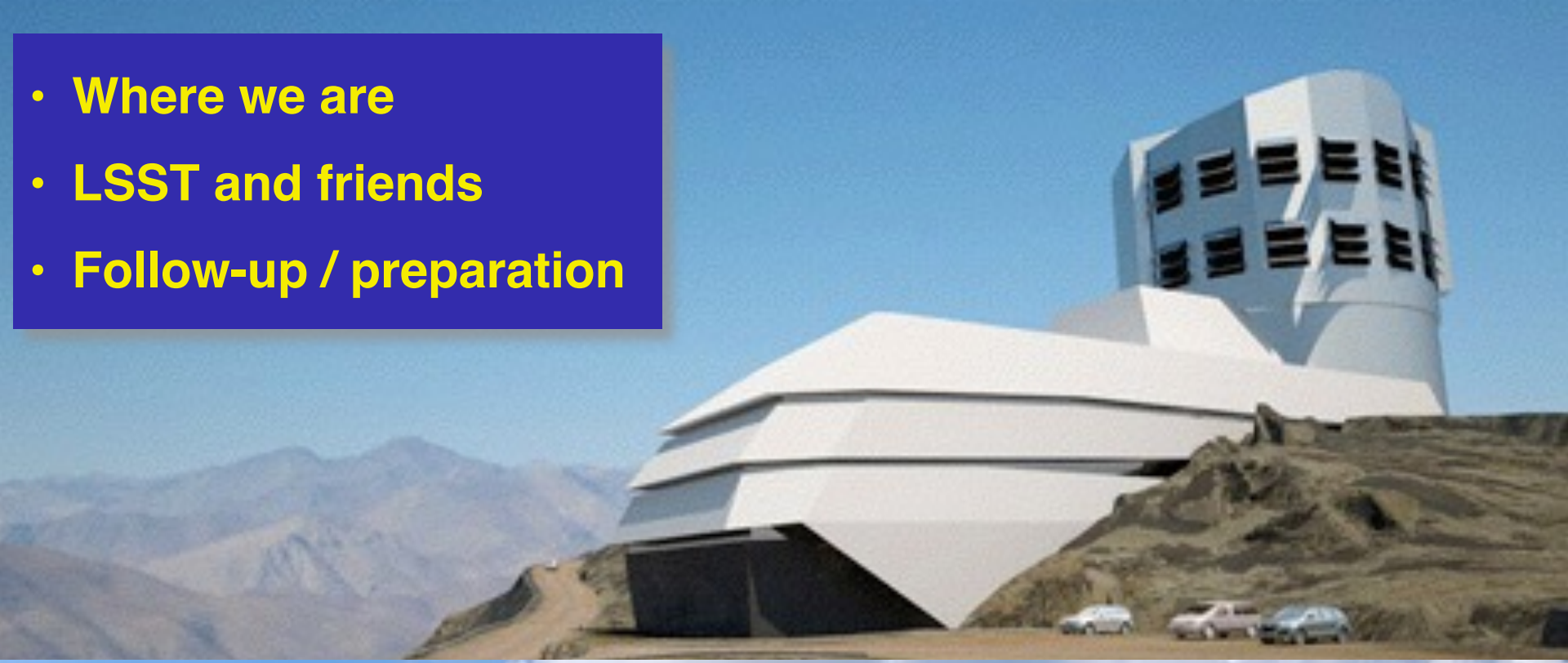
- Where we are
- LSST and friends
- Follow-up / preparation

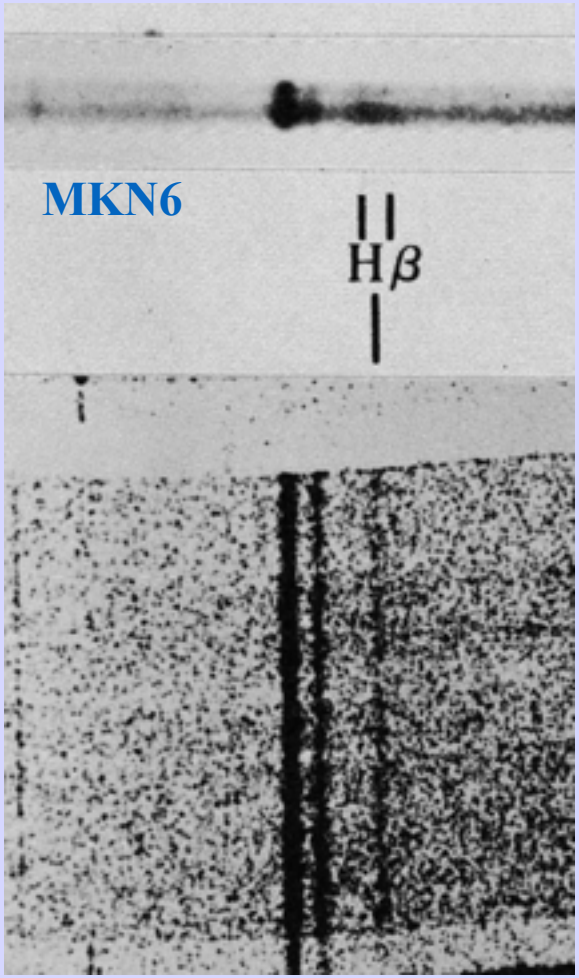


July 2017
Andy Lawrence
St Thomas

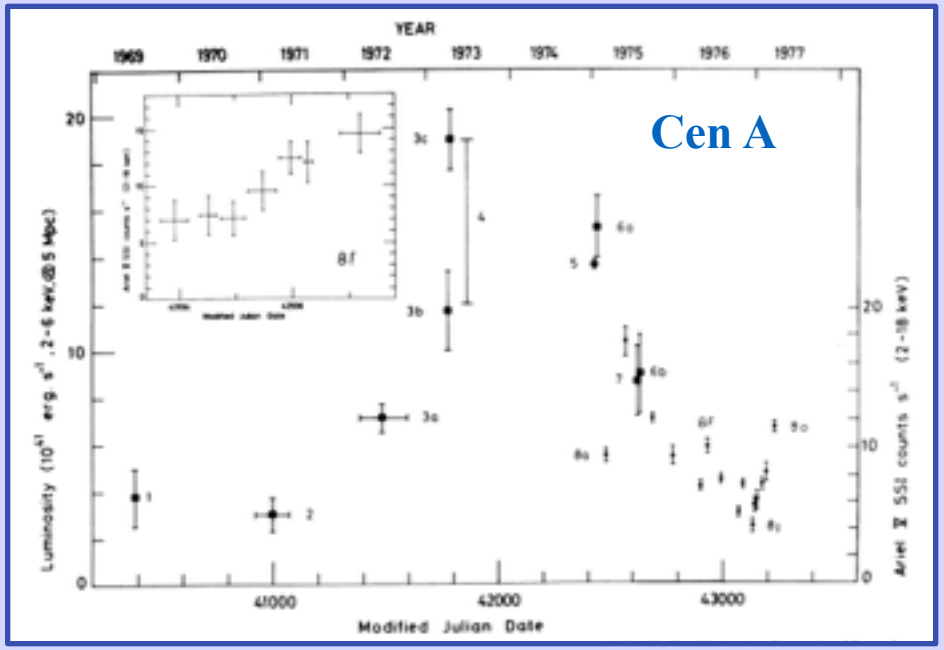

Where we are

Not new: extreme variability

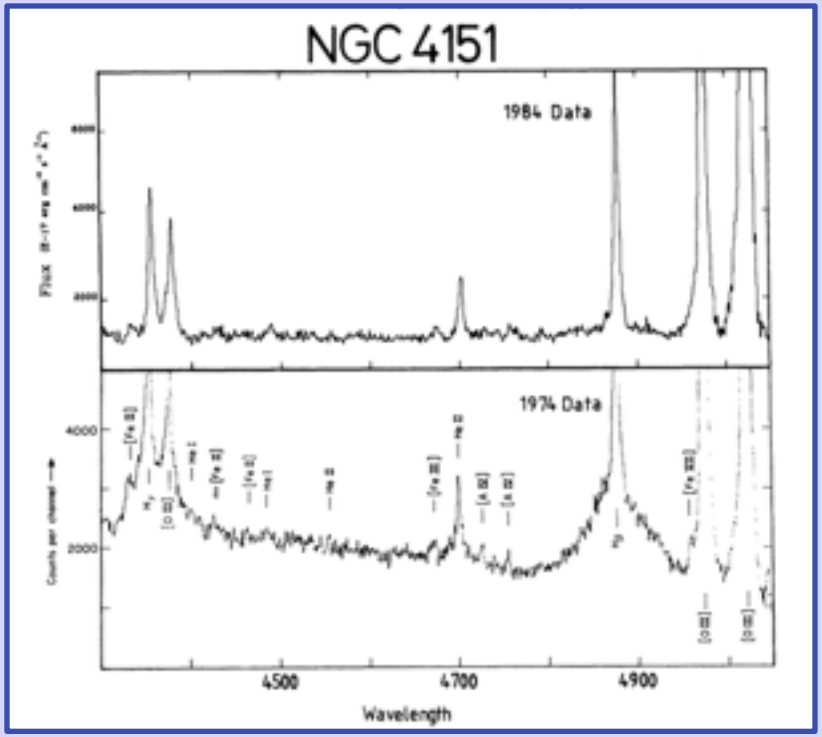
Khachikian and Weedman 1971



Lawrence Pye and Elvis 1977

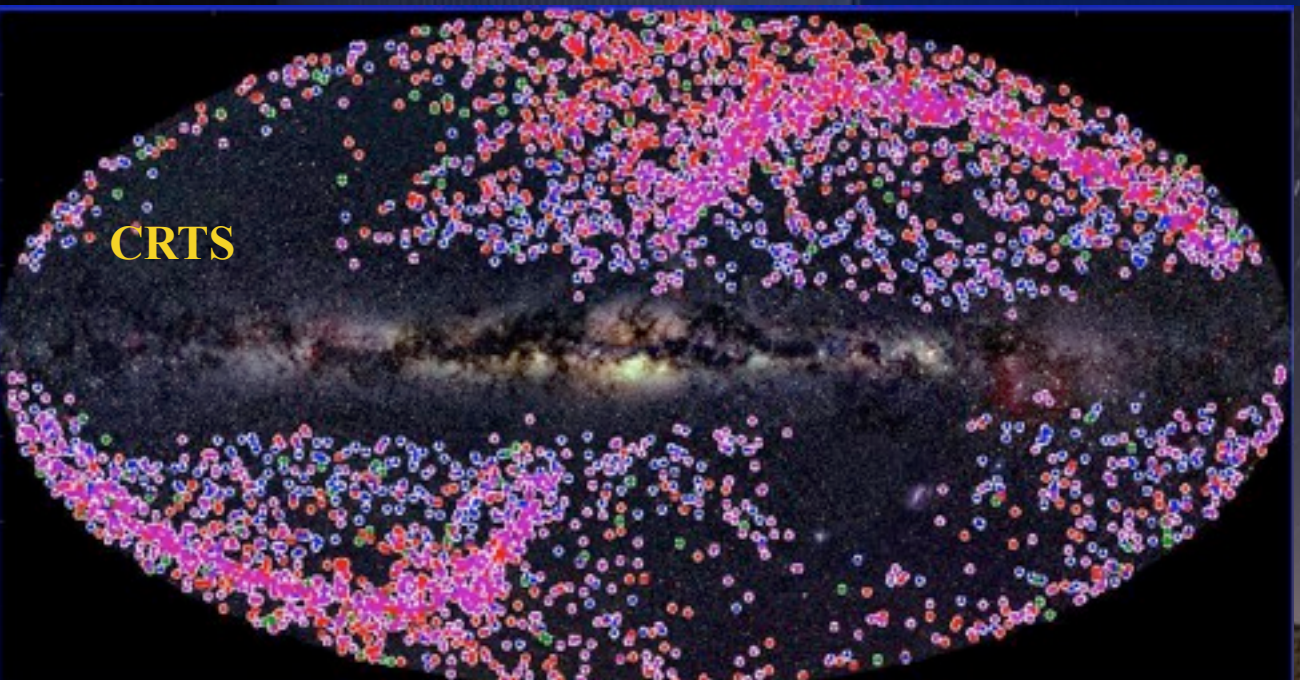


Penston and Perez 1984

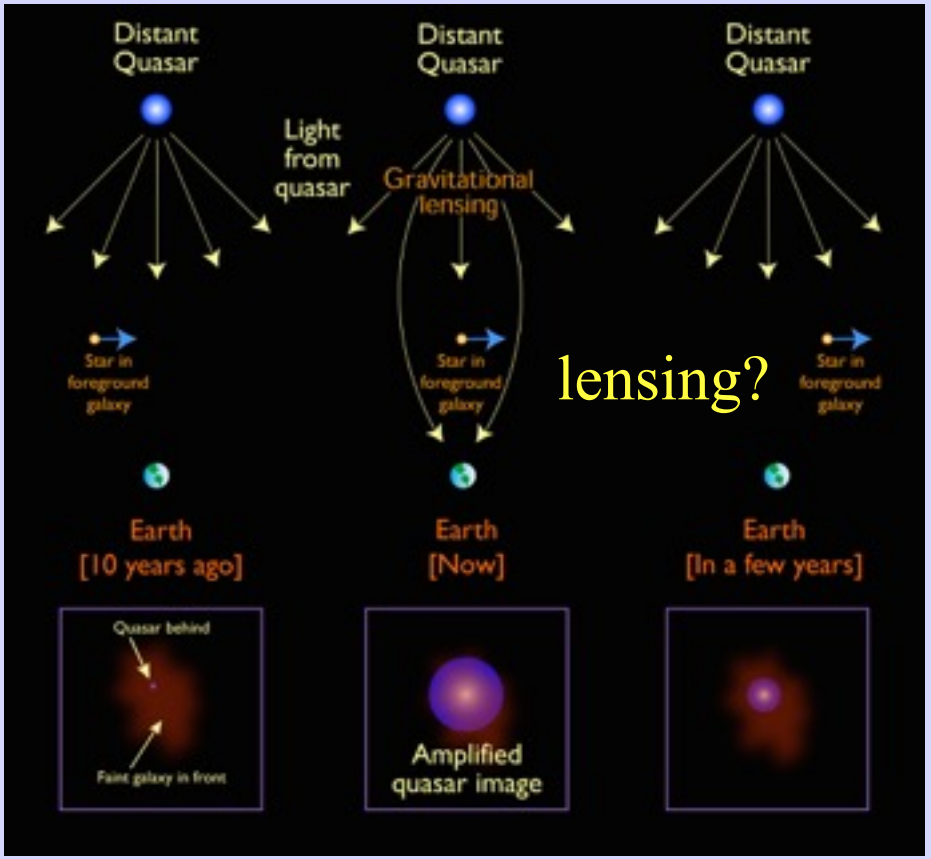


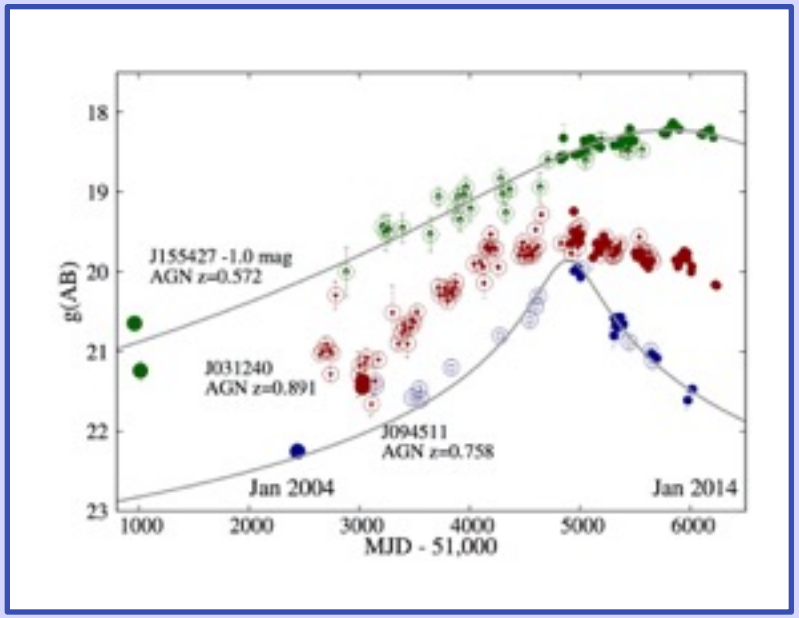
PS1

New(1): large sample discovery

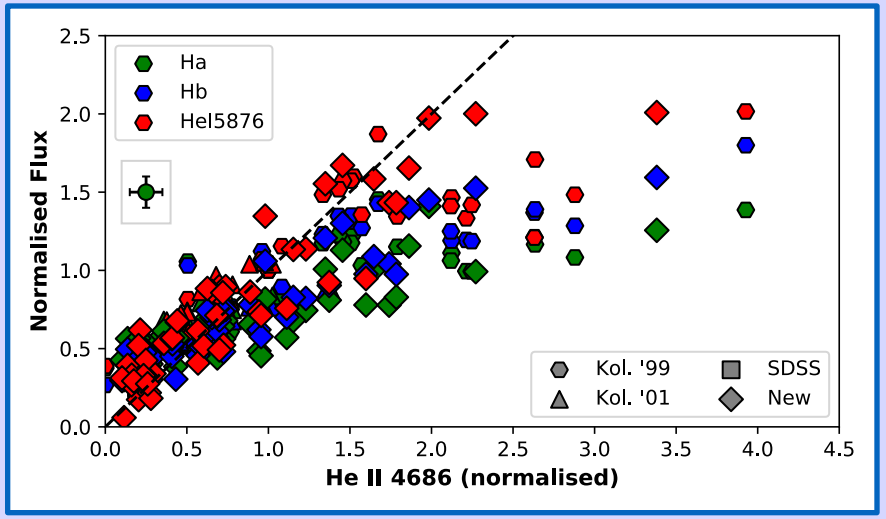


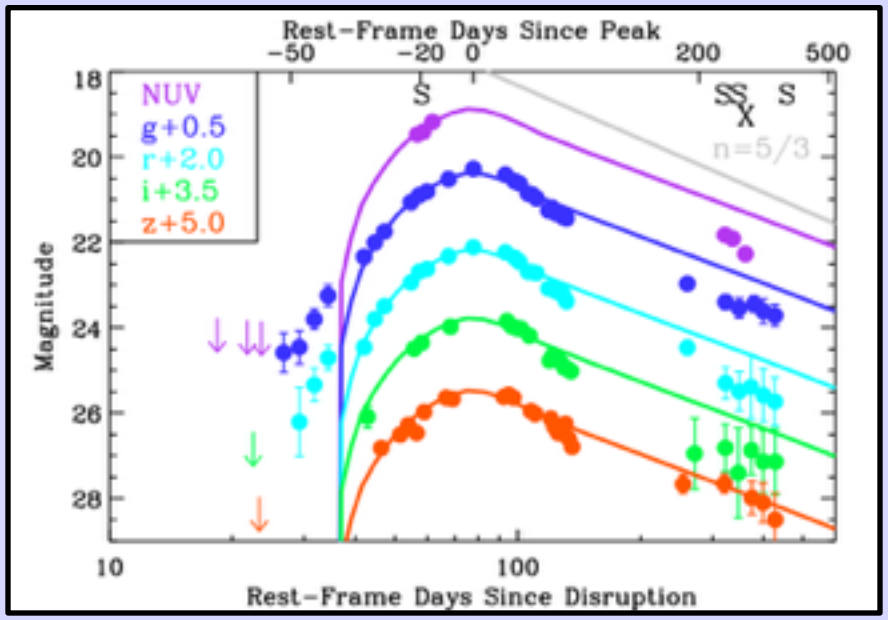
New (2): three models





New (3): Gsec timescales





New (4): Msec sampling

questions

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

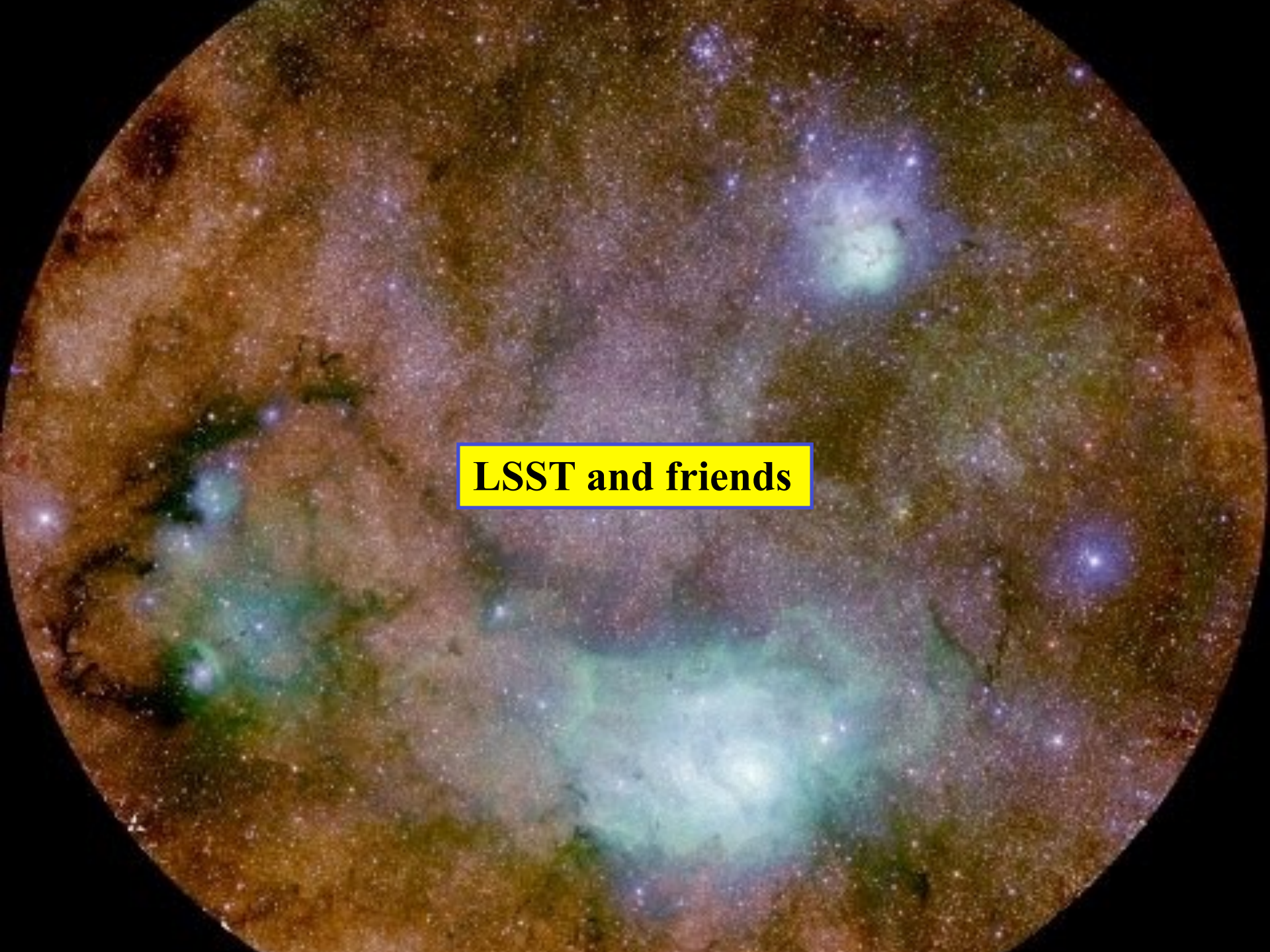
if you wait long enough

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

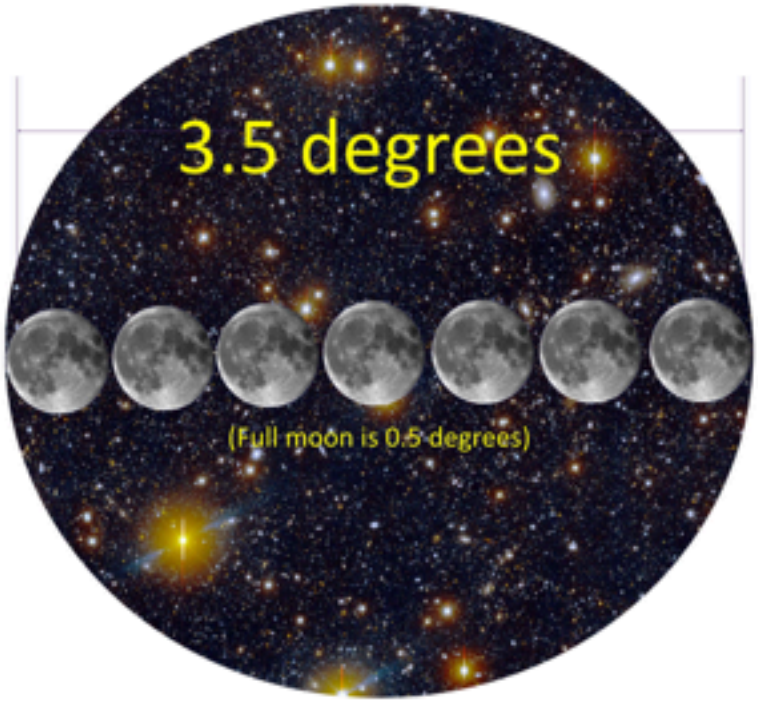
Jan 2020: ComCam
Oct 2020: LSST Cam
Mar 2021: SV start
Oct 2022: Full operations

deep and wide

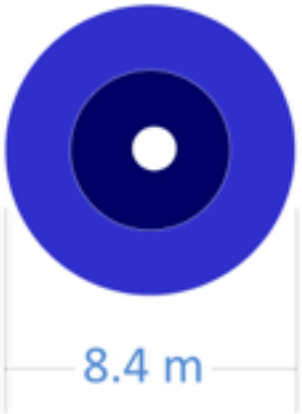
KECK
TELESCOPE

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

cf POSS/UKS
sixty year light curves

10^6 alerts per night

Quasar Estimates
10^7 quasars total
10^3 z~6
10^5 extreme variables?
10^4 TDEs/yr
10^4 macrolensed quasars

tens of high-amp events?

data flow

Level-1: alert stream
- some simple access via DAC
- fed to third party systems (brokers)

cf PESSTO

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

cf PESSTO


Follow up planning

types of variability project

fast AGN transients

slow AGN transients

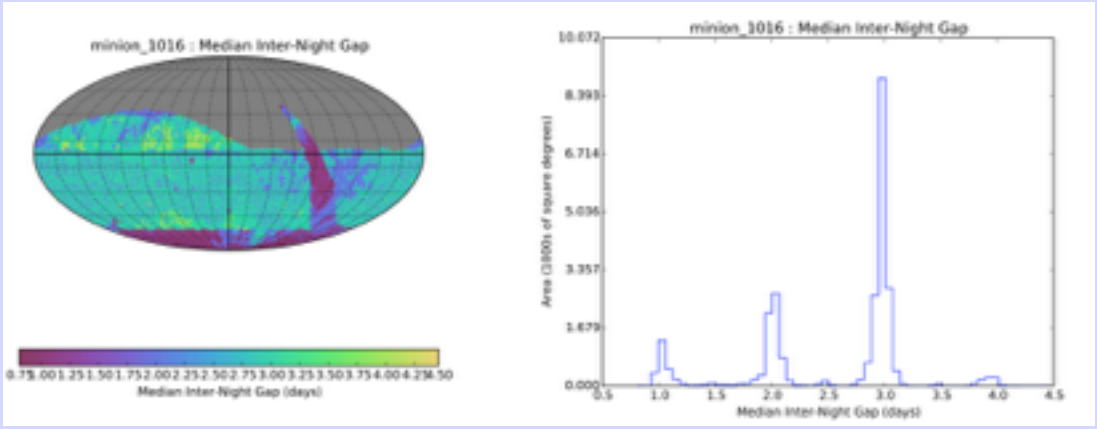
macro lensed AGN

sixty year AGN LCs

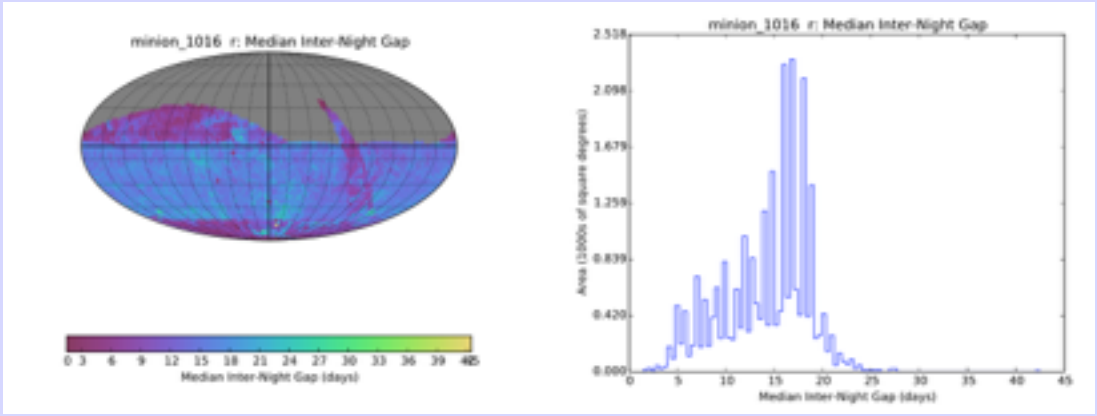
these have different requirements

Uniform cadence

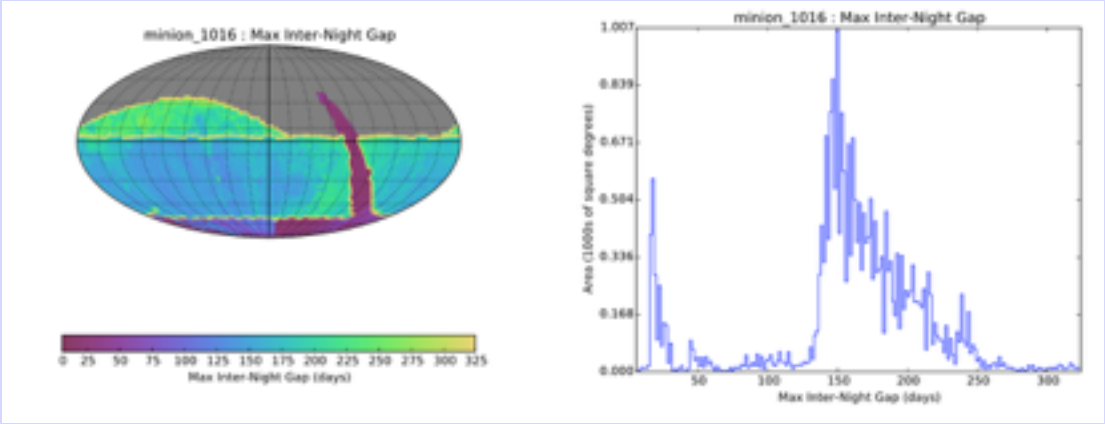
cadence issue



any filter: median 3 days

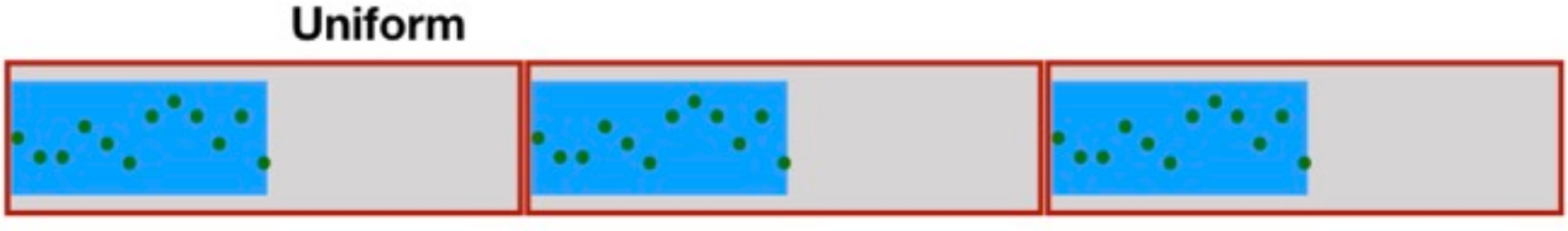


r-band: median 15 days



worst case: 200 days

can increase sampling by reducing season



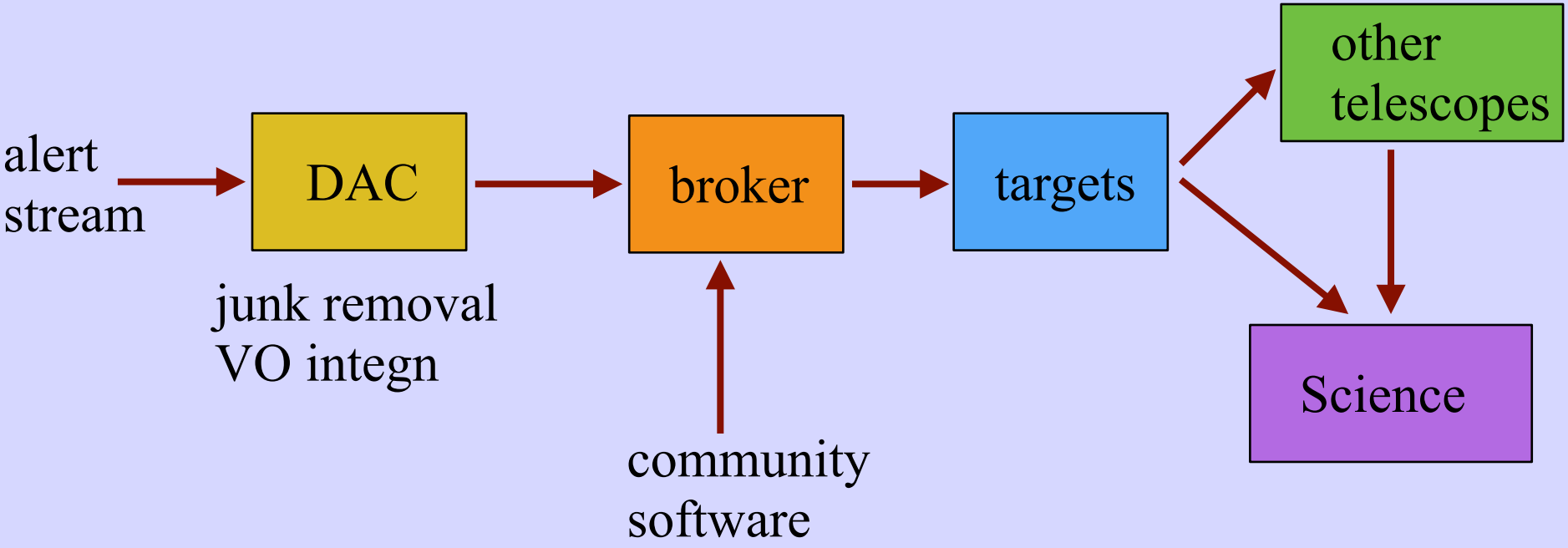
TDEs: rolling cadence better
mulens: uniform cadence better
CLQs ???

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



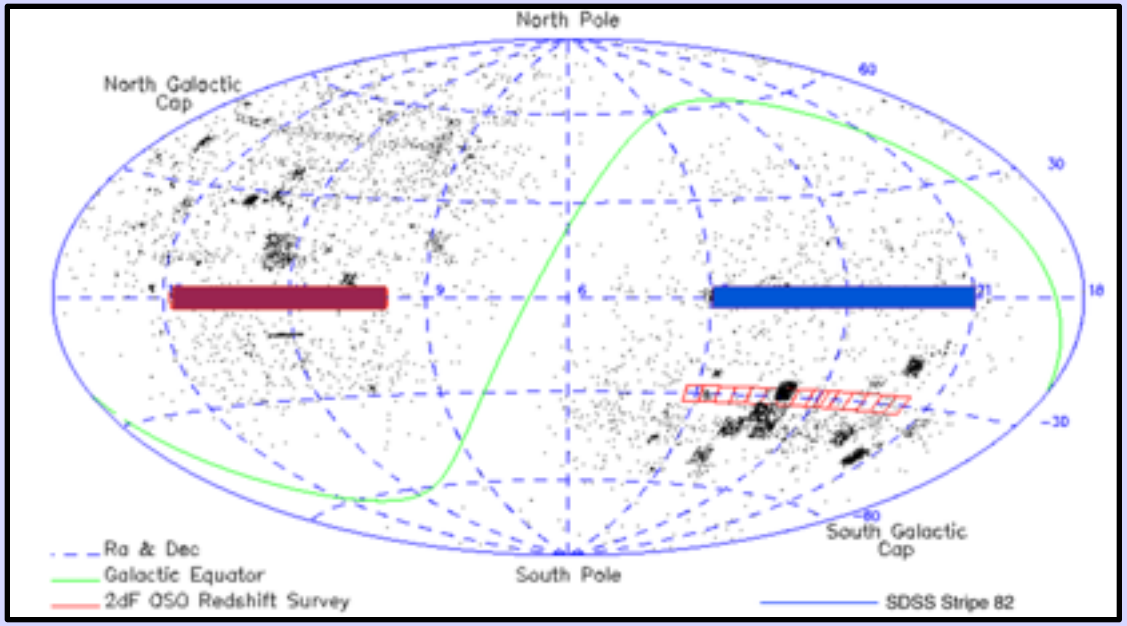
massive spectroscopy

long term light curves ✓

transient characterisation ✓

RM campaigns ✓

long term massive spectroscopy **get this going!**



(1) ResPeQ medium tier

(2) Repeat 2QZ and S82