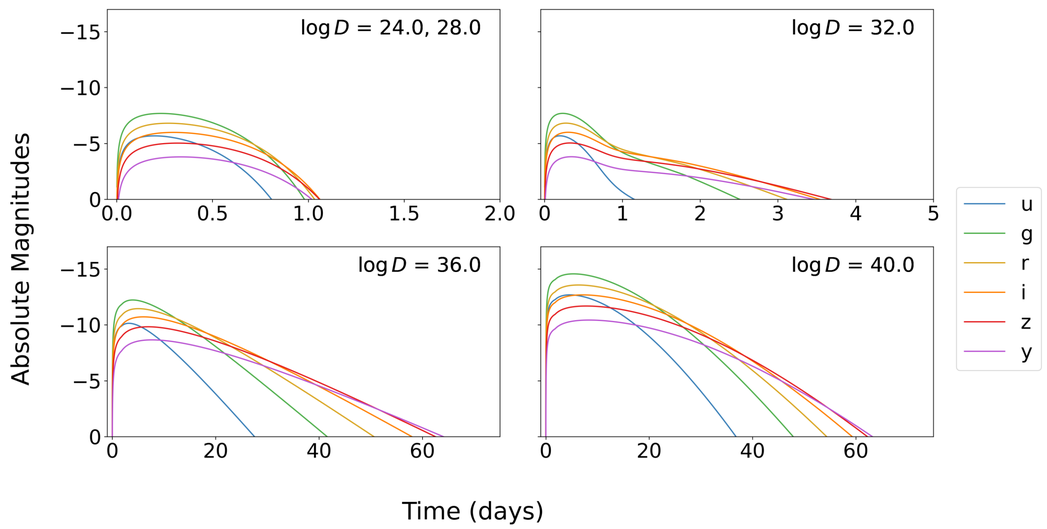
ON THE OPTICAL TRANSIENT FROM DOUBLE WHITE-DWARF MERGERS

Ridha Fathima[1,3], Alexandre Almeida[2], Mattia Bulla[1,4,6], Jaziel Coelho[2], Jorge Rueda[1,3,7], Cristiano Guidorzi[1,4,5]
[**ridha.fathima@icra.it**]

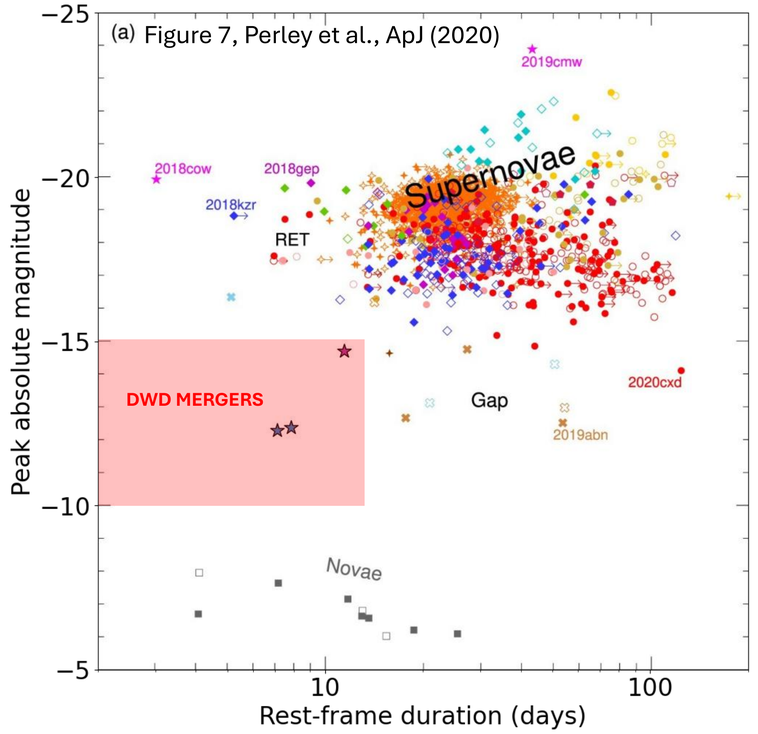
TRANSIENT MODEL: Non-explosive double white dwarf (DWD) mergers can lead to three possible remnants: 1) a stable sub-Chandrasekhar WD; 2) a rapidly rotating super-Chandrasekhar WD; 3) a neutron star (NS). We explore the optical transient arising from DWD mergers that leave an NS remnant formed by prompt collapse of merged core. The thermal transient is powered by heating and cooling of the dynamical ejecta. The heating source is the magnetic dipole radiation of the newborn NS, which depends on the dipole factor $\boldsymbol{D = B_d^2/P_0^4}$, where B_d is the magnetic strength at the pole and P_0 is the initial rotation period.

FAST, FAINT TRANSIENTS

- **Peak > -15 mag**
- **Decay rate > 0.1 (mag/d)**
- **Blue at peak (g-r ~ -1 mag)**



WHAT IS HIDING IN THE GAP?



PREDICTIONS: Accounting for survey cadences, we find that only cases with high injections from newborn NS (log D = 36–40) with detection upper limits:

- **10–100 yr^{-1} in ZTF *g*-band within 20–70 Mpc**
- **100–1000 yr^{-1} in ATLAS *o*-band within 40–120 Mpc**
- **100–10^6 yr^{-1} in LSST *g*-band within 240–760 Mpc**

References:

- Ridha Fathima – Almeida, et al., JHEAP 53 (2026), "*Optical transients from non-explosive double white-dwarf mergers: the case of a central neutron star remnant*"
- Sousa, et al., ApJ (2023), "*On the Optical Transients from Double White-dwarf Mergers*"

Affiliations: 1 - University of Ferrara, Italy; 2 - Universidade Federal do Espírito Santo, Brazil; 3 – ICRANet, 4 – INFN Ferrara, 5- INAF-OAS Bologna, 6 – INAF-OAA Teramo, 7-INAF-IAPS Rome, Italy

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