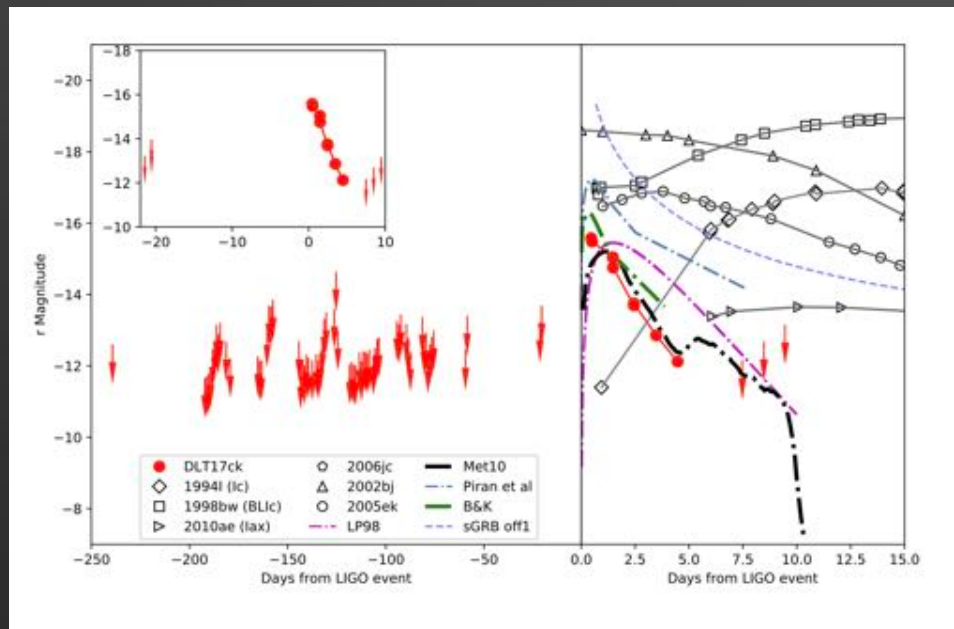


Follow-up: photometric evolution

Kilpatrick et al. 2017

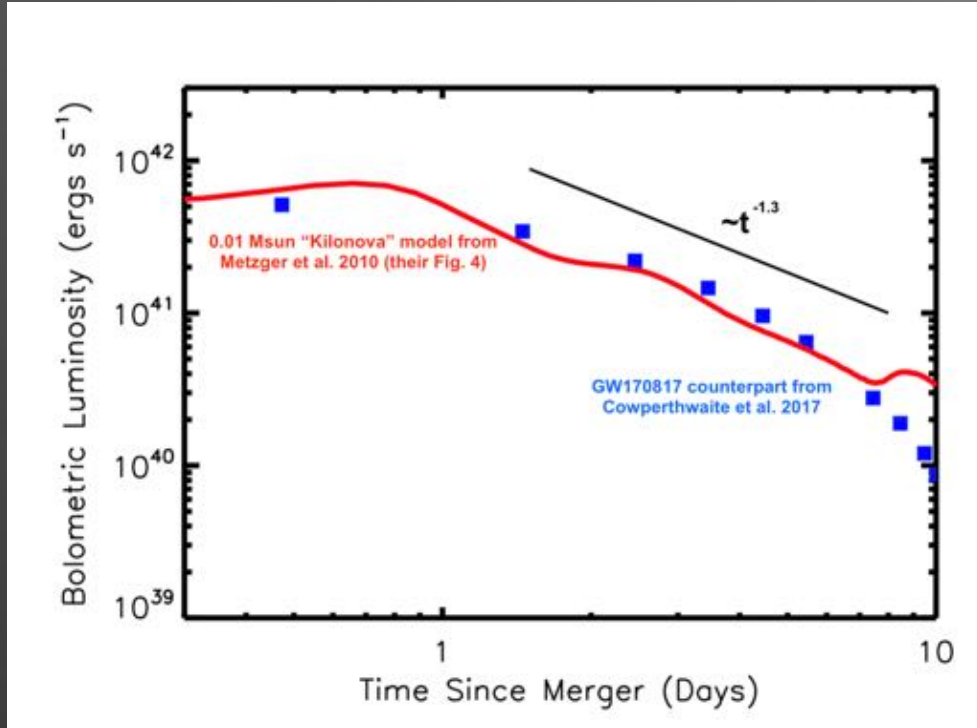


Valenti et al. 2017



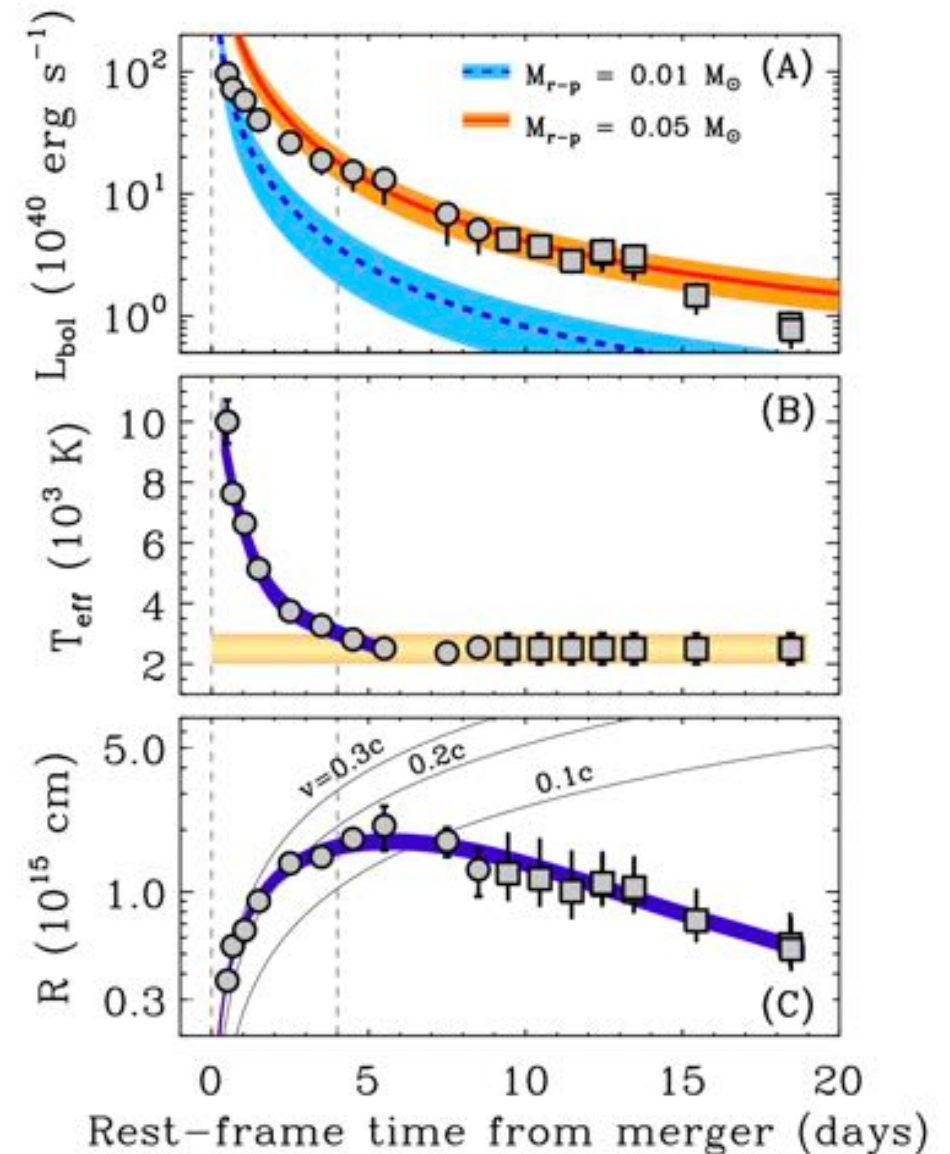
Kilonova properties

Drout et al. 2017



Metzger 2017

Radius at early epoch
requires expansion
velocity of $\sim 0.3c$

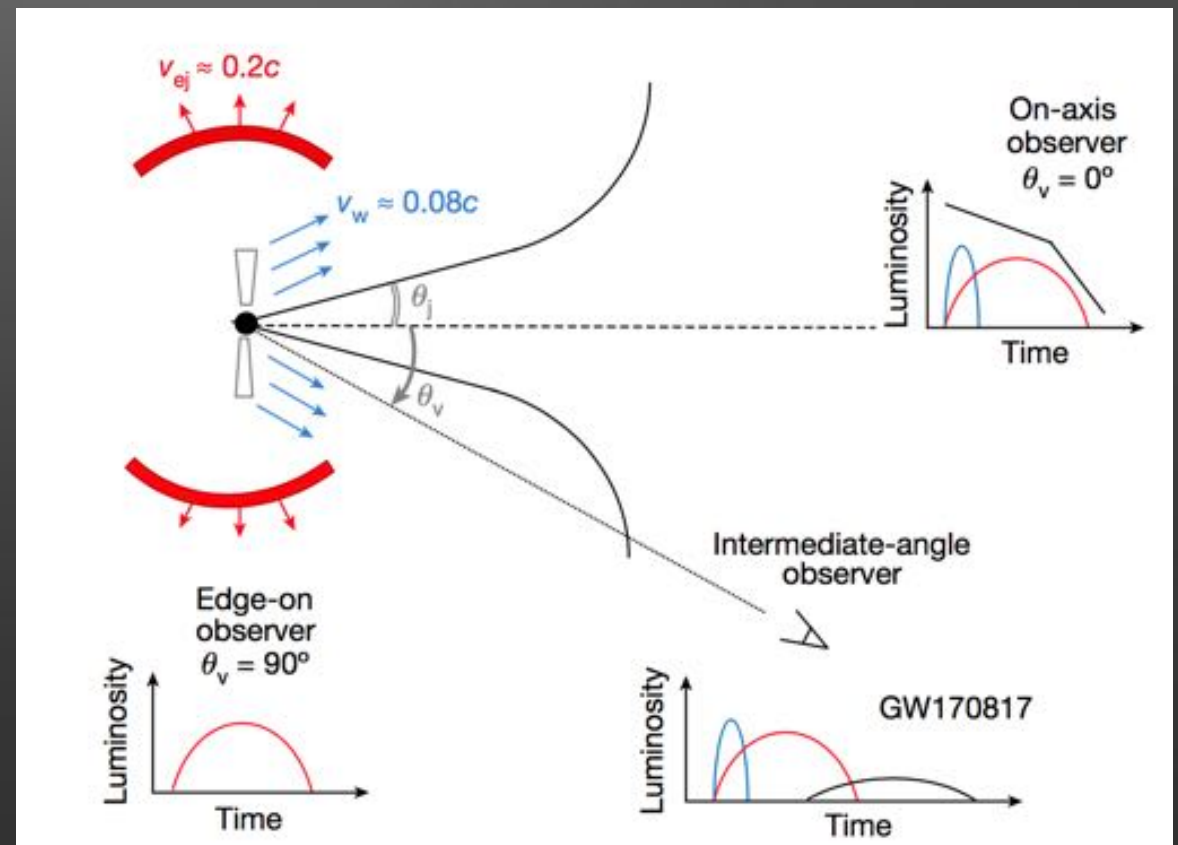
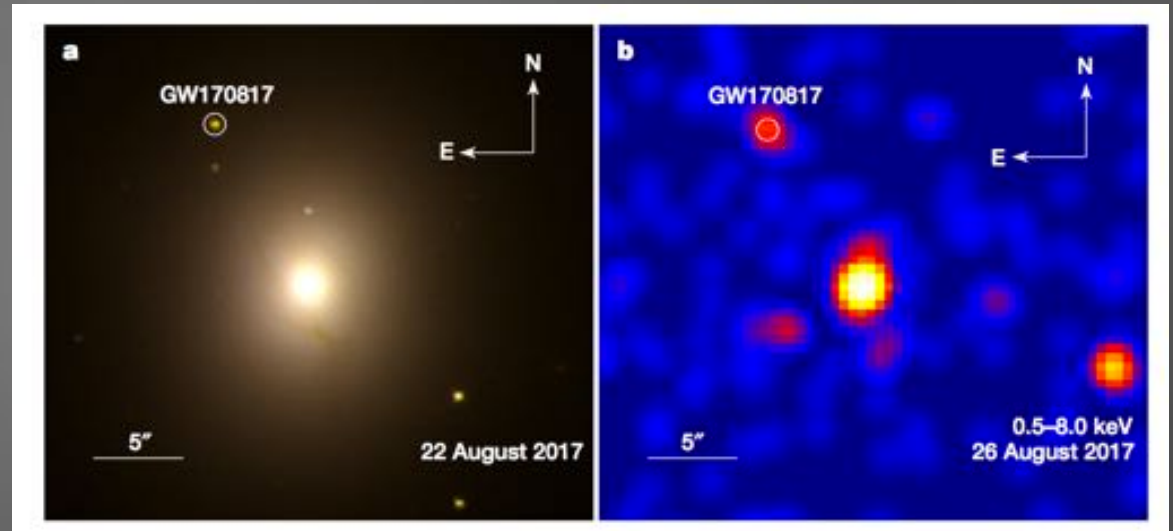


X-ray

First detection
tc = +9d with
Chandra

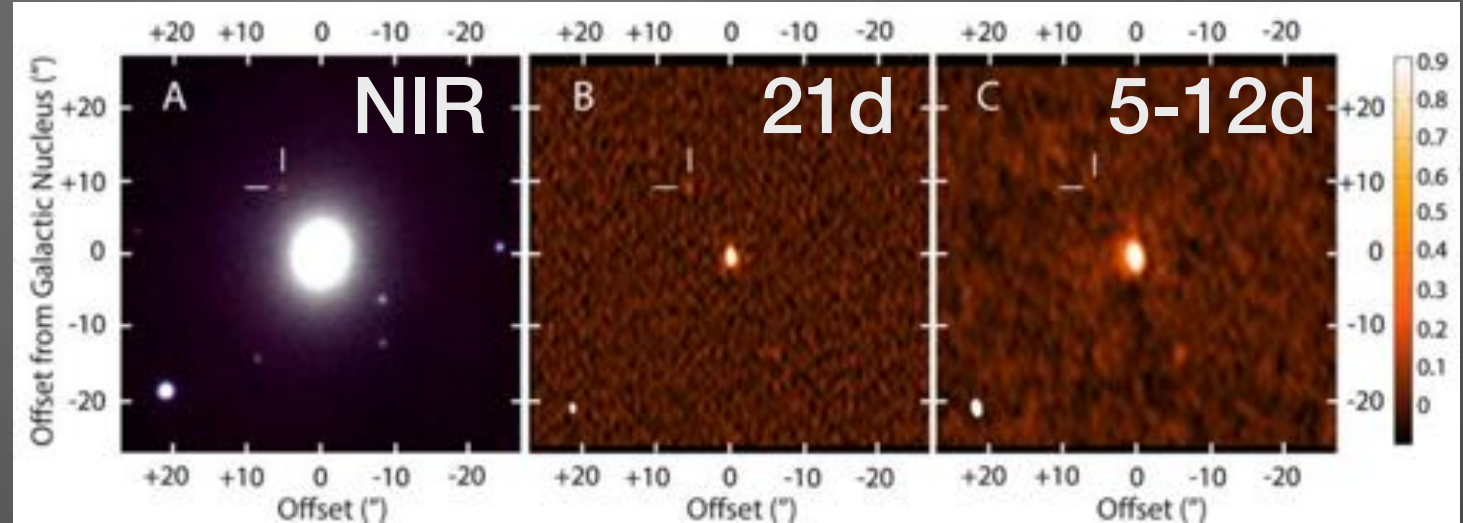
Short GRB view off-axis by 20-40 deg or cocoon emission

Troja et al. 2017

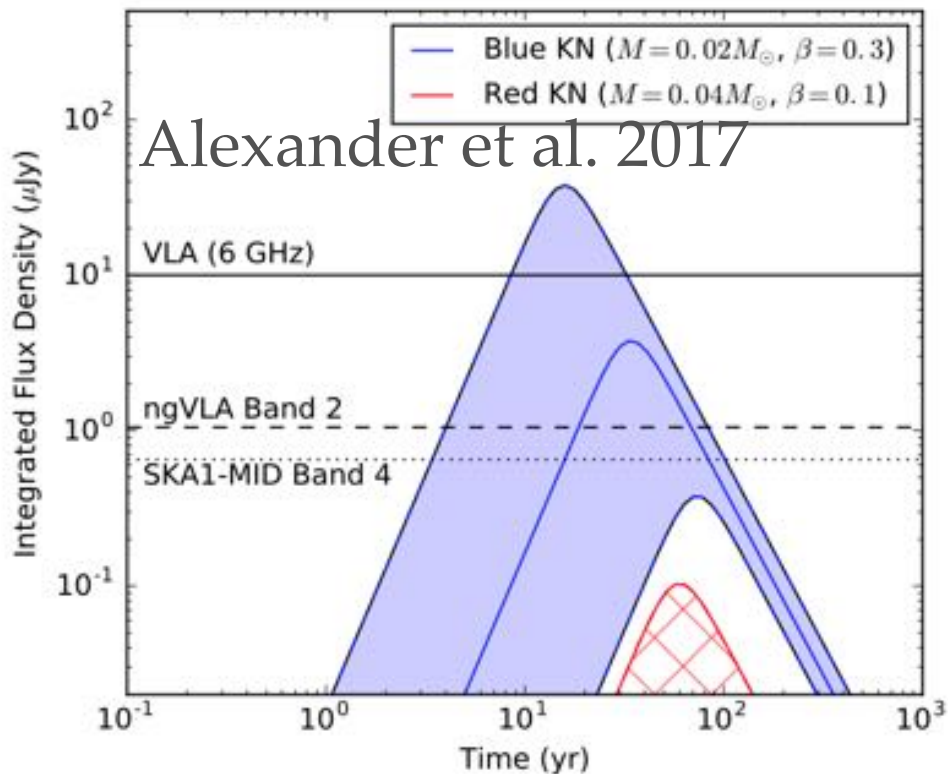


Radio

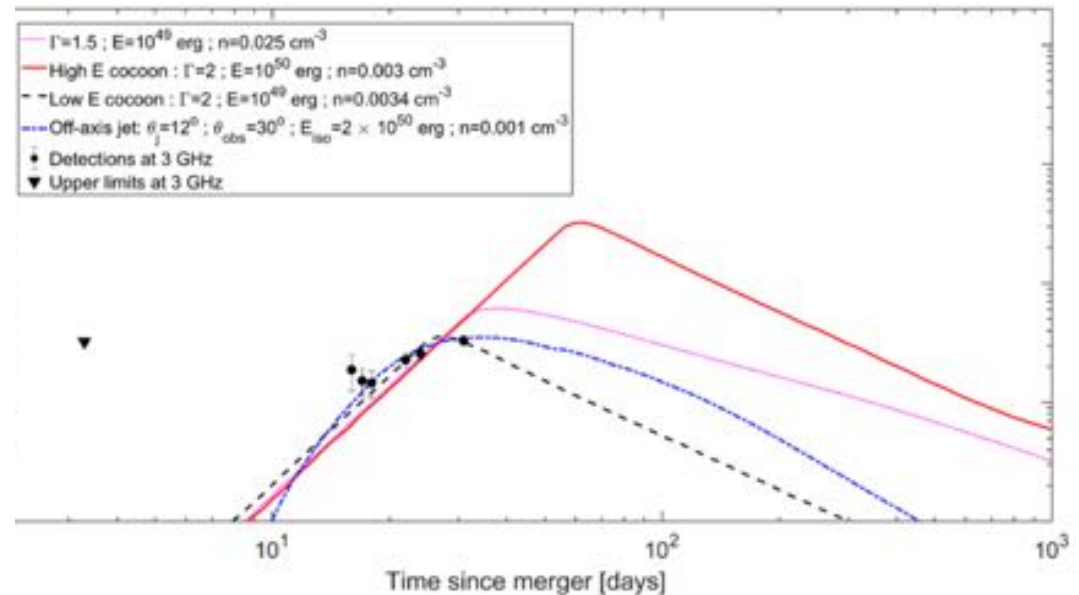
First detection
 $t_c = +16d$ with
 VLA at 3-6 GHz



Hallinan et al. 2017

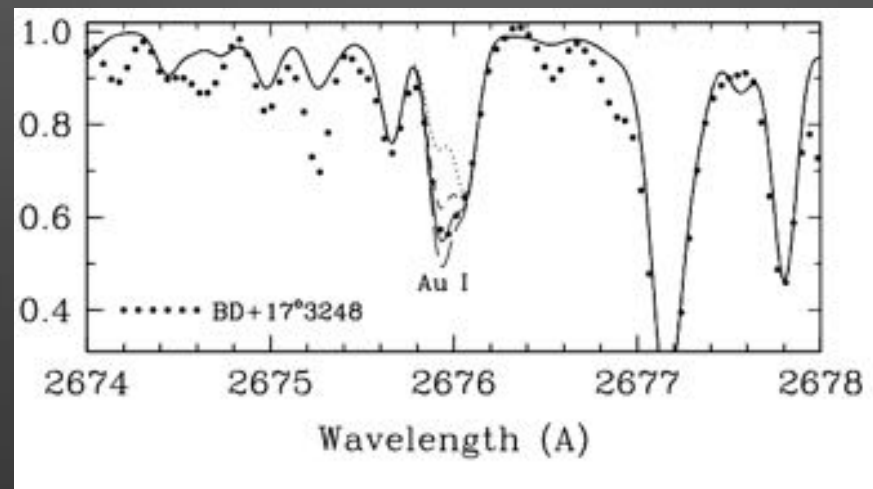


Alexander et al. 2017



Nucleosynthesis

Cowan et al. 2002
Gold in metal poor star

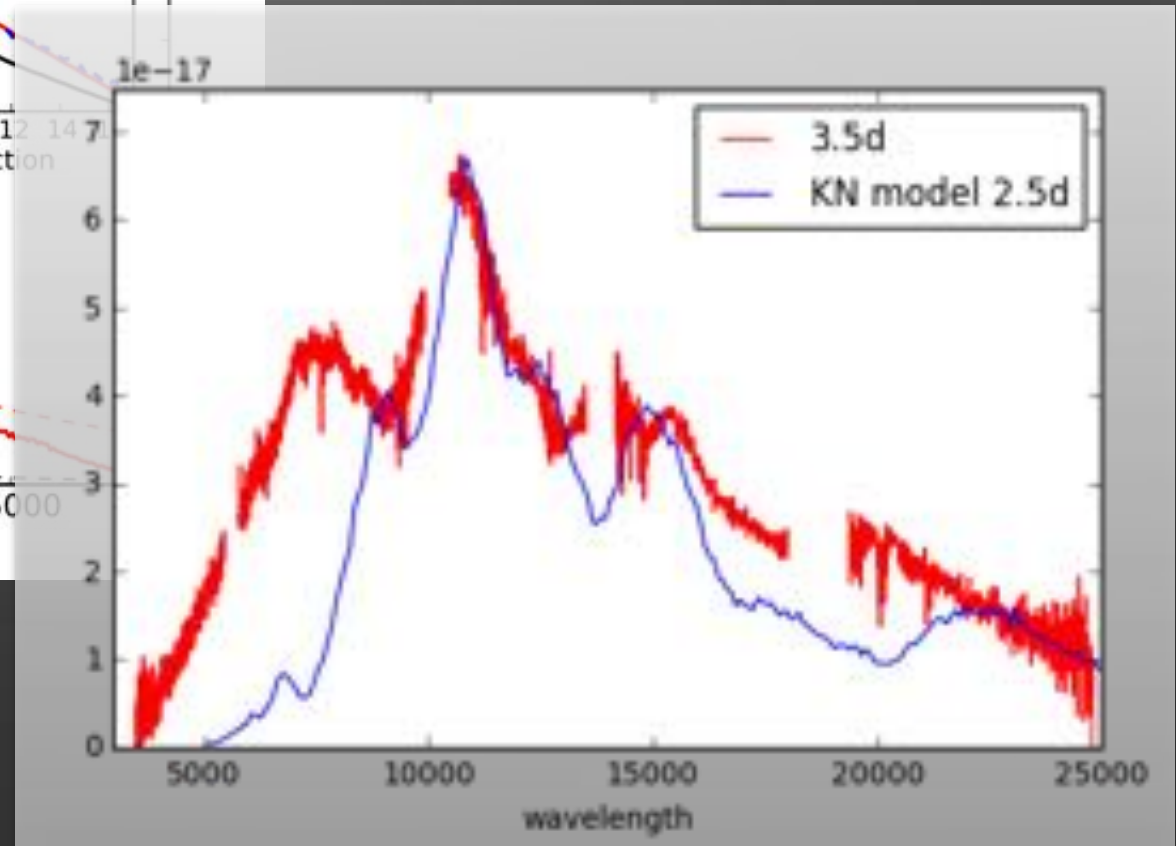
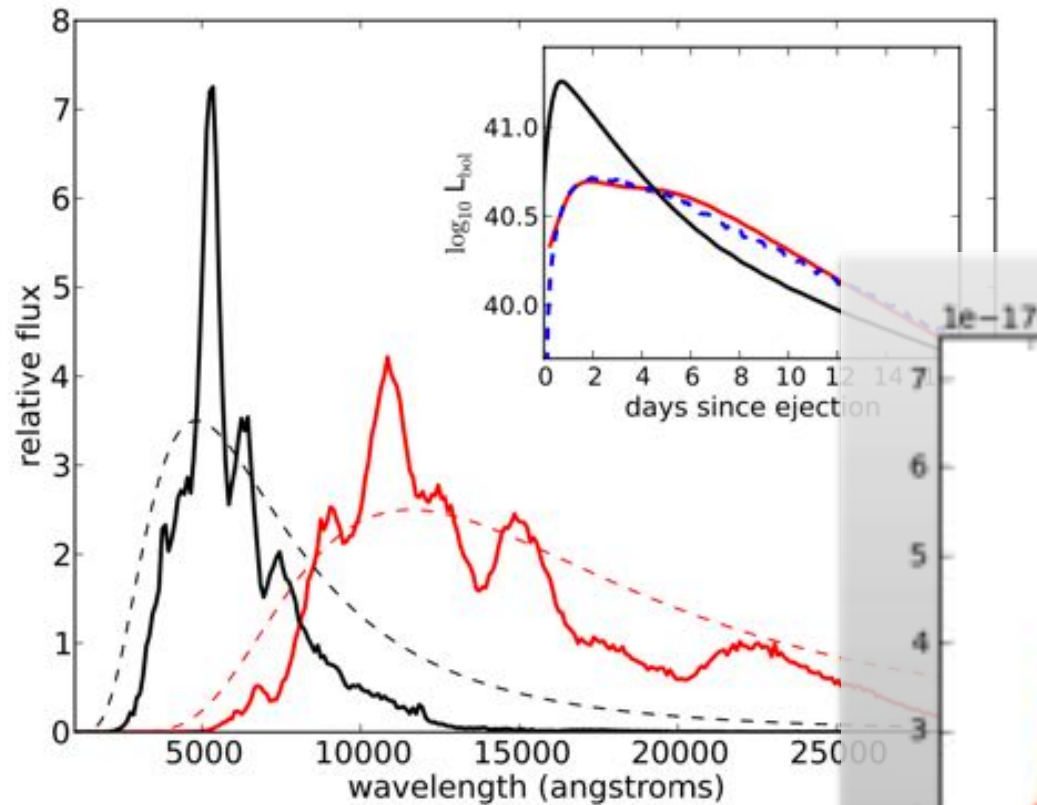


r-process - rapid neutron capture process produce half of the elements heavier than Fe and almost all those heavier than Pb

Nucleosynthesis

Kasen et al. 2013

Kilonova models predict the emergence of broad features of r-process elements

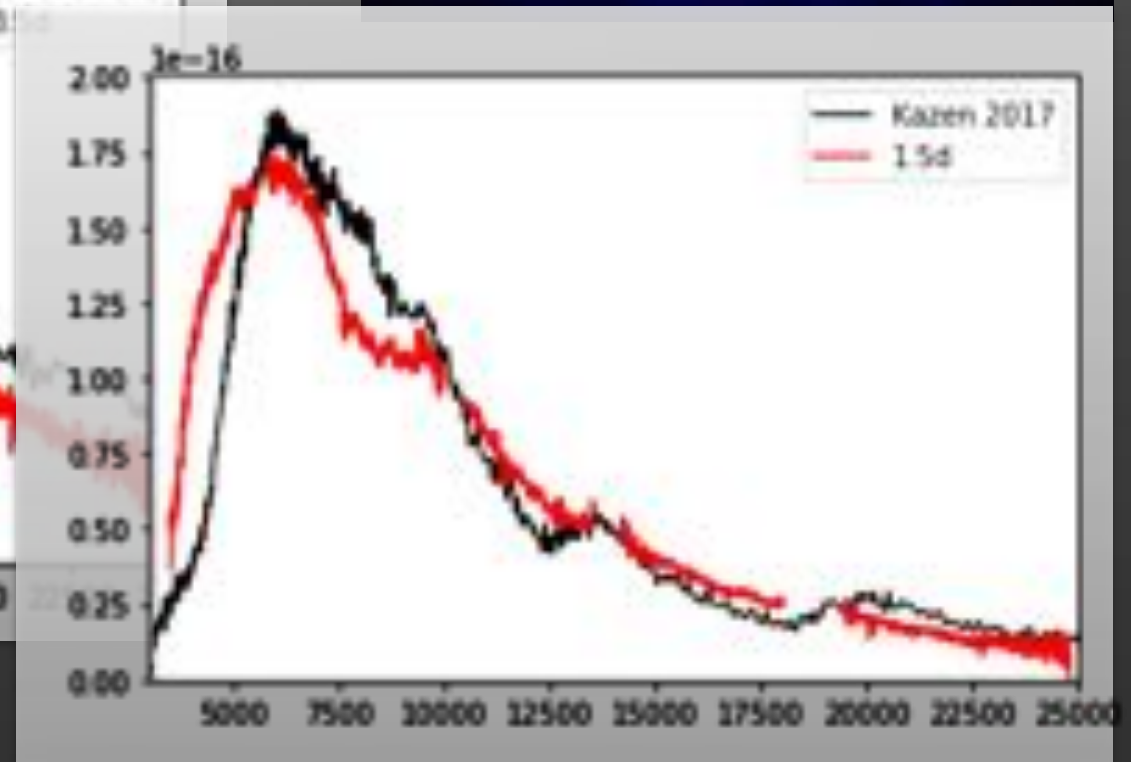
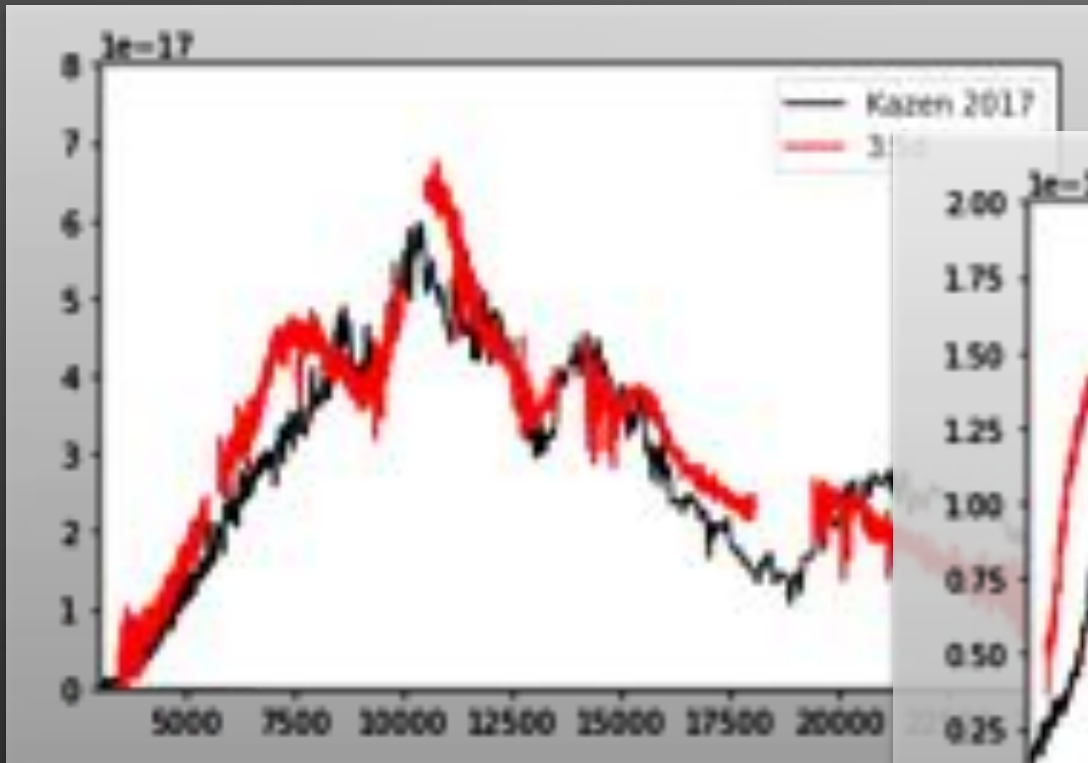
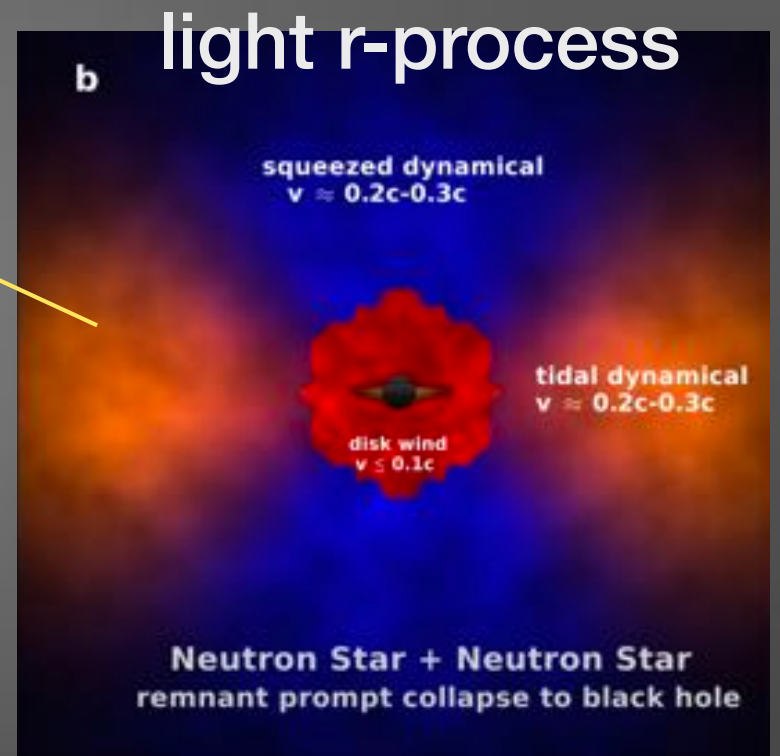


Nucleosynthesis

heavy
r-process

models Kasen 2017

observations Pian et al. 2017

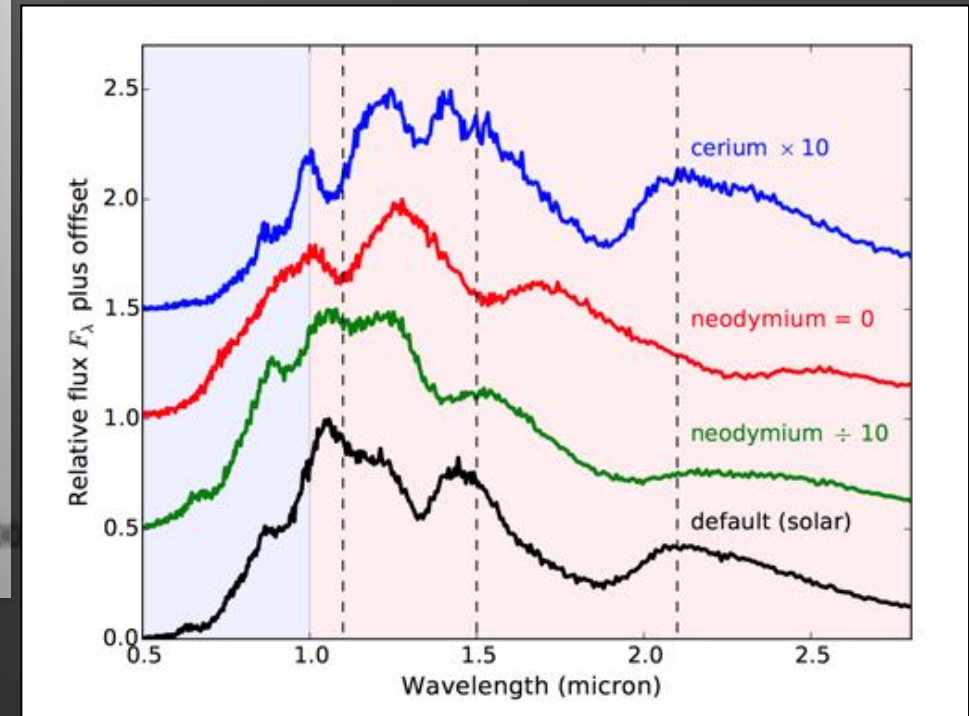
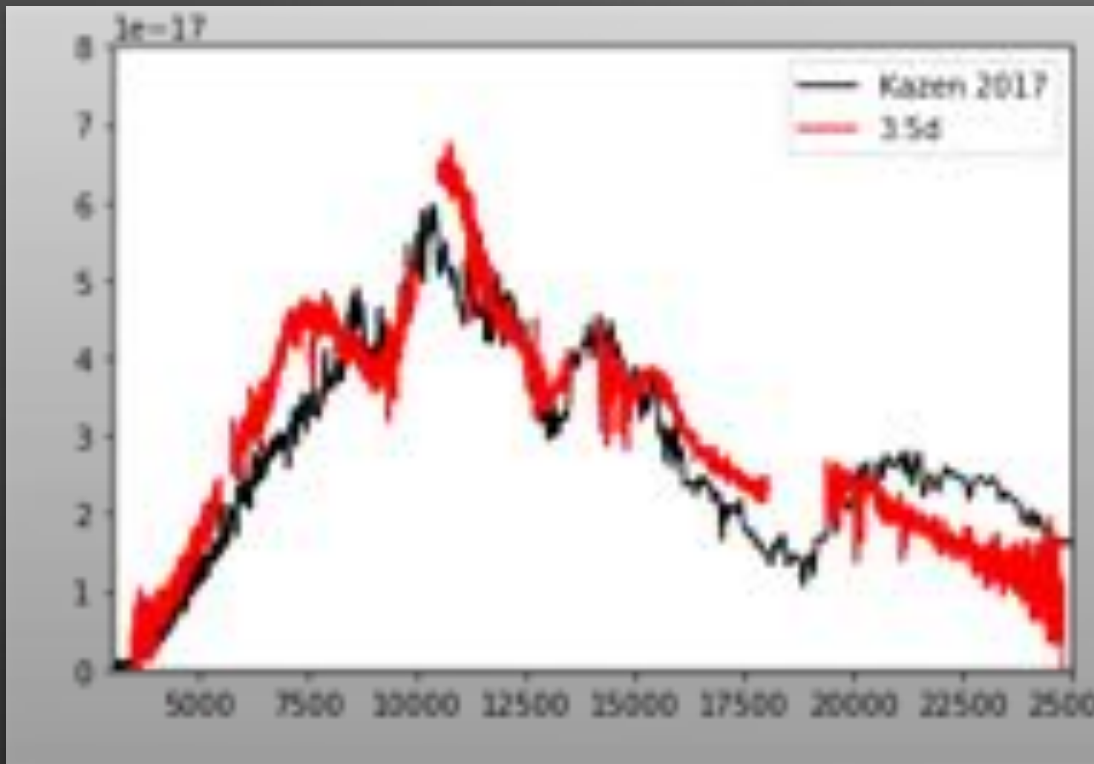


Nucleosynthesis

models Kasen 2017

observations Pian et al. 2017

ejecta mass
0.03-0.05 Msun



**Data analysis
just began**

The host galaxy: NGC4993

Pan et al. 2017

