Red QSO + SASIR

Three Subsets

1. High-z QSO
   - absorption by IGM

2. BAL QSO
   - absorption by outflow

3. Extincted QSO
   - absorption by merger ISM

Blue QSO

- Intrinsic spectra are blue and independent of redshift
- Optical surveys are sufficient up to z=5-6
- Neutral H in IGM creates Lyman-α Forest
  - Absorption by forest increases with redshift
  - At epoch of reionization, forest becomes opaque!

So Blue QSOs turn red at higher redshift.

  - At z=6.6, Lyman-a passes out of Z band (Z band dropout)
  - To go to higher redshift, SASIR is needed; in particular, Y band

- To find z > 6.6 QSO, SASIR is necessary but not sufficient.
  - Also need deep Z-band survey to confirm absence of Z-band flux
- SDSS is not deep enough for this purpose
  - Need PanStarrs or LSST or ??

Science questions

1. Study IGM at reionization
2. Study evolution of QSO, i.e., when did massive BH first appear?

BAL Quasars

- Three flavors
  - HiBALs (C IV @ 1550Å)
  - LoBALs (Mg II @ 2800Å)
  - FeLoBALs (Mg II @ 2800Å)

- Traditional BALs only produce modest reddening
  - can be found with optical surveys

- But in extreme BALs (typically LoBALs+FeLoBALs) spectra can disappear blueward of Mg II
  - at z ~ 2.2, Mg II passes beyond Z-band (will look like a Z-band dropout)

- SASIR will be necessary to find high redshift ($z > 2.2$) examples of extreme BALs
- Extreme BALs may be associated with mergers, in which case their number could increase with redshift

BAL science

1. Are BALs an evolutionary stage or an orientation effect?
2. If evolutionary, they should track merger rate

Dust Reddened QSO

- High column densities of dust in the QSO environment can extinct their optical brightness
- SED is very different from typical blue QSO

- SASIR photometry combined with optical photometry will allow photometric selection

Science

1. dust reddened QSO associated with mergers
2. define early evolutionary stage in QSO emission