Science with ULTRASAT

- ULTRASAT mission goals
- ULTRASAT @ DESY:
  - Neutrinos
  - Cosmology
  - GRBs
  - AGN
  - …

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DESY ULTRASAT science book

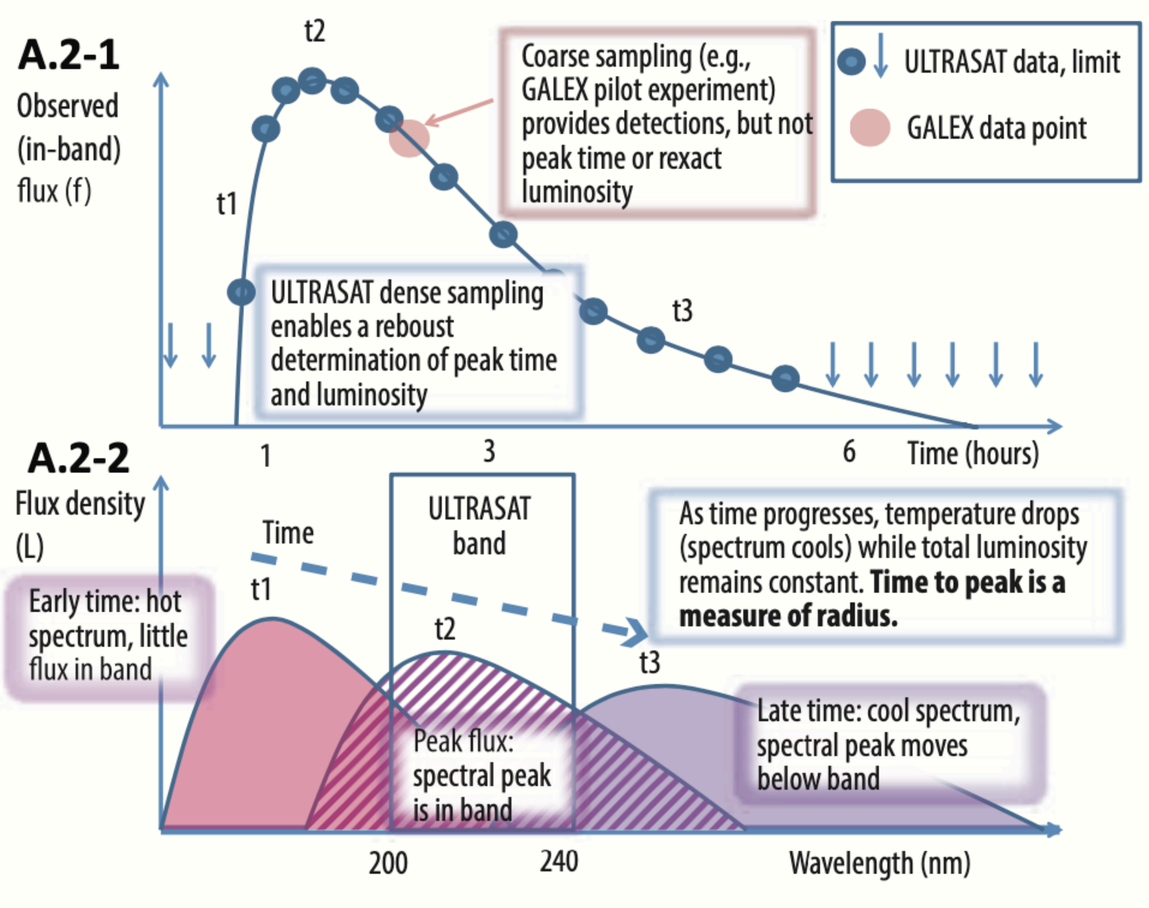
- **Coordinated by Marek K.**
  - Working on a short white paper, summarising the science topics of interest for us at DESY
    - Refine scientific goals
    - Understand how these might impact the observation strategy of ULTRASAT
    - Map out future projects / analyses to be developed

  - First “complete” draft by early January, but this will be a living document
  - Anyone interested is welcome to join the effort !

Science with ULTRASAT

- **The death of massive stars**
  - Shock breakouts & early shock cooling of CC-SNe
  - Superluminous SN
  - Type Ia SNe
- **Wide-field UV time-domain survey**
  - Discover transients
  - GRB afterglows
  - Transmit alerts to the community
  - MWL / MMS correlations (IceCube, LSST, CTA, …)
- **Compact object transients**
  - Emission from GW NS-NS / NS-BH mergers
  - Cataclysmic variables
  - TDEs
- **& more…**
  - Flaring stars
  - Eclipsing binaries
  - …

High cadence UV observations



Sagiv (2014) arxiv:1303.6194

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- **Neutrinos**
  - Astrophysical neutrinos → AGNs, Blazars, TDEs, SNe, GRBs, Starburst galaxie, …?
  - Followup high-energy neutrinos
  - Cross-correlation of cosmic neutrino sample with UV(+MWL) sources

- **Cosmology**
  - Type Ia SNe, plateau CC-SNe (SNe IIP) & kilonovae (KNe) → distance measurements
    - Probe the nature of dark energy and dark matter
    - Tests of the early Universe
    - Tests of general relativity
  - Early UV+optical light curves of SN Ia needed → redshift-evolution of progenitors?
  - Kilonova cosmology
  - Better models of dust extinction for distance measurements
  - Time delay of lensed SNe & other exotic transients → Hubble constant

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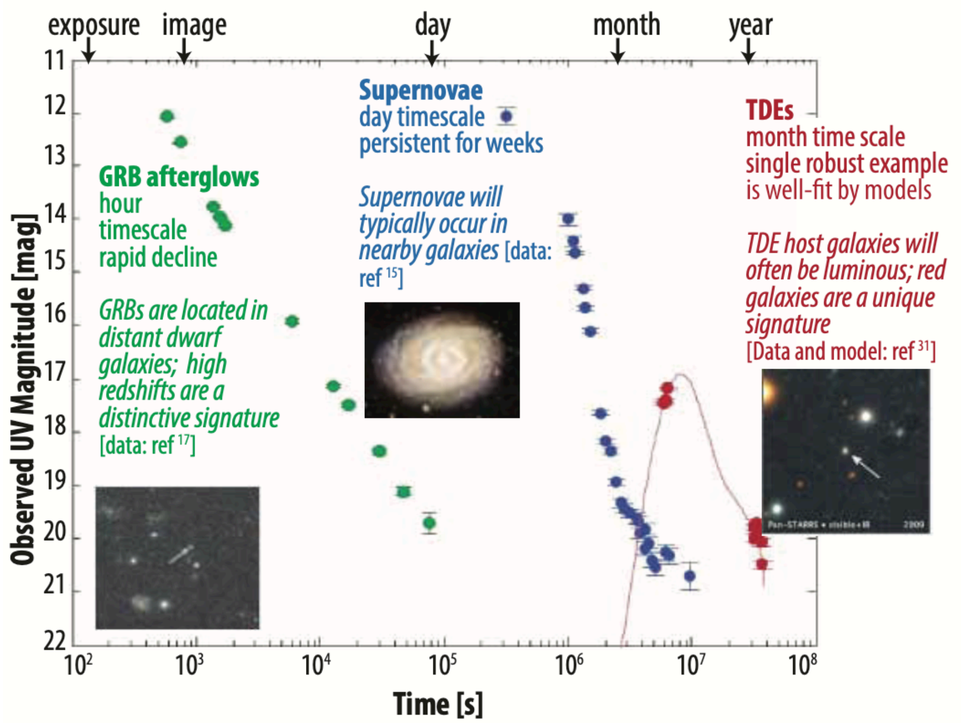
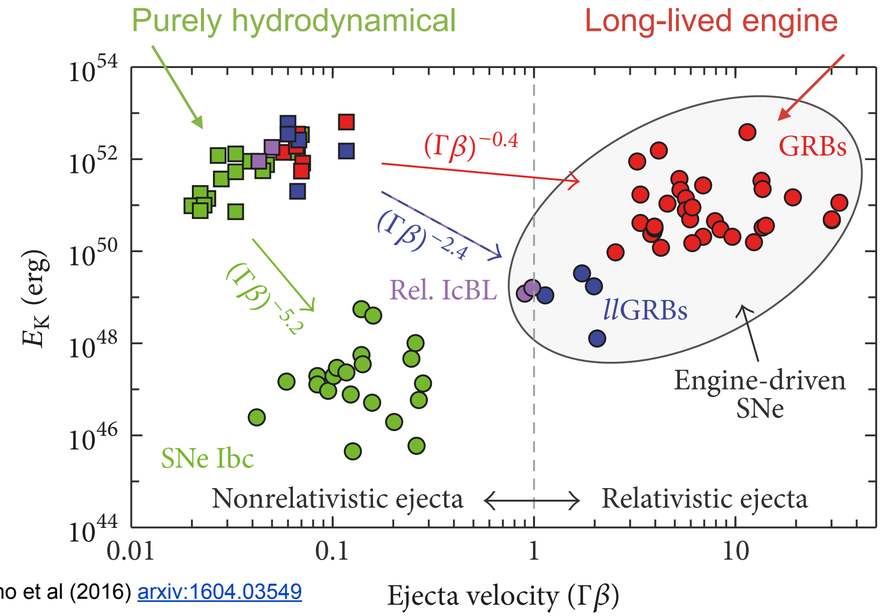
- **GRBs**
  - Serendipitous UV(+MWL) detection
  - Followup of external alerts
  - Detection afterglows & shock breakouts of known GRBs
  - SN Ic → shock breakouts → LL-GRBs → HL-GRBs:
    - Wide field survey UV(+MWL) → early UV data ⊕ SN Ic classification
    - Late time MWL followup → identification of (sim-)relativistic outflows
    - Populations studies of (low-redshift) GRB progenitors

Sagiv (2014) arxiv:1303.6194





Cano et al (2016) arxiv:1604.03549

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- **AGN**
  - Blazar monitoring and flare follow-ups
  - Large-scale AGN classification → disk obscuration, MWL cross-correlation
  - More details needed!

- **What else?**
  - …