TDEs with LSST

Katja Bricman
Center for Astrophysics and Cosmology
University of Nova Gorica

Gaia Science Alerts Workshop, Vipava, October 9th, 2018

Tidal Disruption Events

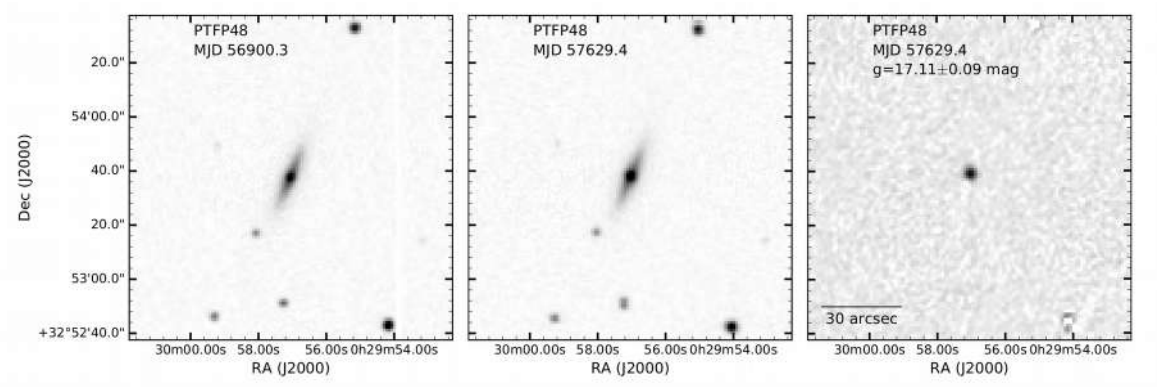
- Disruption of a star by a supermassive black hole

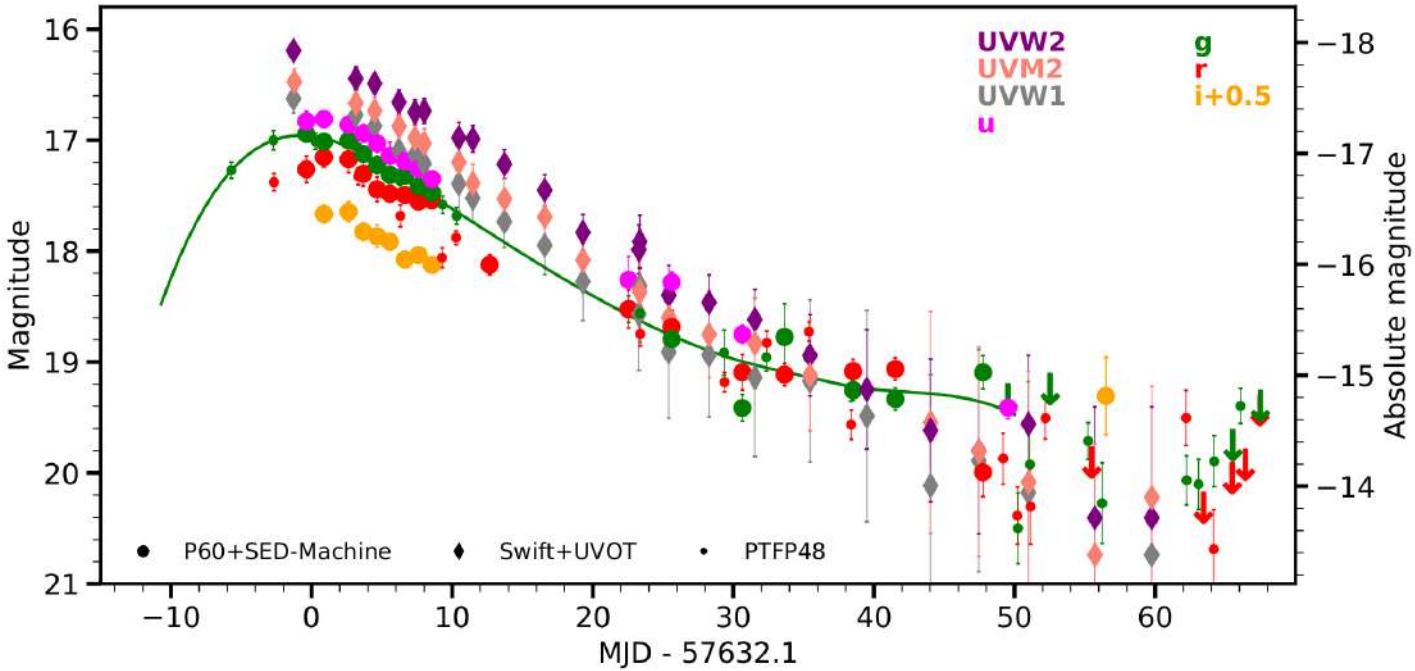
  → Flares from quiescent galaxies

- To date ~ 70 candidates.

Observational signatures

- $M_{peak} \approx -18$ to -20 mag
- Blue ($g - r \approx -1.0$)
- Luminosity $\propto t^{-5/3}$
- Decline: months to years

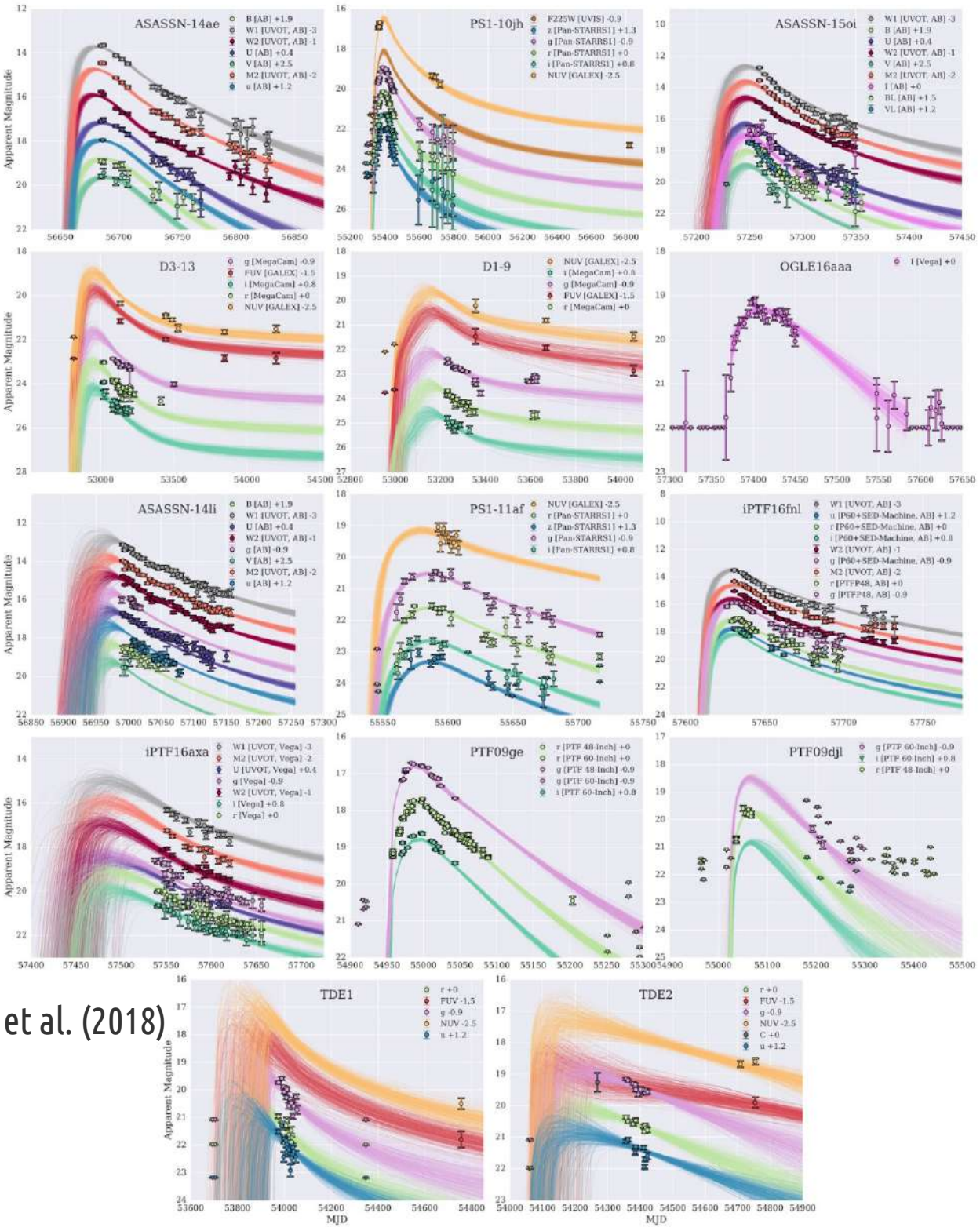




iPTF-16fnl, Blagorodnova et al. (2017)

MOSFiT

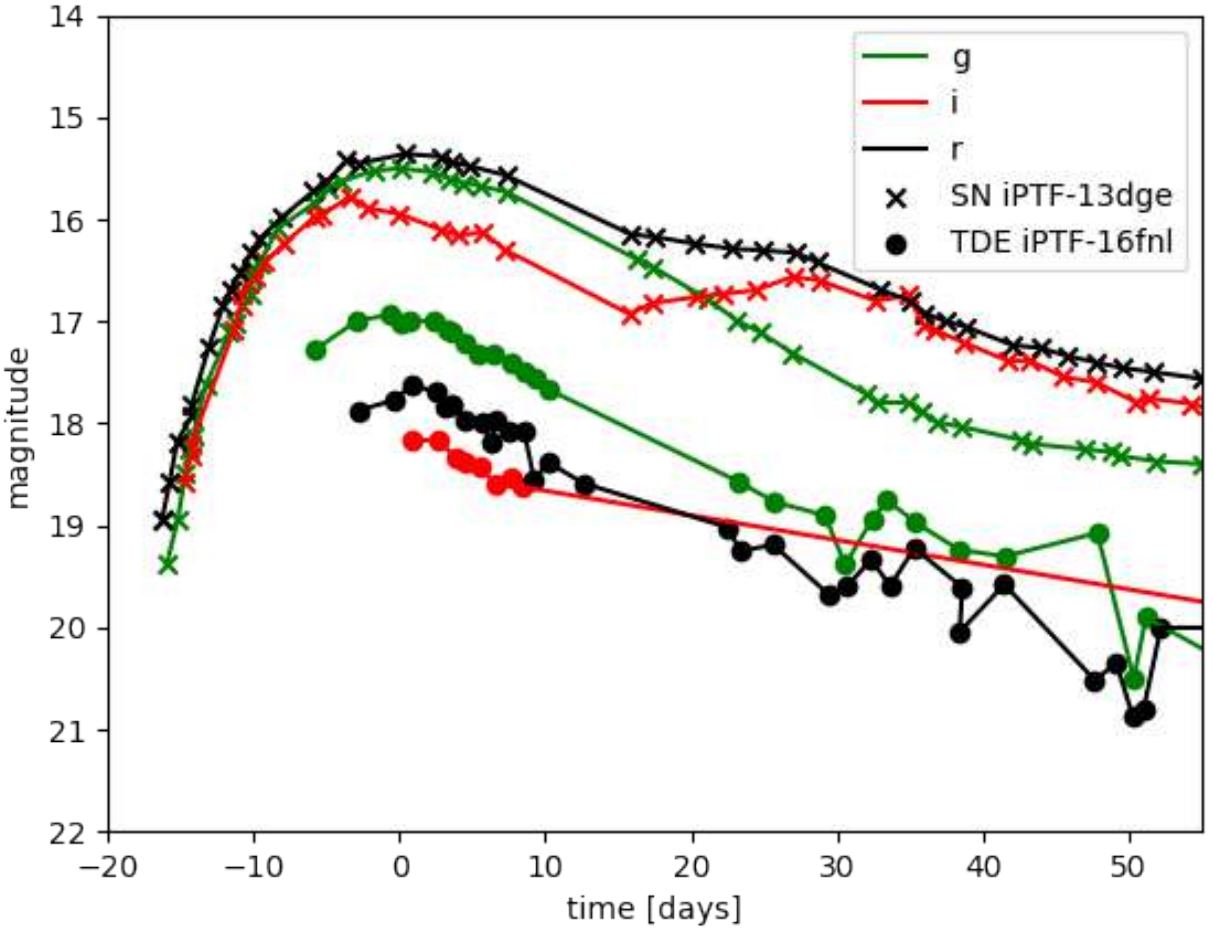
- The Modular Open Source Fitter for Transients
  - Semi-analytical model
- MCMC fitting based on hydrodynamical simulations of TDE fallback rate



Mockler et al. (2018)

Rare events with many impostors

- Rare events → large surveys needed (LSST)
- Main sources of contamination: Type Ia SNe

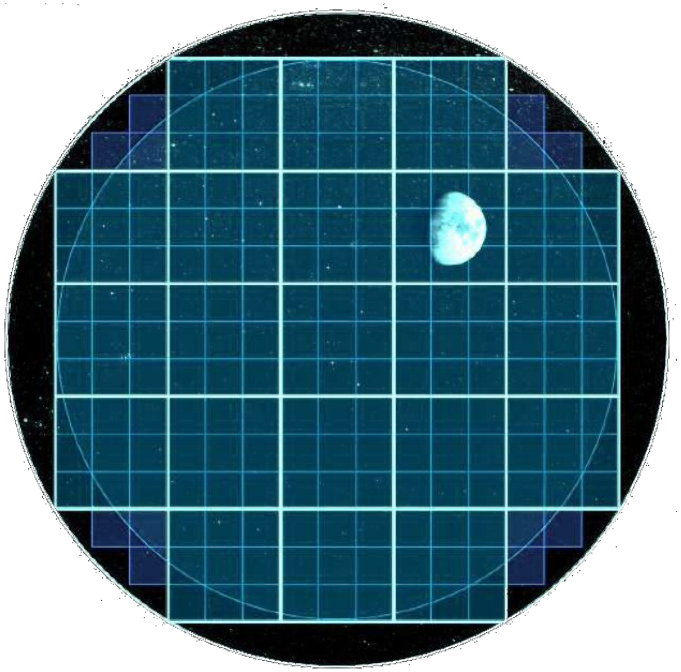


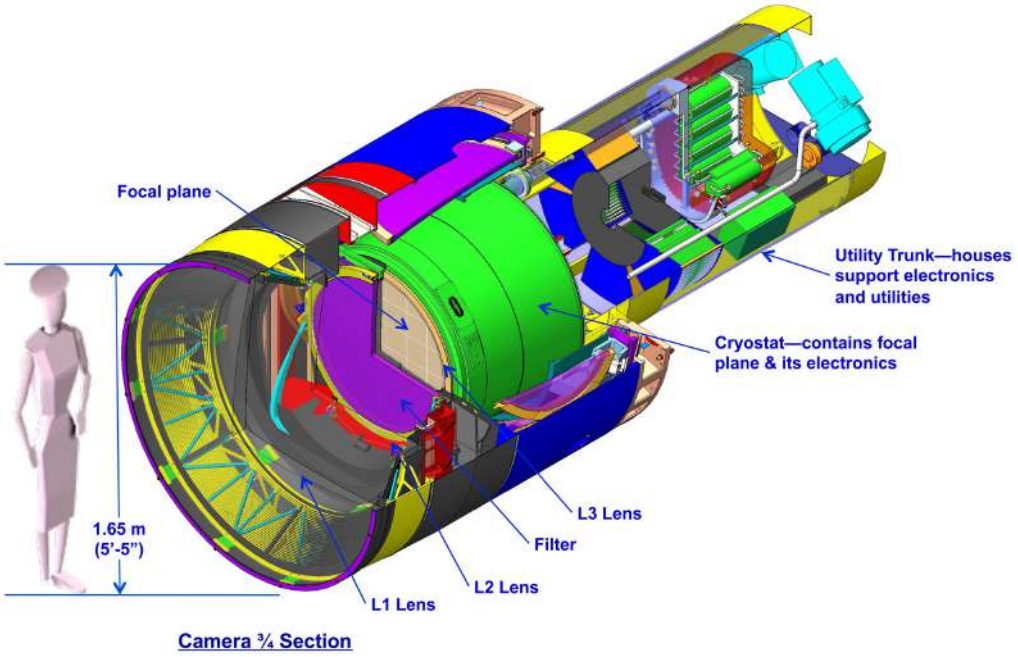
Classification ASAP after the first observation is crucial!

Large Synoptic Survey Telescope (LSST)

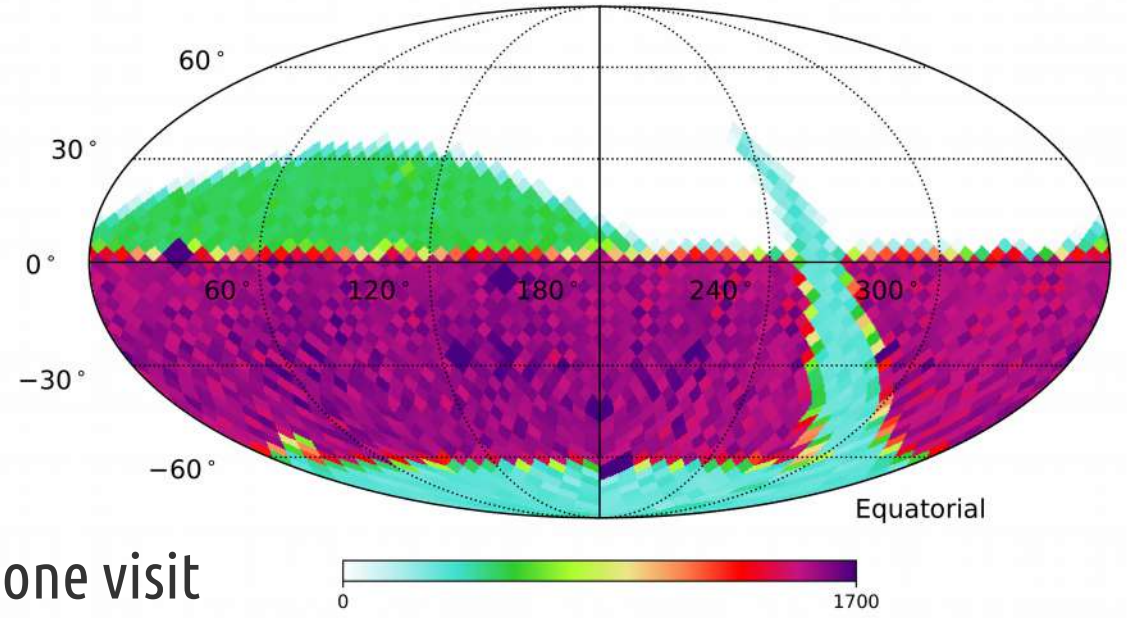
Technical details

- 10000 deg² per night
- Total observing area: 18000 deg²
- FOV 9.6 deg²
- Primary mirror 8.4 m in diameter
- 3.2 Gpx camera
- 6 optical bands (ugrizy)
- Magnitudes up to 24.5 in a single exposure, 27.5 in co-added images
- Transient classification in 60s





Observing strategy
minion1016



Bricman&Gomboc (in prep.)

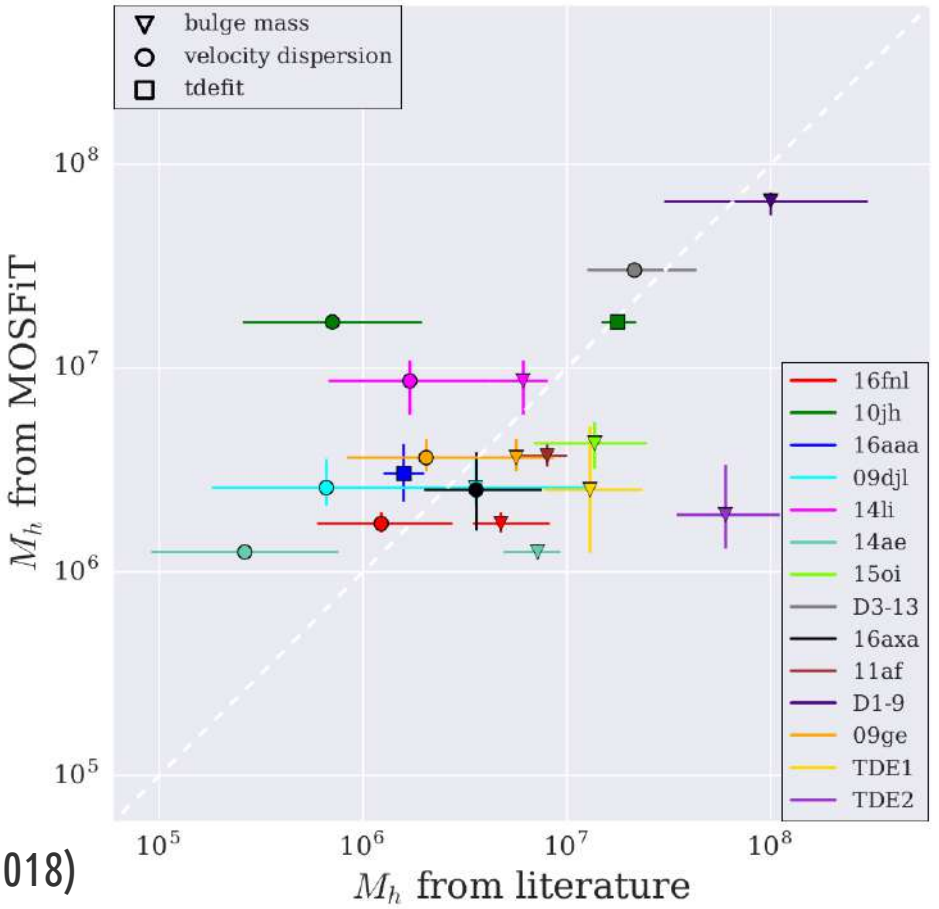
- Wide Field Survey (90%)
  - Two 15 second exposures in one visit
  - ~ 800 visits in 10 years
  - Current observing cadence suggests the next visit in 1h – 3d
- Deep Drilling Fields (10%)
  - 4 selected DDFs
  - More frequent temporal sampling

Where does GAIA come in?

- Previous activity of host galaxies
- Spectra of hosts (E+A postburst galaxies preferred)
- Astrometric position of the event (is the event in the center of the galaxy?)

Why are TDEs interesting?

- What are they and what are they rates?
- Evolution of BHs, IMBHs?
- Dynamics in GCs
- SMBH mass distribution
- Accretion physics



Mockler et al. (2018)