NINA HATCH

OPTIMISING WEAVE-LOFAR FOR HI ABSORPTION

WHAT WEAVE-LOFAR WILL PROVIDE

- Spectroscopic redshifts for ~ 1 million sources at R~5000 resolution.
- Source type (Star forming galaxy vs radio-loud AGN)
- Ken has been compiling complementary catalogues

$L_{1.4GHz}$	RLAGN	Star forming galaxy
v. Bright	510,000	
Bright	100,000	350,000
Faint	42,000	20,000

ASSOCIATED ABSORPTION

- Direct detection
  - Excellent sample for direct detection searches: redshifts for 510k of the brightest RLAGN (type 1 and 2) in the Northern hemisphere.
  - Use the redshift catalogue to differentiate between associated and intervening absorption in blind HI surveys
  - Expect >50 RLAGN at z > 6 over 5 years of survey (EoR)

ASSOCIATED ABSORPTION

- Stacking (full 650k sample)
  - Reach much lower τ

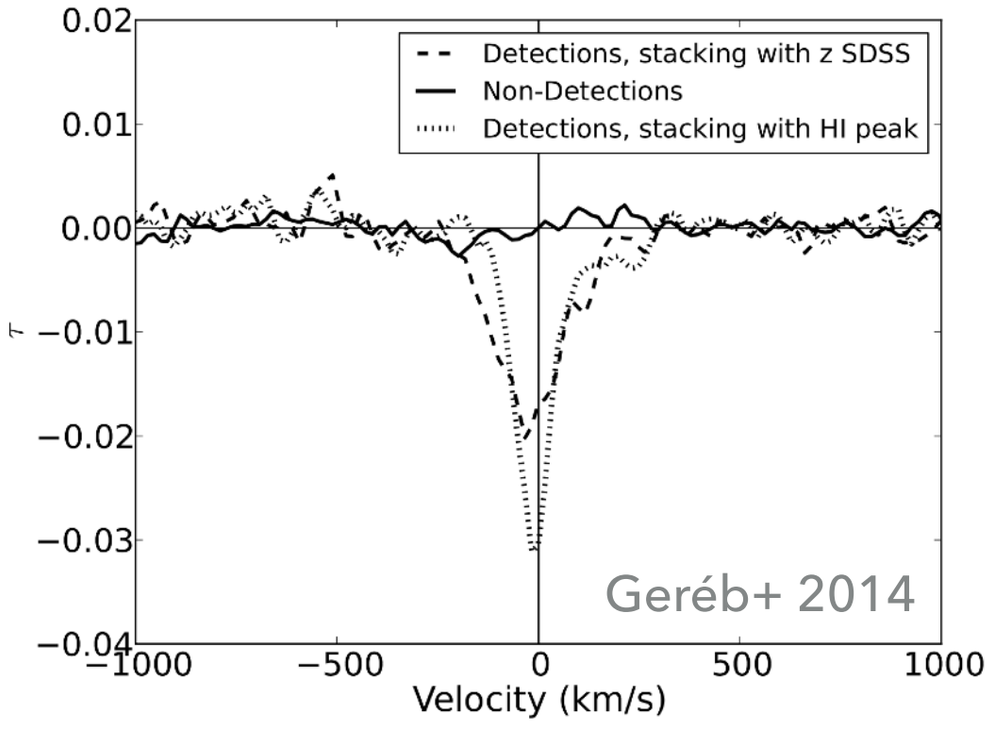


Fig. 6. Sample of 93 red AGN, stacked profile of 27 detections (dashed and dotted lines, see explanation in the legend) and 66 non-detections (solid line).

- Divide into bins of redshift, AGN type … what other information would you like to allow you to divide the sample?
- Data will allow stacking of any blind survey with a component in the Northern hemisphere (e.g. Apertif)
- Which surveys are being performed? Which areas of the sky would you like us to target?

ASSOCIATED ABSORPTION

- Stacking II - 370k of the radio-brightest star-forming galaxies
  - H I absorption studies can be used just as efficiently to find cold gas not just in AGN, but also in star-forming galaxies at higher redshift. The increased number of sources will provide enough data to perform H I stacking experiments and, hence, to probe the highest redshift regime of the observed radio sky at low optical depth. Thus, even though H I absorption only traces the cold

    Gereb+ 2014

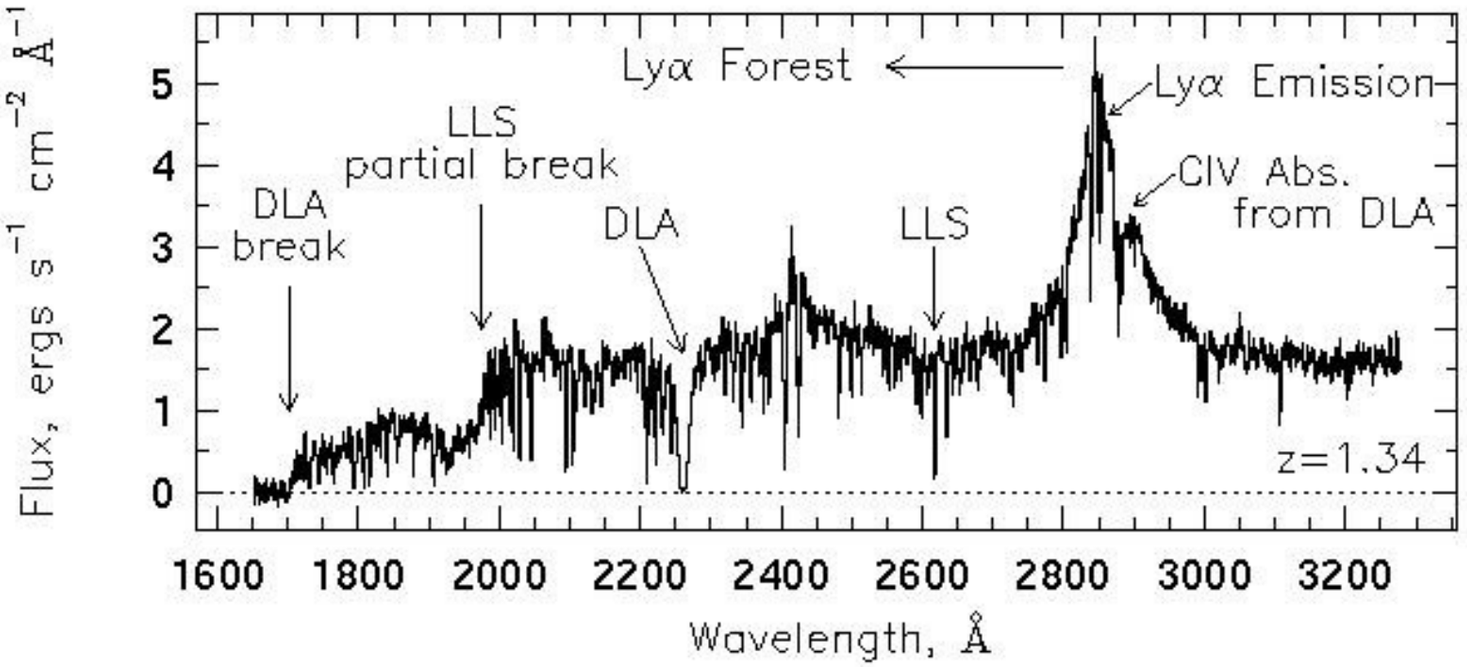
- What would we see from stacked RL SFG? Emission or absorption? Absorption troughs in the emission line?

INTERVENING ABSORBERS

- 2 observational methods to identify intervening systems

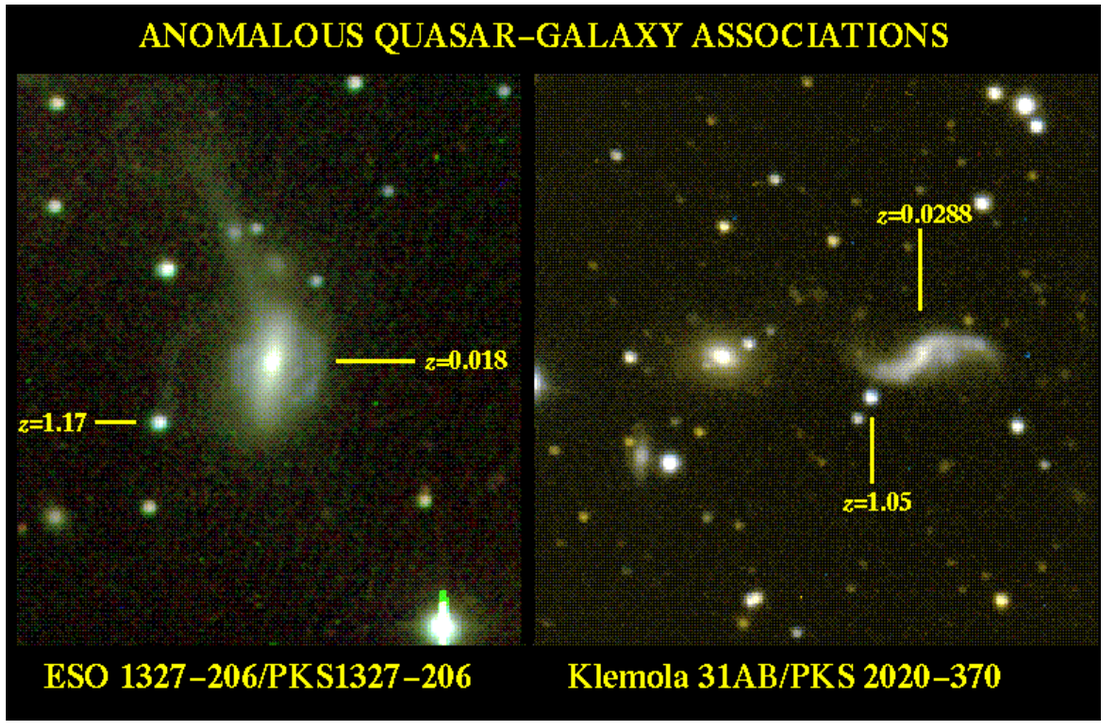
  1. Direct optical detection
  2. WEAVE-LOFAR IFU survey

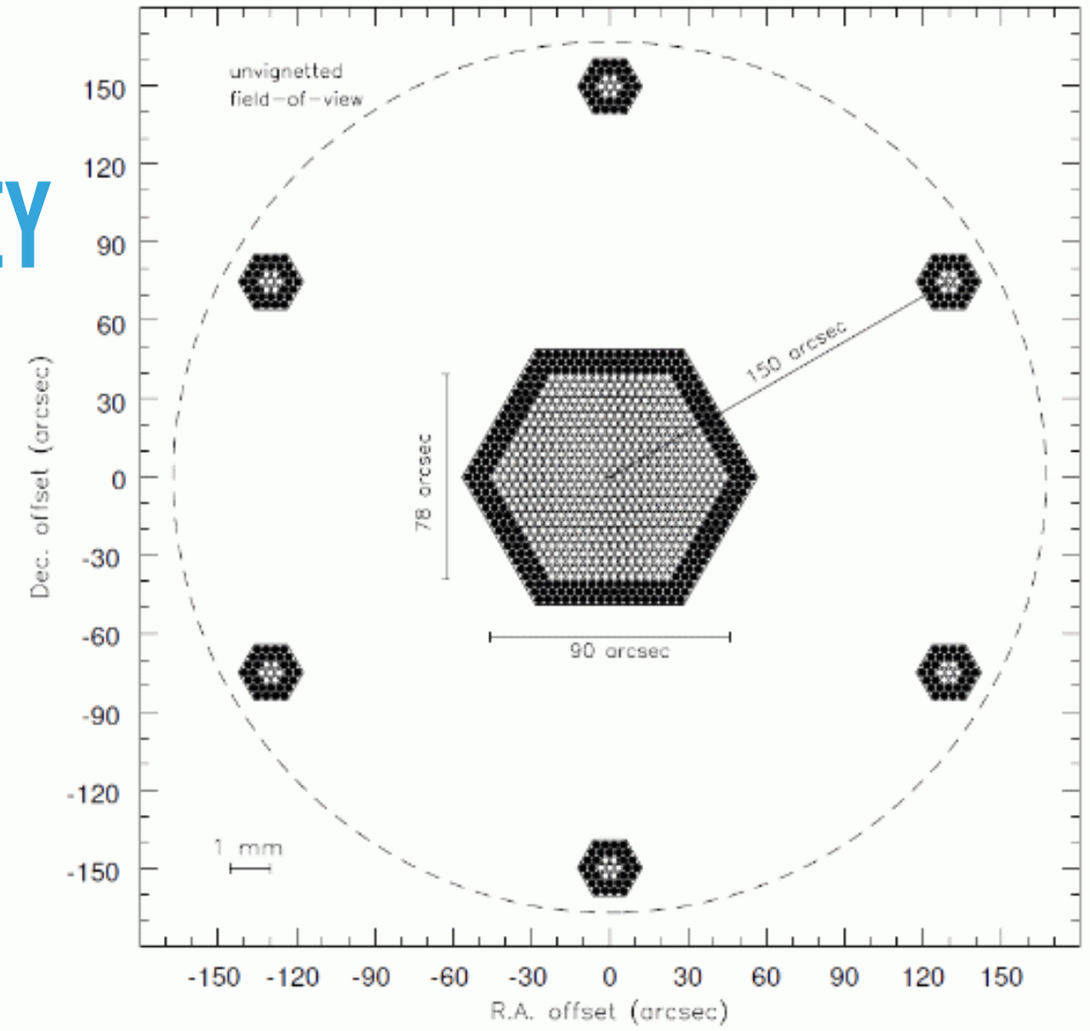
INTERVENING ABSORBERS: DIRECT OPTICAL DETECTION



- DLA, sub-DLA, LLS for z > 2 quasars
- Mg II, CIV systems for lower-z quasars
- 21cm followup enables statistical measurement of T_{spin} / c_f
- How many are needed to be a useful/transformative sample?
- This analysis is not currently in our science plan, so speak up if this would be useful for you.

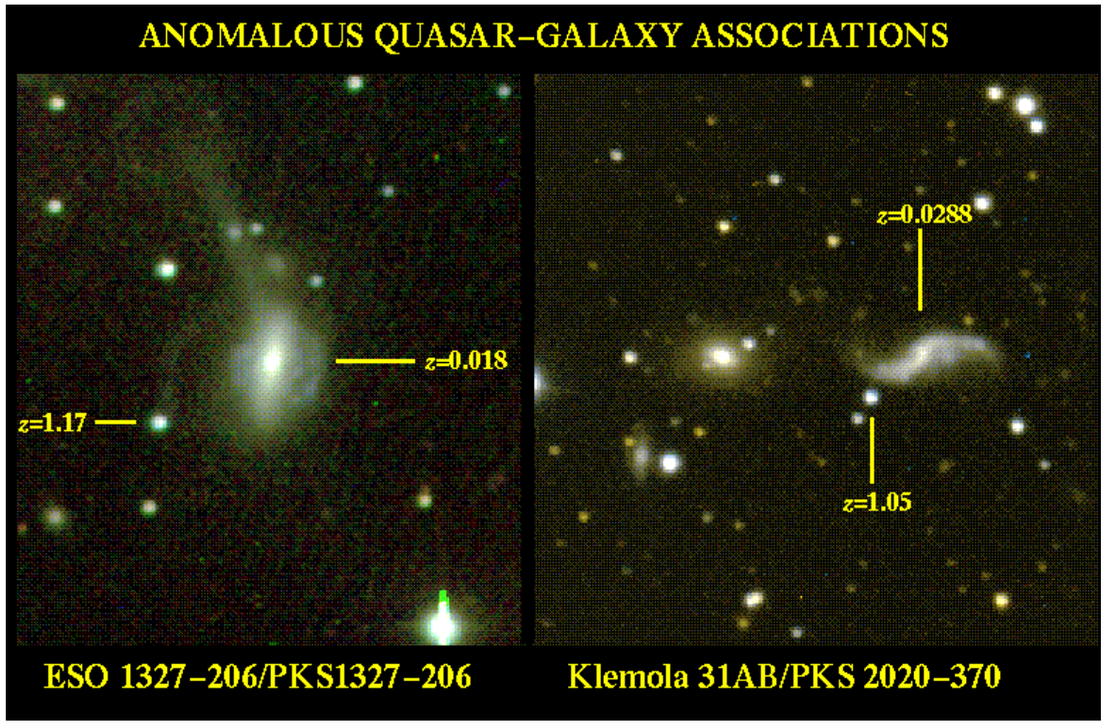
INTERVENING ABSORBERS: IFU SURVEY

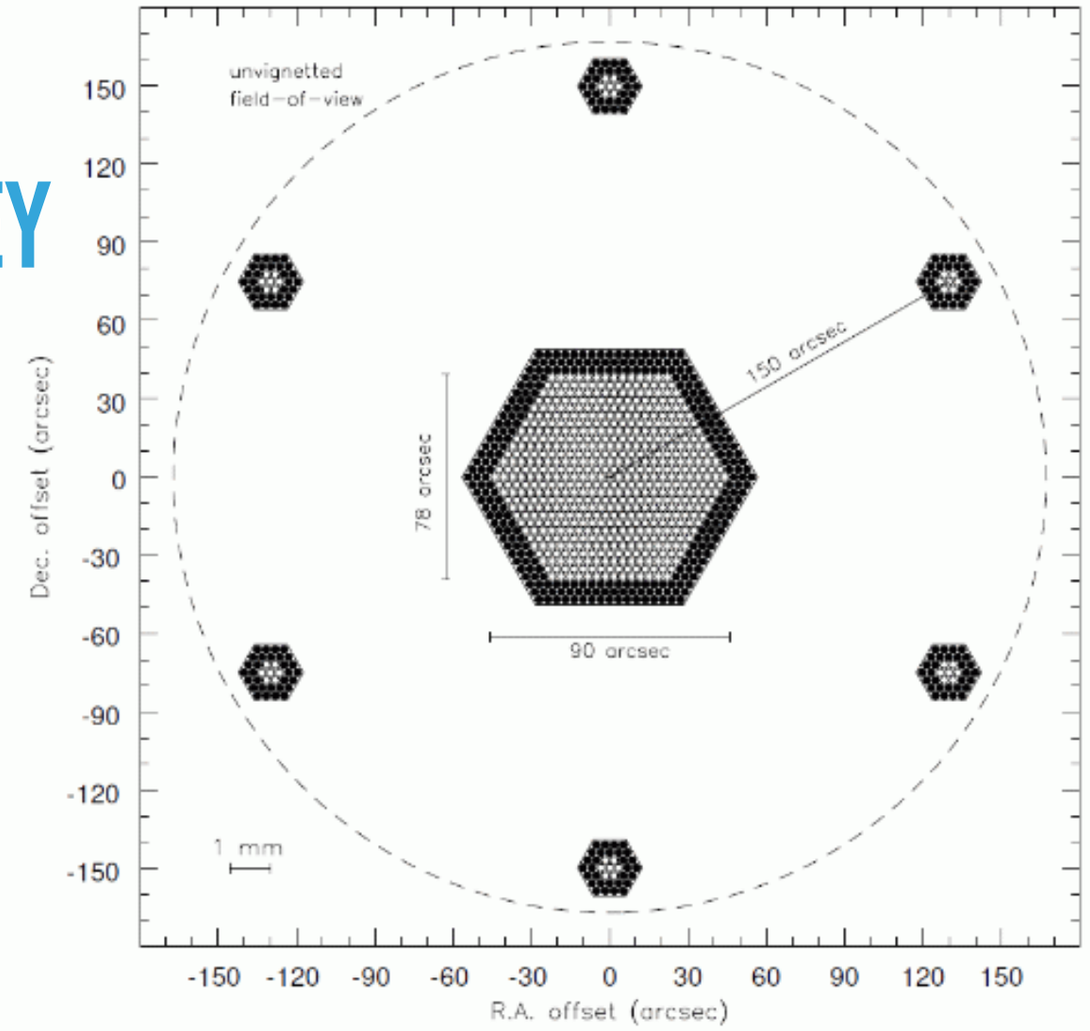




- WL provides background radio source redshift
- WEAVE-IFU followup provides foreground galaxy redshift
- can then stack 21cm signal at foreground redshift for all foreground sources

INTERVENING ABSORBERS: IFU SURVEY





- 22 galaxies per IFU if RLAGN is at z > 1
- Min distance = 2.6", max distance = 80"
- 100 IFU paintings gives 2,200 galaxies (or double if we go for double radio sources) - is this enough?
- Good idea? Quasars or radio galaxies? Minimum L_{Radio}? Can you tell us which RLAGN to go for? Can we look for more than 21cm, e.g. OH, CO?

SUMMARY

- WEAVE-LOFAR will provide data that can facilitate both associated and intervening HI absorption studies
- Both MOS and IFU data may be of use to you
- Please talk to me if you have any comments/ideas about how we can optimise the survey for your science.