Follow-up of GW counterparts in optical, IR and radio

Optical, NIR and radio counterparts expected from nucleosynthesis in NS+NS or mildly relativistic outflows NS+NS and BH+BH systems (Nakar & Piran 2011; Perna, Lazzati & Giacomazzo 2016). The common feature is the predicted low flux levels, which require sensitive observations, coordinated at various facilities:

Network of ground-based optical and radio telescopes:

VLT: X-Shooter (or FORS2) spectroscopy: 8h; FORS2 imaging: 2h; HAWKI imaging: 2h
NOT: ALFOSC (or StanCAM, or MOSCA) imaging: 10h
TNG: DOLORES 12.5 h; NICS 13.5 h
Asiago: AFOSC
LBT: LBC: 1h; LUCI1: 1h; MODS1: 5h
PESSTO: Supernova spectroscopic survey with ESO NTT
SRT: 75 hr
ATCA: NAPA program (3 triggers of 30 h each)
REM: ROSS e REMIR 100 h

Collaborations (active and in development):

VISTA (PI: N. Tanvir): VIRCAM: 25h
HST (PI: A. Levan): Long-term TOO program active since Cycle 23
Swift/UVOT
iPTF and PanSTARRS surveys
FIGARO network (M. Boer, Univ. Nice)
ARAE network (A. Castro-Tirado, Granada)

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Short GRB130603B
(z = 0.356)

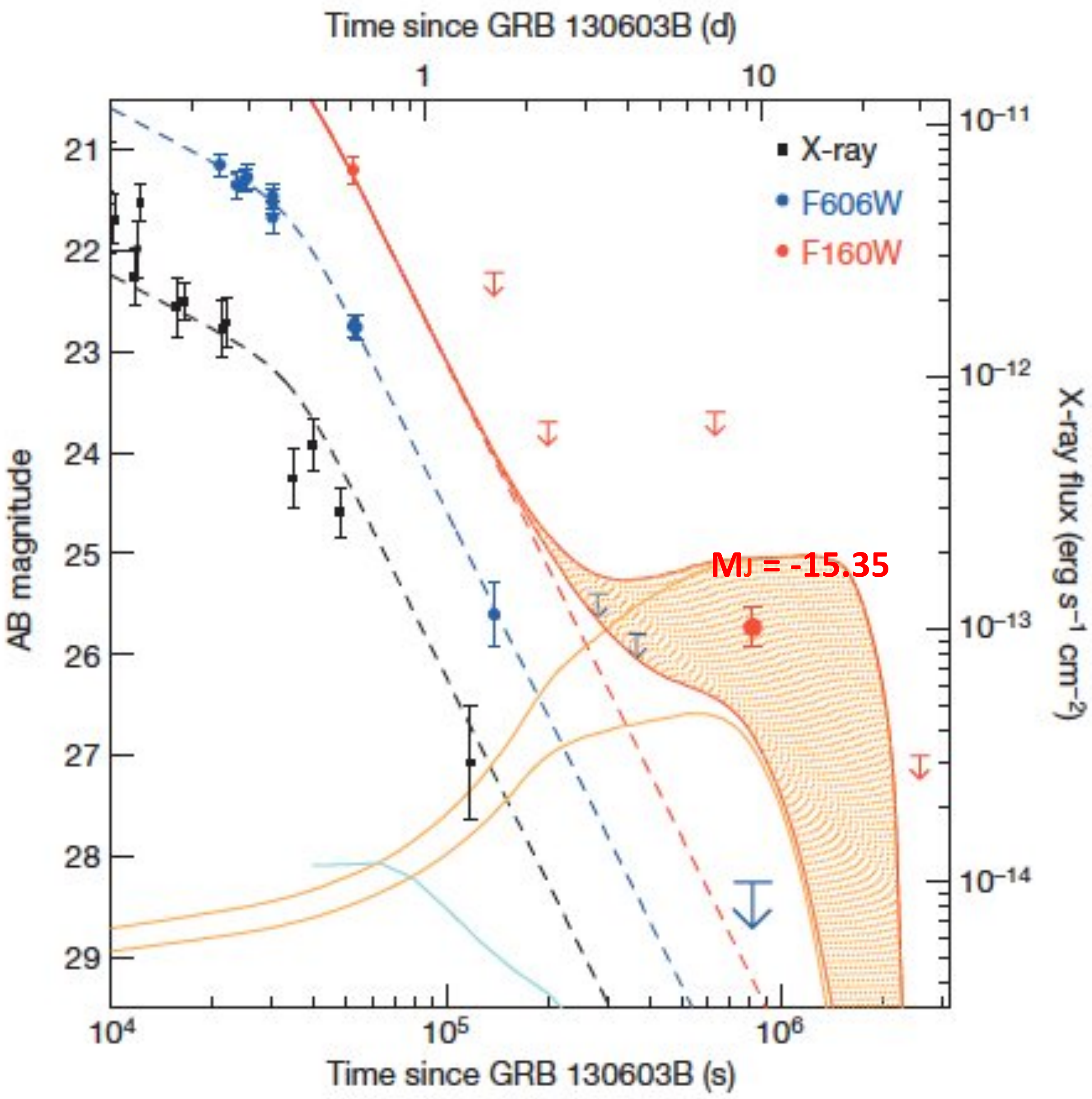
<u>Kilonova</u>:

Ejection of r-process material from a NS merger (0.01-0.1 Mo) (Barnes & Kasen 2013)

MH ≈ -15

MR ≈ -13

If NS+NS mergers are detected within 150 Mpc (z ~ 0.03), the fluxes will be a factor of 100 larger, i.e. AB mag about 21, weak, but affordable from the ground



Tanvir et al. 2013;
Berger et al. 2013

A big innovation through a long tradition

GRAWITA draws upon and benefits from experience built in 20 years of **GRB** follow-up activity (many of the more senior members are the same!).

Goals: near real-time low- and high-resolution spectroscopy and deeper multi-band imaging for identification and characterization of candidates
(polarimetry may be included in the near future).

Current flourishing of surveys and rolling searches, that increase the probability of transient detection at early stages.
Big opportunity for comparative studies and data analysis procedures (see for example collaboration with the VISTA-VIRCAM team)

Very efficient alert system: repointings can be very fast (few hours to less than 1 day), if accurate positions are provided

During the LIGO observing run of Fall 2015 we have alerted many telescopes of our network (Asiago, TNG, REM, NOT, NTT, LBT) and have obtained data for several dozens of “transients” detected by both VST and other surveys in the GW sky areas.

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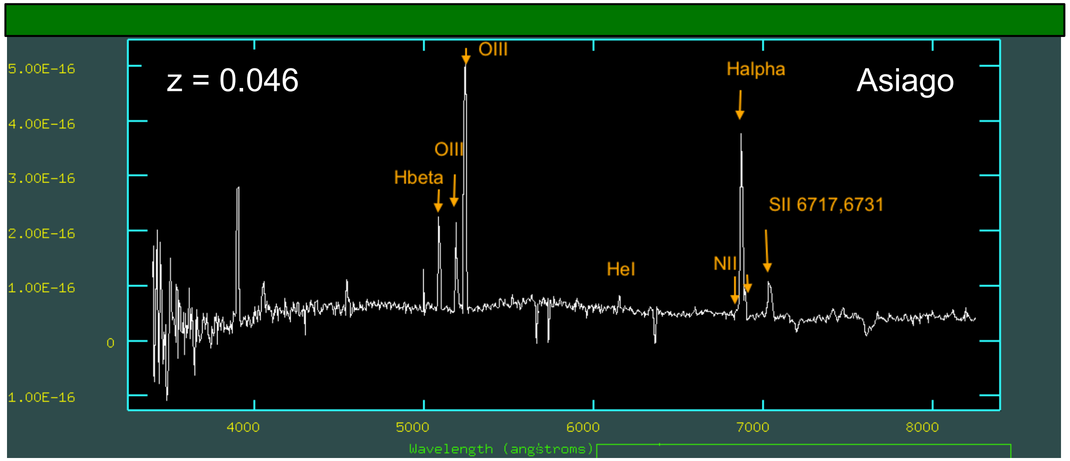
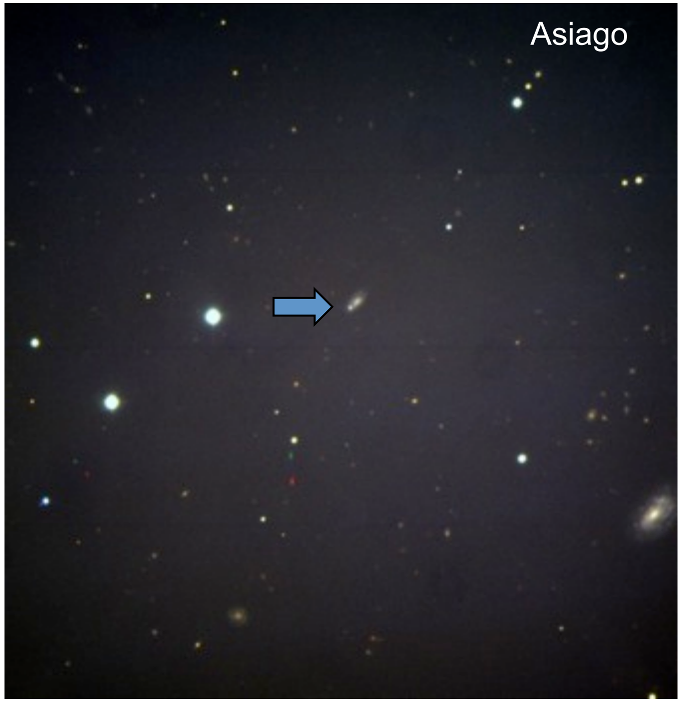
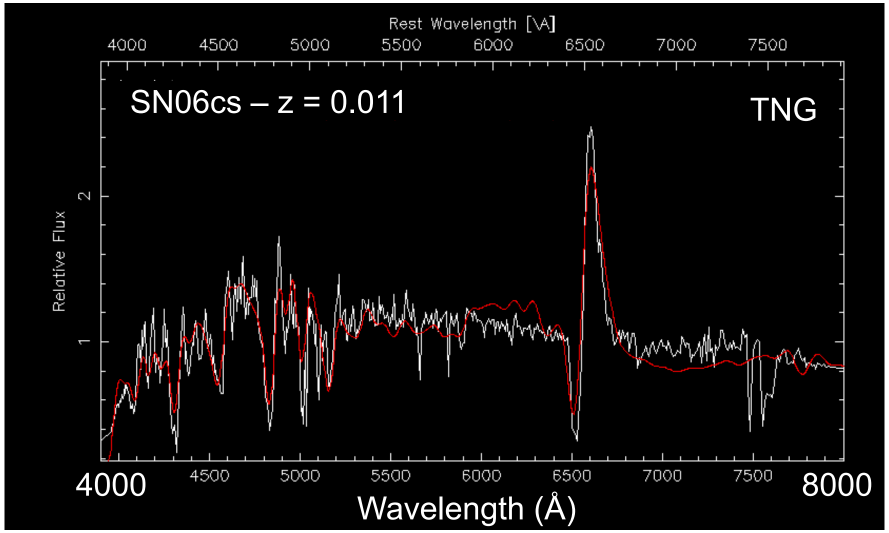
GRAWITA: GRAvitational Wave Inaf TeAm

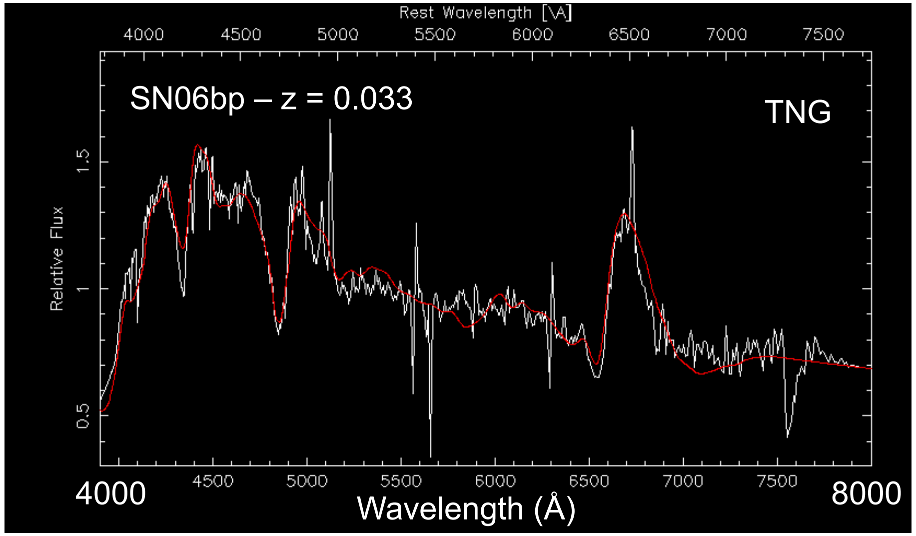
Characterization

Telescopes: LBT / NTT / TNG / NOT / Asiago
Collaborations: IPTF and PanSTARSS/PESSTO





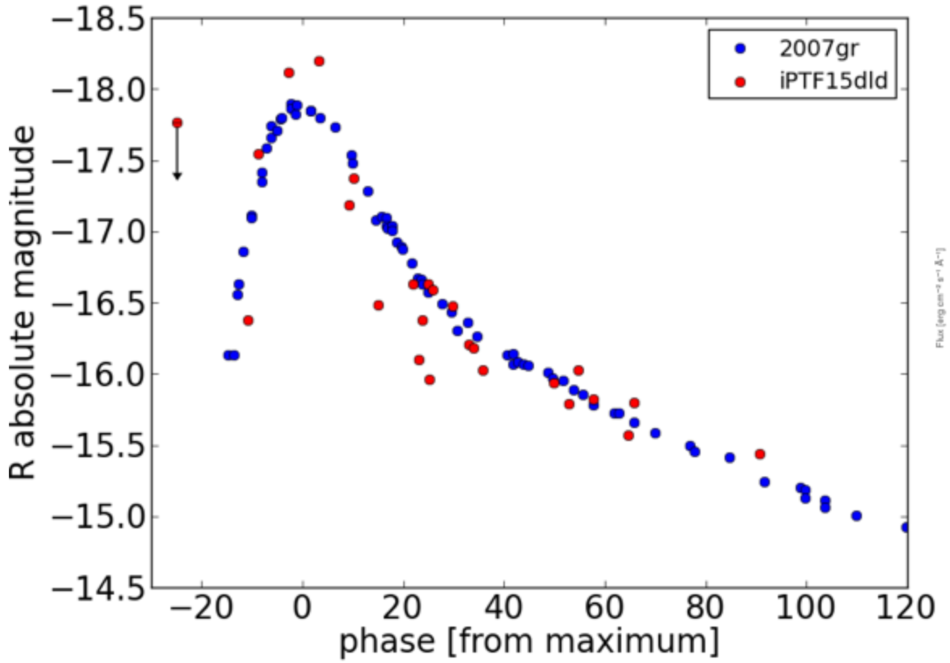


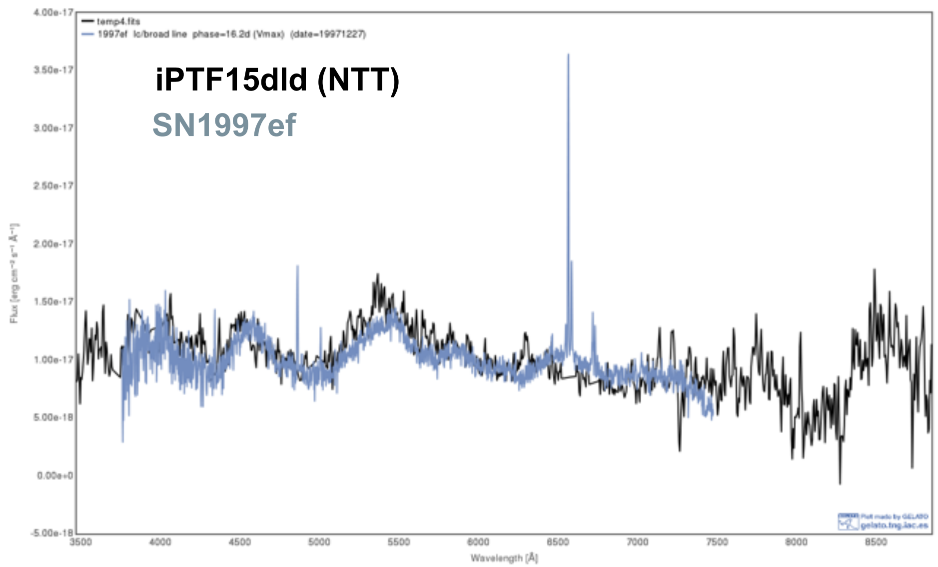


data analysis : L. Tomasella

Broad-lined Ic Supernova iPTF15dld (z = 0.046)

Detected by the *intermediate* Palomar Transient Factory and identified at Asiago as part of the GW follow-up program; then observed also by TNG, NOT, PESSTO.
The SN has a light curve similar to that of a “normal” Ic SN, but the spectrum close to max is similar to that of broad-lined, energetic “stripped-envelope”





Pian, Tomasella, Benetti, Cappellaro, Sheng, GRAWITA Collaboration, et al.. 2016, in prep.

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