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FMOS & LOFAR?

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LOFAR

- LOFAR will be the fastest survey telescope in the world.
- Able to detect Milky Way-type galaxies up to z~3, and SCUBA-type galaxies at z>6
- Now being built in Netherlands.
- UK joined along with Germany.
- 1st in the new generation of powerful radio telescopes.
- Operates at 30-80MHz and 120-240MHz
- Free of any dust obscuration

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LOFAR surveys

- All Sky Survey
  - 20,000 sq.degree survey at 15, 30, 60, 120, 200MHz to 10, 2, 0.75, 0.1, 0.2mJy
  - 1000 sq.degree survey at 200MHz to 0.065mJy (Cluster relics/haloes, starburst galaxies)
- Deep Survey
  - 3000 sq.deg at 30 & 60MHz to 0.7 & 0.25mJy
  - 550 sq.deg at 120MHz to 0.025mJy
  - 360 sq.deg.at 200MHz to 0.016mJy (distant starbursts, AGN, clusters…)
  - choose blank field regions with the best degree-scale multi-wavelength data
- Ultra-Deep Survey
  - 71 sq. deg. at 150MHz to 0.0062mJy (confusion limited at sub-arcsec resolution) very high-z starbursts, RQ-AGN, …

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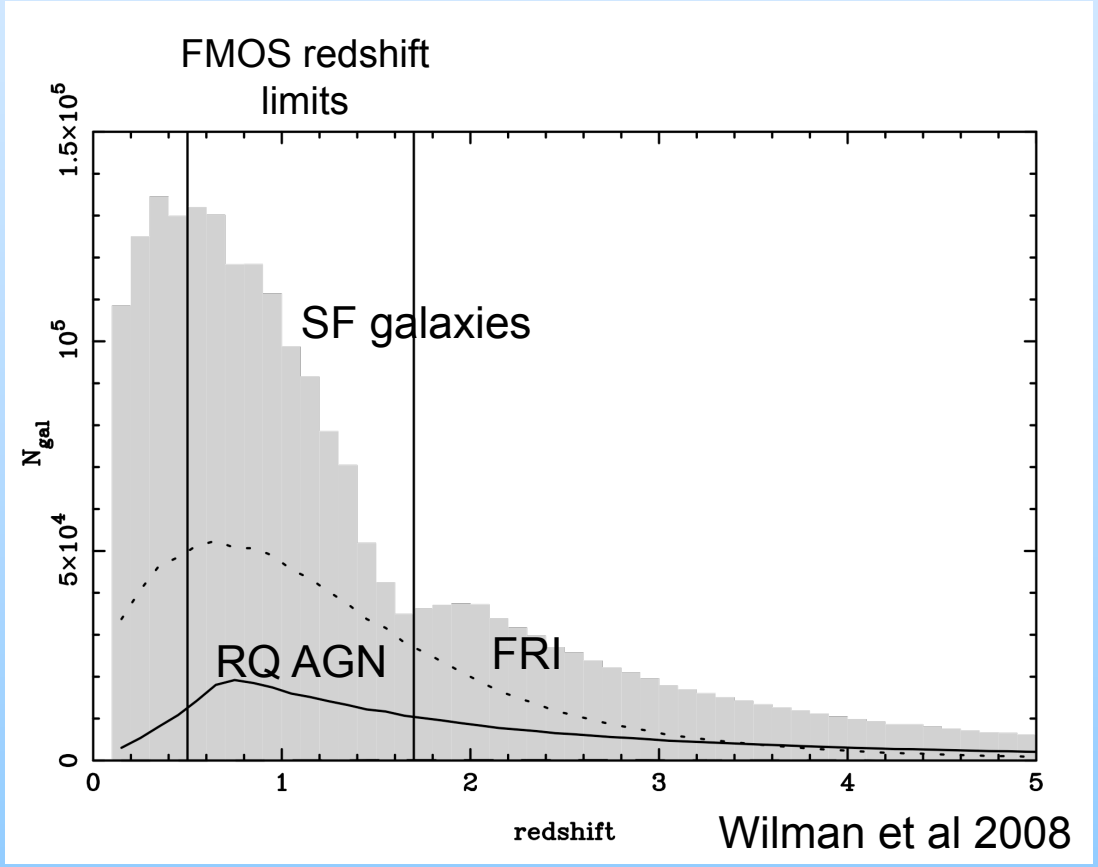
LOFAR deep redshift distribution

- LOFAR 10σ sources expected in deep survey (550deg^2)
- cut to 300deg^2 survey
- assume we can remove z<0.4 galaxies with photometric (SDSS?) selection
- gives ~1x10^6 SF galaxies with 0.5<z<1.7
- 1.9x10^6 other sources (including 0.4<z<0.5 SF gals)
- gives a "redshift completeness" of 0.36
- pessimistic as would also get z for some AGN + extra photo-z selection. Also can use luminosity to favor SF galaxies



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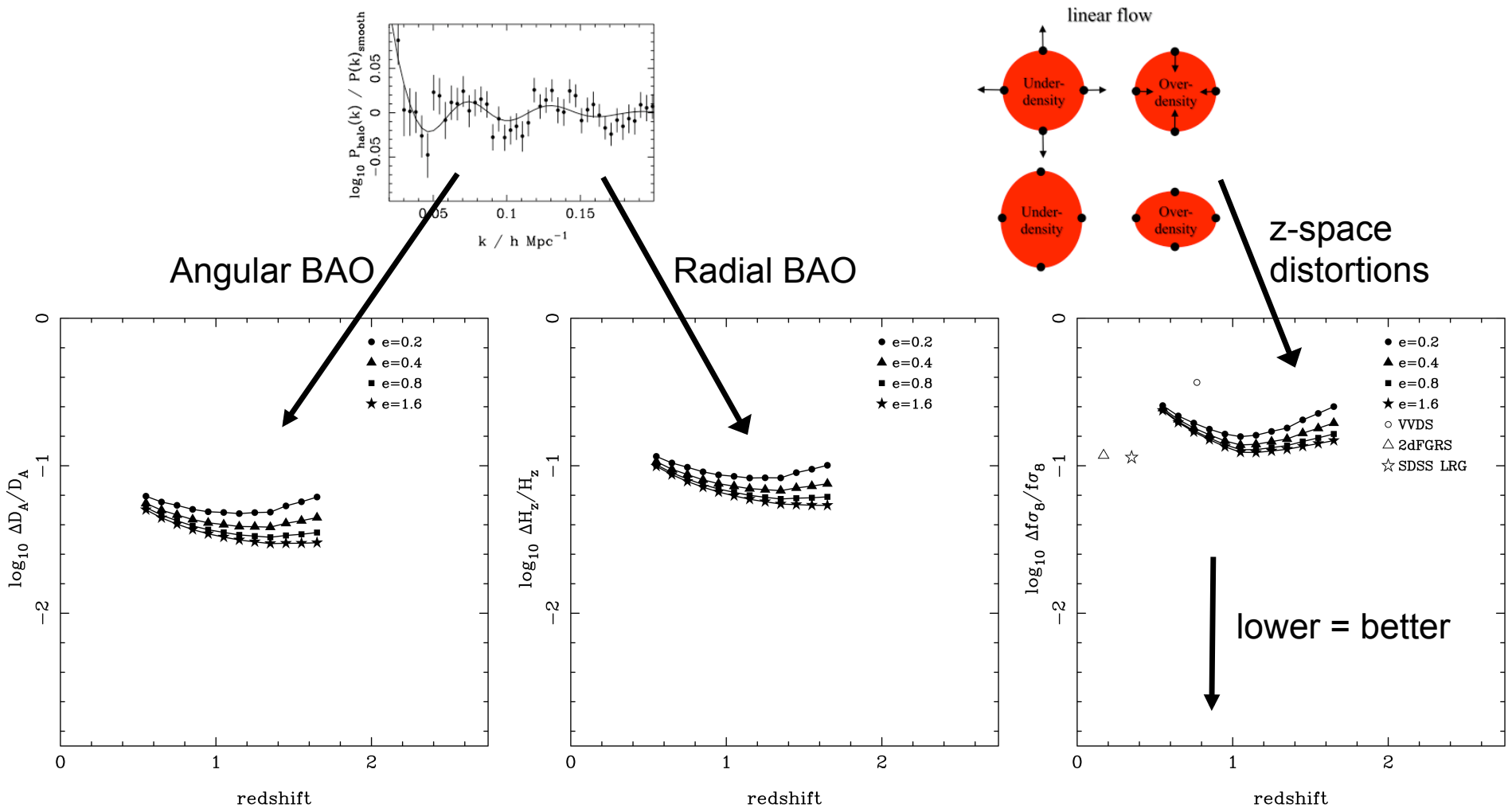
Plot explanation: cosmological constraints



- Fisher matrix predictions for cosmological constraints from BAO and from redshift-sapce distortions

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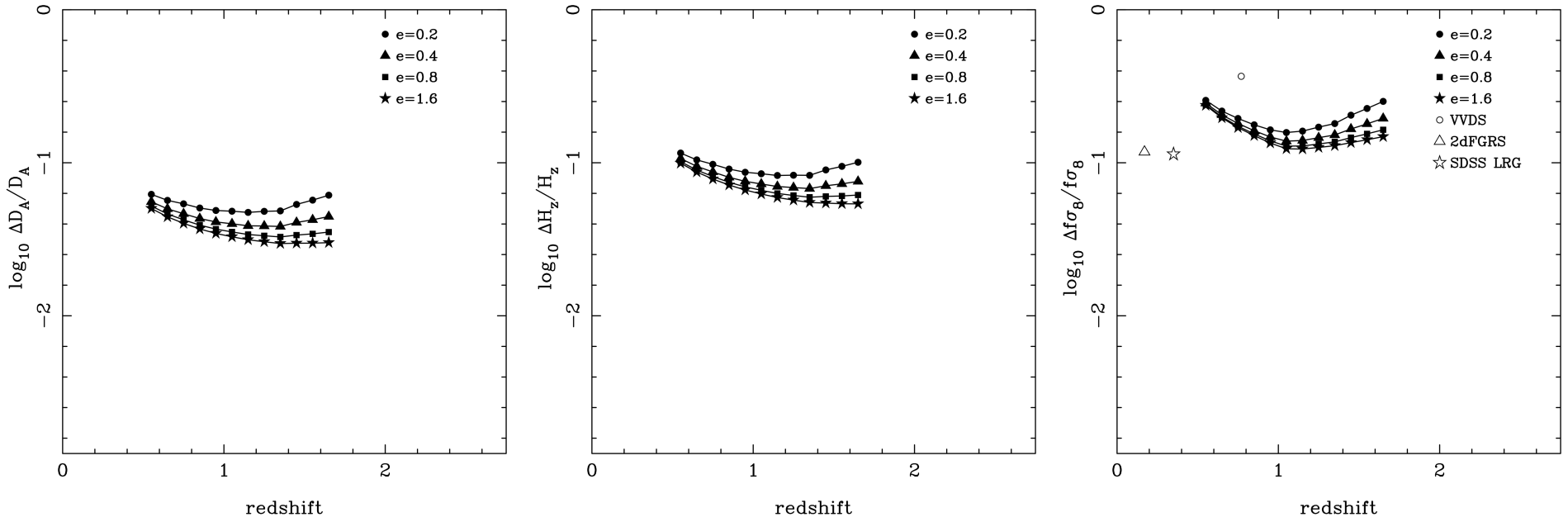
Redshift completeness

- take SF galaxy distribution (predicted 10σ LOFAR sources)
- 0.5<z<1.7, 300deg² baseline FMOS survey has ~600 000 targets
- effect of sub-sampling by a factor *e* shown below



- big gains until *e*~0.5, then diminishing returns, particularly for redshift-space distortions

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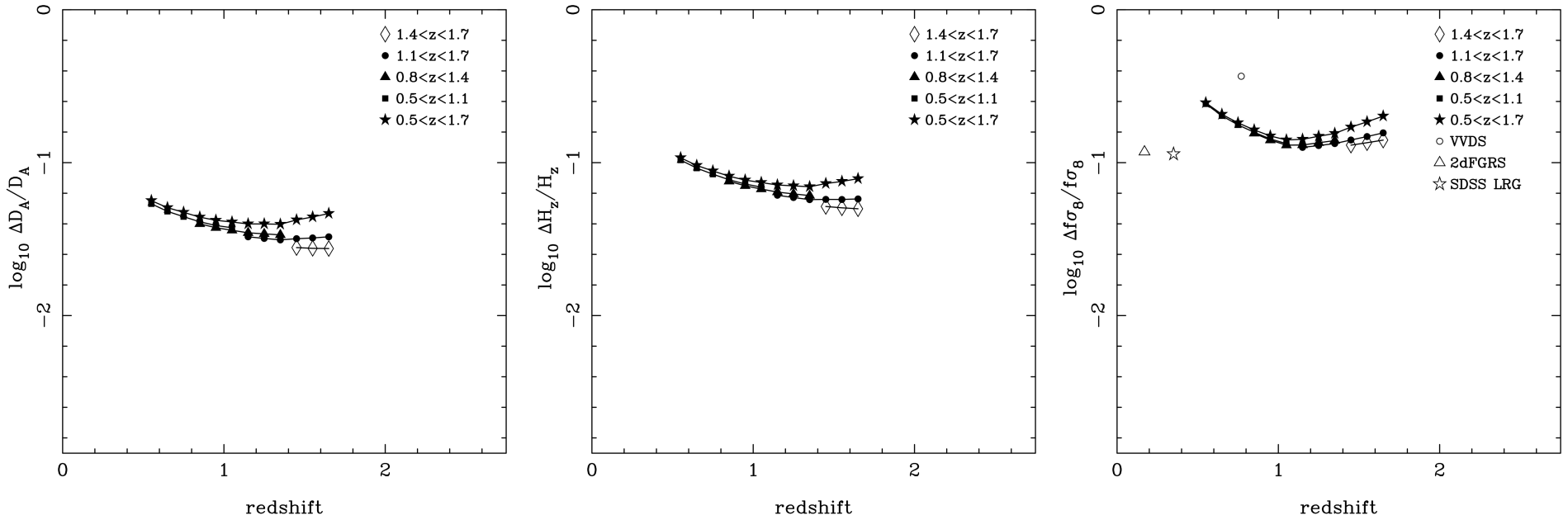
Galaxy selection?

- take SF galaxy distribution (predicted 10σ LOFAR sources)
- 0.5<z<1.7, 300deg² baseline FMOS survey has ~600 000 targets
- assume fiducial e=0.36
- where to pre-select galaxies – ie put these galaxies in different redshift bins



- high number of high redshift galaxies helps

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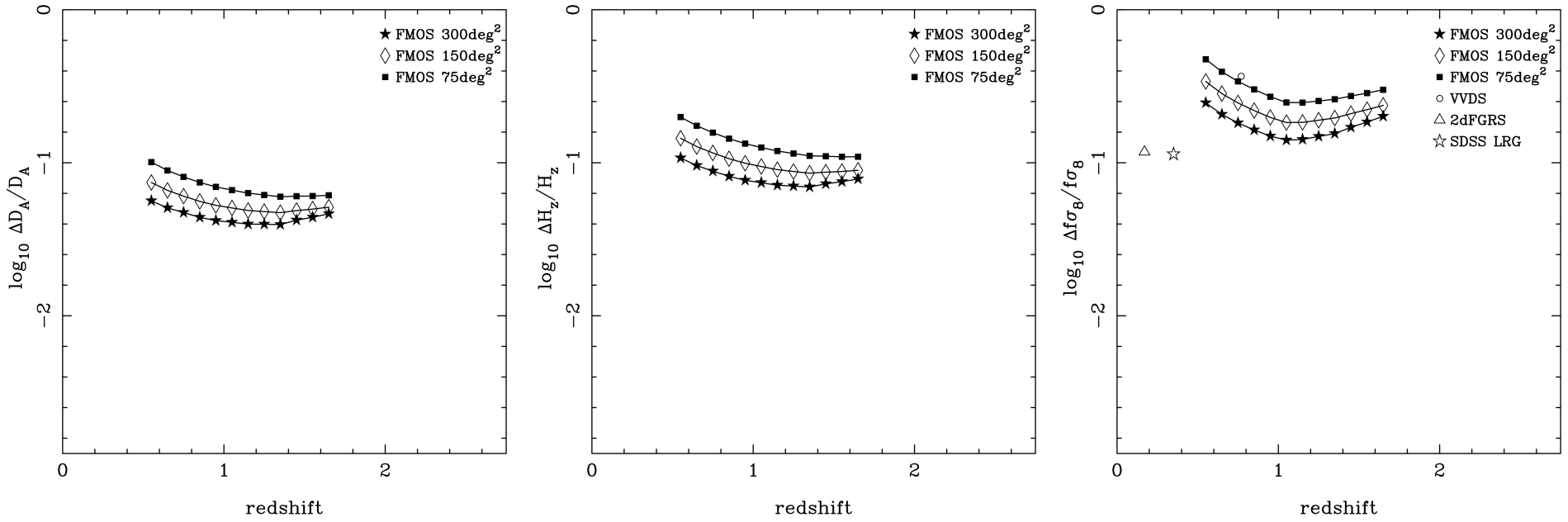
Volume vs number density

- take SF galaxy distribution (predicted 10σ LOFAR sources)
- 0.5<z<1.7, 300deg² baseline FMOS survey has ~600 000 targets
- compare with oversampling by a factor of 2 or 4, covering a smaller area



- definitely do not want to decrease survey area

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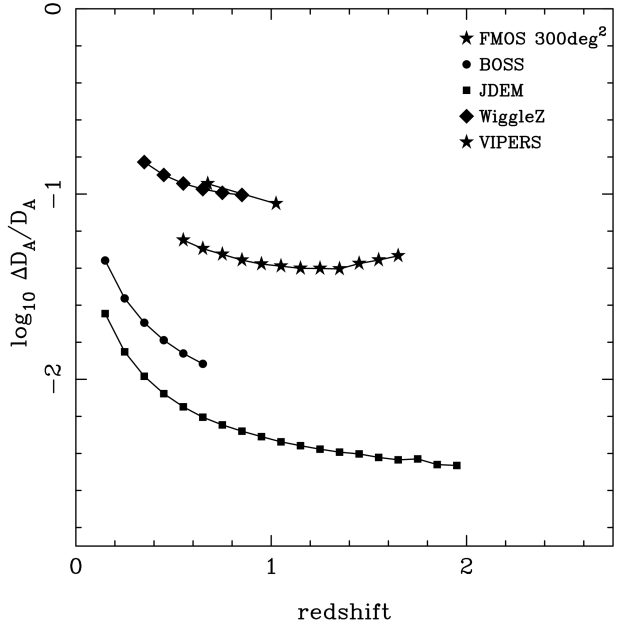
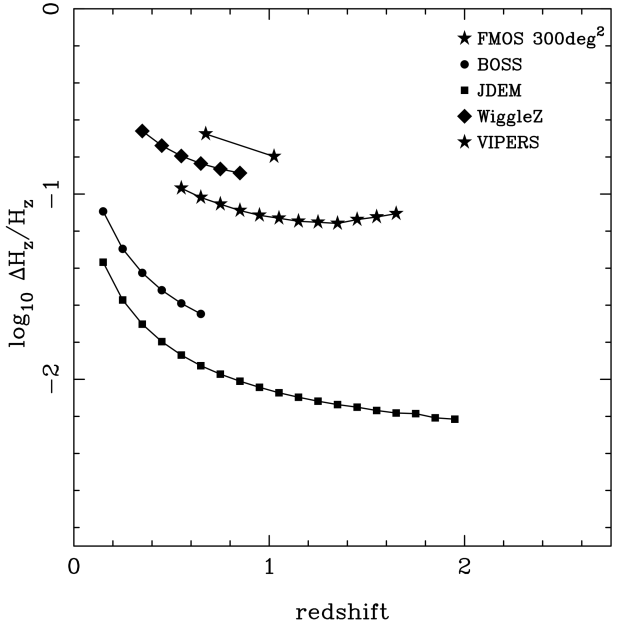
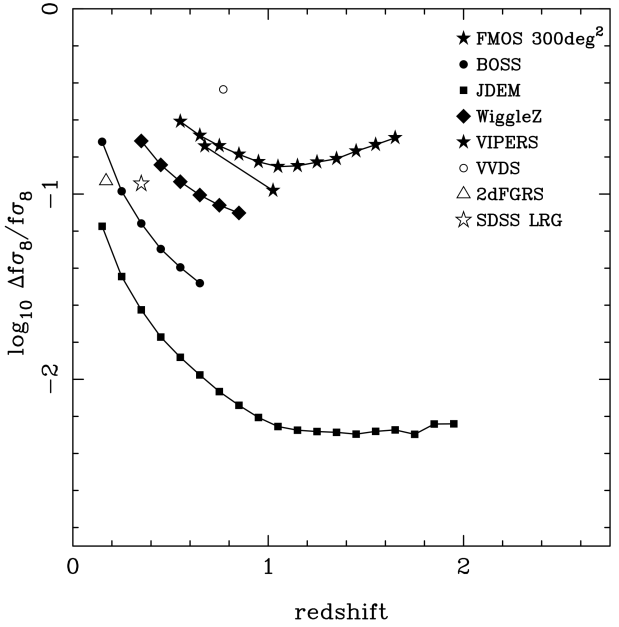
Comparison with other surveys

- take SF galaxy distribution (predicted 10σ LOFAR sources)
- 0.5<z<1.7, 300deg² baseline FMOS survey has ~600 000 targets
- assume can remove z<0.4 galaxies from photometric redshifts
- leaves e=0.36 SF galaxy fraction in 0.z<z<1.7
- pessimistic as can get redshifts for some AGN







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Things look better with larger bins …

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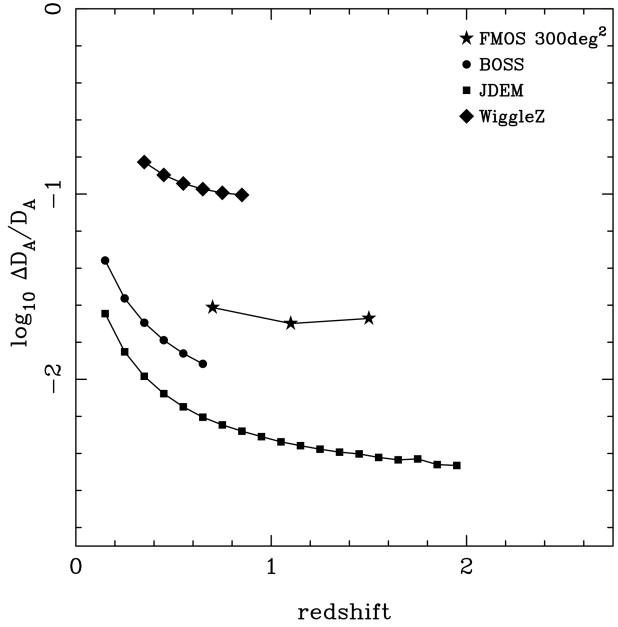

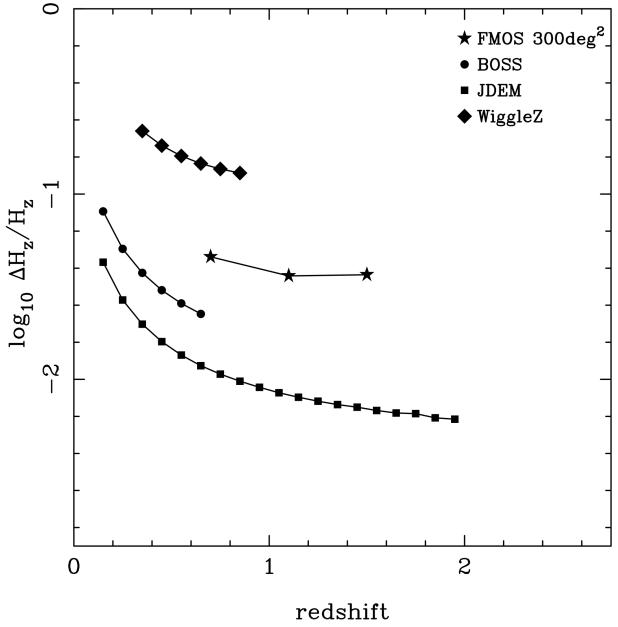

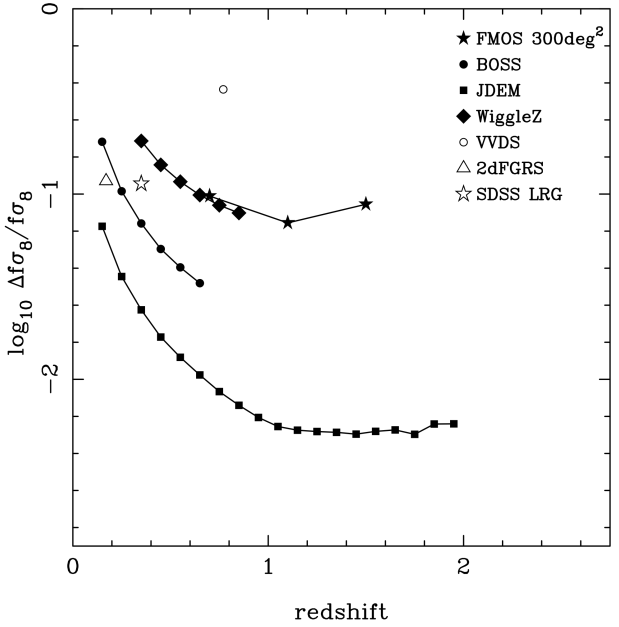

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conclusions

- 300deg^2 FMOS survey means close to cosmic variance limit
- To optimise science return need to increase high-z galaxy distribution
- LOFAR deep selection can provide a sample of star-forming galaxies with a sampling return of 0.36, just removing $z<0.4$ galaxies
- would also pick up redshifts for some of the AGN so e=0.5-0.6 probably more realistic