Searching for high redshift QSO in the LSST survey

alberto moretti – INAF Brera

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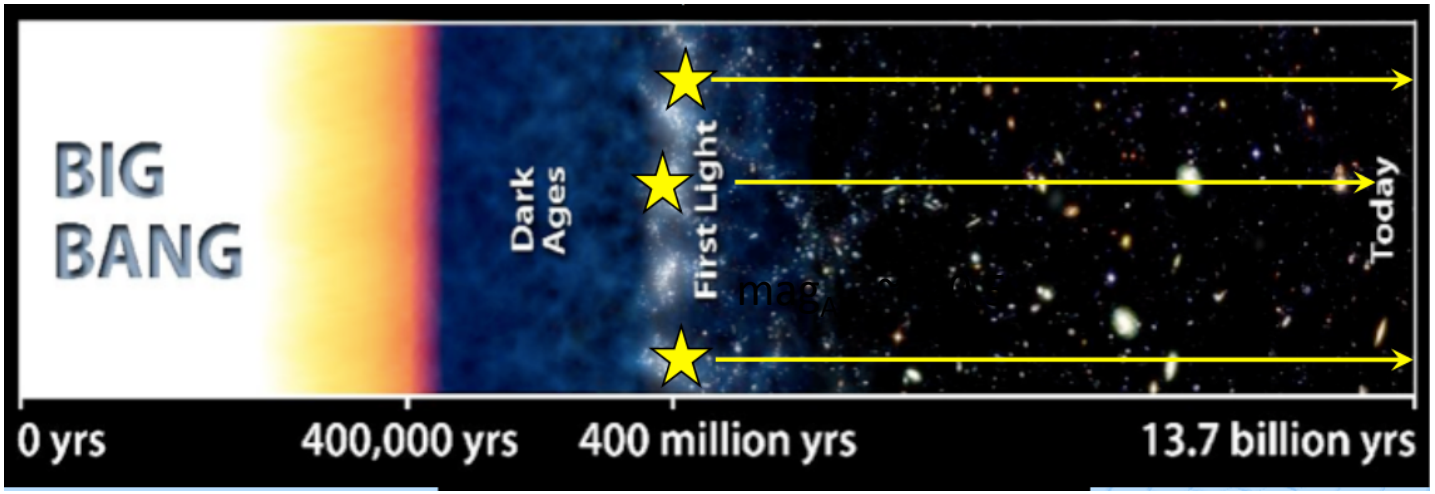


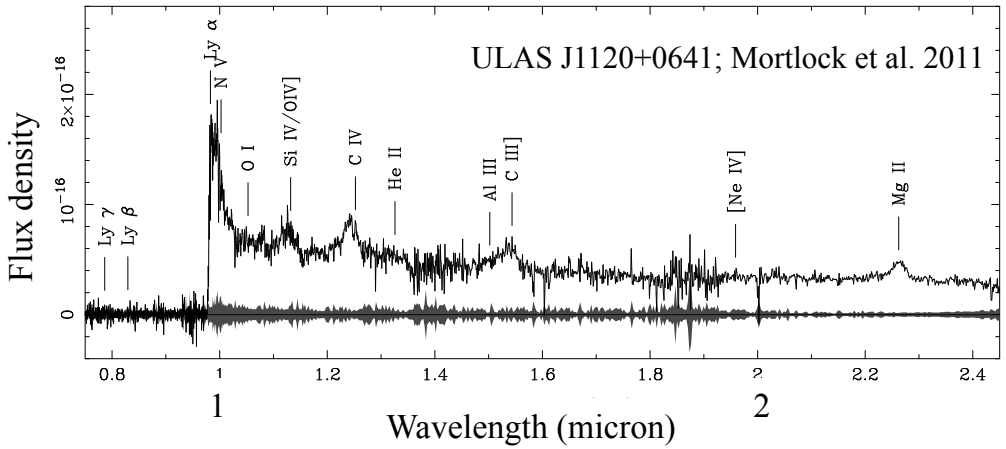
Quasars at redshifts $z > 6$ can be used to:

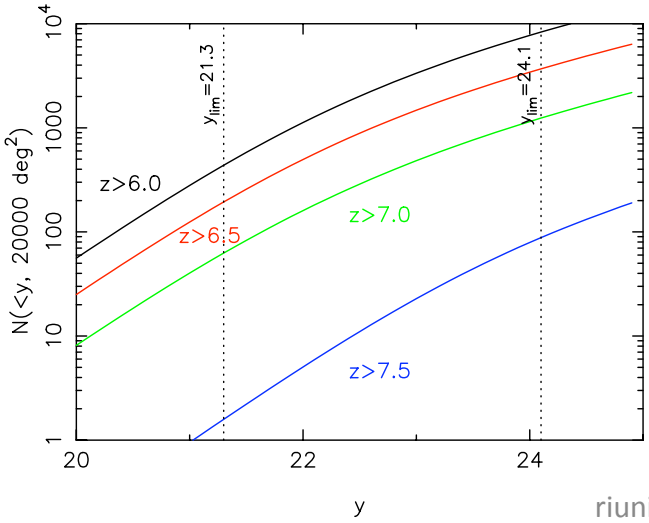
- determine the state of the inter-galactic medium
- measure space density of massive black holes
- study the formation of massive hosts
- locate galaxy overdensities in the early Universe

Status of the observations and LSST

50 QSOs z ~ 6 (SDSS)

6 QSO 6.5 < z < 7.0 (VIKING, Pan-STARRS)
1 QSO at z=7 (UKIDSS-LAS)





LSST will detect :

nx1000 QSOs at z ~ 6
nx100 QSOs at z ~ 7

A technical and critical point :

The key point is that, thanks to the depth of the survey, high-z QSOs will be directly identified in the LSST catalog

This is a giant improvement with respect to Pan-STARSS and other present surveys

To identify 3 QSOs at z~6.7 in the PS1 catalog 500 z-y drop-outs have been observed with 4-m telescopes. The 3 objects for which no optical (I,R) counterpart has been detected at 25 mag lim. are z~6.7 QSO.

In the VIKING survey 3 z~6.7 objects have been identified in a sample of 45 z-y drop-outs with the same technique

LSST will provide optical (I,R) limit ~ mag 25 after few visits:
this will allow for the first time to build high-z QSO candidate sample with an expected contamination of 20-30%, to be compared with the current (~95%)

Synergies with other facilities :

LSST will catalog a huge number of typical unabsorbed QSO up to z ~7.5

From the combination with EUCLID photometric catalog will be possible to search for z~8 unabsorbed QSOs

From the combination with radio (SKA precursors), near IR (EUCLID photometric catalog) and X-ray catalogs (XMM and Chandra archives) will be possible to search for mildly obscured objects

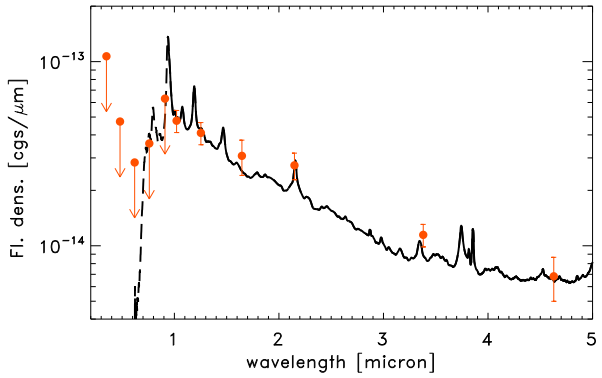
Activities in Brera

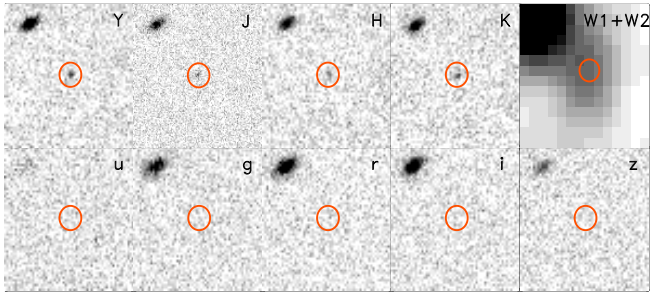
UKIDSS-LAS + SDSS + ALLWISE ~ 3000 deg^2, mag_{AB} ~ 20.5

UKIDSS-LAS + SDSS + ALLWISE + 3XMM ~ 100 deg^2 mag_{AB} ~ 20.5, f_X 10^-15 [cgs]

We select candidates by SED fitting with QSO templates, allowing for different levels of absorption

- first pilot proposal with TNG in AOT 33 (4 hours, 8 candidates) accepted
- new proposal for 35 QSOs z~7 candidates prposed to AOT34





CONCLUSIONS

LSST will significantly transform the high-z QSO field, providing for the first time luminosity and mass functions of z~7 unobscured accreting black holes.

Synergy with EUCLID will extend the search to z ~8-9

Synergies with radio and X-ray catalogs will provide insights on the obscured accretion

In Brera we are developing the skills to exploit the LSST database