- Where we are
- LSST and friends
- Follow-up / preparation

July 2017 Andy Lawrence St Thomas

Where we are

Not new: extreme variability

Khachikian and Weedman 1971



Lawrence Pye and Elvis 1977













New (2): three models







New (3): Gsec timescales



New (4): Msec sampling

if you wait long enough

• which are which?

questions

- do they repeat?
- is everything an extreme variable?
- are the wavelengths simultaneous?
- dependence on L,M_H, λ_{Edd} , etc
- 3D structure of BLR •

is viscosity dead?

μlens and RM in same object

what do we need?

- even larger samples
- even longer term coverage
- good cadence
- multiple spectroscopic epochs
- massive spectroscopic monitoring

LSST and friends

upcoming photometric facilities

- now : PS2, DES
- v.soon: ZTF
- soon: LSST

upcoming MOS facilities

- now : AAOmega, TDSS
- soon: WEAVE, 4MOST, ReSpeQ, BigBOSS, PFS, MOONS

LSST: nearly there



Jan 2020: Oct 2020: Mar 2021: Oct 2022: ComCam LSST Cam SV start Full operations

deep and wide



KECK TELESCOPE

Primary Mirror Diameter



Field of View (full moon is 0.5 degrees)









LSST



long and fast

18,000 sq.deg
10 years
6 bands
825 visits
r=24.5 per visit

Quasar Estimates 10⁷ quasars total 10³ z~6 10⁵ extreme variables? 10⁴ TDEs/yr 10⁴ macrolensed quasars cf POSS/UKS sixty year light curves

10⁶ alerts per night

tens of high-amp events?

data flow

Level-1: alert stream

- some simple access via DAC
- fed to third party systems (brokers)



Level-2: stacked images, catalogues annual releases access via DAC cutouts, SQL queries, Jupyter notebook access

Level-3: community products/sw e.g. weak lensing analysis VO multi-wavelength federation classification, light curves transient filtering and action

AGN community has some work to do



Follow up planning

types of variability project

fast AGN transients

slow AGN transients

macro lensed AGN

sixty year AGN LCs

these have different requirements

Uniform cadence



cadence issue

any filter: median 3 days

r-band: median 15 days

worst case: 200 days

can increase sampling by reducing season



TDEs: rolling cadence better mulens: uniform cadence better CLQs ???

what we should be doing

- model light curves
- simulate with OpSim
- contribute to Obs.Strat. White Paper

need for brokers

- Find TDEs
- Find CLQ outbursts?
- Find slow-risers
- Feed to follow-up
 - Spectra
 - Dense photometry



massive spectroscopy

long term light curves

transient characterisation \checkmark

RM campaigns 🗸

long term massive spectroscopy



get this going!

(1) ResPeQ medium tier

(2) Repeat 2QZ and S82



out-takes

deep AGN samples select and confirm quasars find exvar subset; make LCs

types of project

fast AGN transients filter, VO xmatch, classify

slow AGN transients make LCs

macro lensed AGN find lensed AGN make component LCs

 follow-up fill-in photometry peak spectrum; decay spectra

prep
find risers; start spectra
follow-up
regular spectra, over peak

prep

select key areas; start spectra **follow-up**

regular spectra, over peak