Review of some Gaia alerts: not only SNe.....

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1) "Older" Gaia objects 2) Recent Alerts

Matching Gaia Alerts with archive spectra

- All Gaia Alerts from beginning (2014) to 11/2018 (GA)
- + Nuclear Transients from Kostrzewa et al. (KR-2018), 6/2016-6/2017
- 6308 GA and 482 GNT candidates
- Compared with LAMOST-DR5 (and complemented with SDSS-DR15)
- 3" search radius
- Spectral range ~ 3700-9000 A, R~ 1800, down to r~18
- Spectral date usually different from Alert date..!!

Results: stars...

- 26 "stars" (among which 12 have multi-epoch spectra)
- Mostly cataclysmic variables
- Easy to recognize when in 'low' state...but less so in high accretion stage (opt. thick!)

Some 'stellar' spectra may be misclassified Catacl. Variables ! (e.g. G17akp or G18crs) Few YSO's ??



Results: Galaxies

- Mostly emission-line galaxies
- A few absorption line galaxies
- 206 GA-Galaxies (49 multi-epoch)
- 55 GNT-Galaxies (13 multi-epoch)
- And a few Seyferts... (often mis-classified because Sey 1.9 only (weak broad H α))
- Starburst galaxies likely to provide SNe...
- But AGN activity is there also !
- Light-curve needed to distinguish...



Two (only...) SNe confirmed (archive spectra rarely coincident with Alert date!)

GNTJ170213+2543: la ~+15d

Gaia 17aal: la ~near max.



Results: Galaxies-Seyferts

Some mis-classified Seyferts:

Not clear if Alert is due to SN or to genuine AGN activity...

• Few bona-fide Sey 2's (where star formation can be present)

Quasars: 30 GA and 68 GNT, plus 12+23 multi-epoch



Results: AGN's/QSO's

- Difficult to know a priori if SN, TDE, AGN variation: light curve needed...
- Multiple spectra allow to detect variations: a number of CLQ's or CSQ's observed
- Hβ increase goes with bluer continuum
- What is the physics behind? We need spectra coincident with the photometric change!! Probably several things going on...
- What ∆m level for Gaia Alert ??



More recent examples....

- Gaia alert: June 2020, rise > 1mag over monthes
- SDSS reference: Liner
- Object high since then...Broad component appears !
- •Better sampling needed to understand the origin: increase of accretion rate? Or change in reddening? $tcross,BLRcloud = 84M^{-1/2} L^{\frac{3}{4}} days$ (~100) or $tcross,dust = 24M^{-1/2} L^{\frac{3}{4}}$ years (10-20) Need better dust structure model.... !
- •Follow-up: several other similar examples...



Some examples of QSO variations...



Follow-up...

- Any telescope > ~ 2m for spectroscopy
- Classification of « older » objects





• Detections • Alert Scans

Be, or YSO, not AGN as thought...

Follow-up...

- Any telescope > ~ 2m for spectroscopy
- NOT, Asiago, OHP, etc...
- New spectro/imager under tests at OHP (modified copy of SPRAT/Liverpool, thanks to lain Steele; software to be adapted from Marco Lam)
- Available ~~ for general use end of 2021



Conclusion

- We have a lot to do !
- We need a lot of spectroscopic time...
- And we need to react rapidly: time scale depending on type of target! (mns for GRB's, hrs for SNe, days for AGN's (more adapted to Gaia Alerts))
- How to distinguish TDE from AGN activity ? Follow-up...
- More Gaia Alerts welcome (if well defined) as they provide light-curves !

Thank you for your attention