BEST4MOST

Title: Blind Euclid Structure Tracer with 4MOST (BEST4MOST) Survey

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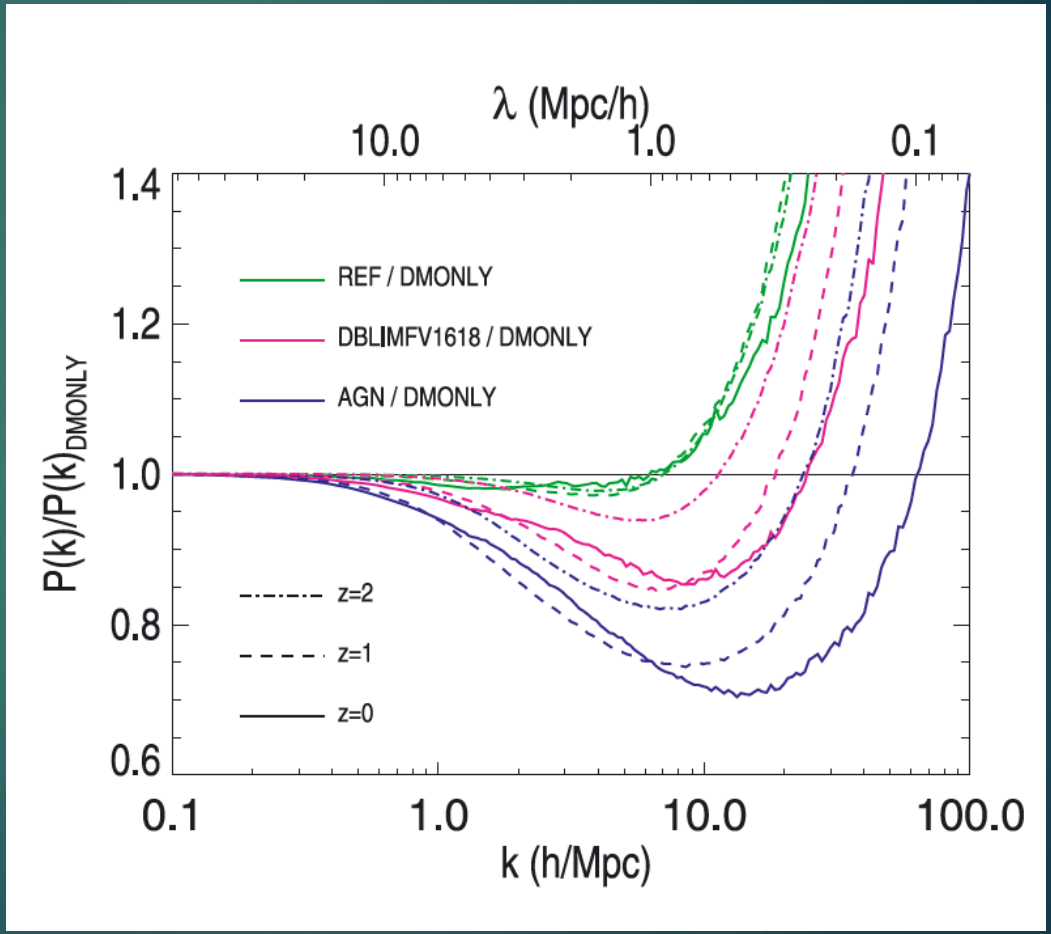
Cols: Martin Sahlén, Anand Raichoor, Johan Comparat, Johan Richard, Jean-Paul Kneib, Richard McMahon, Euclid Cluster SWG, Euclid Voids WP (within GC SWG), S8 survey. See section 7 for a full list of names.

Survey type: Participating Community Survey

1 Abstract

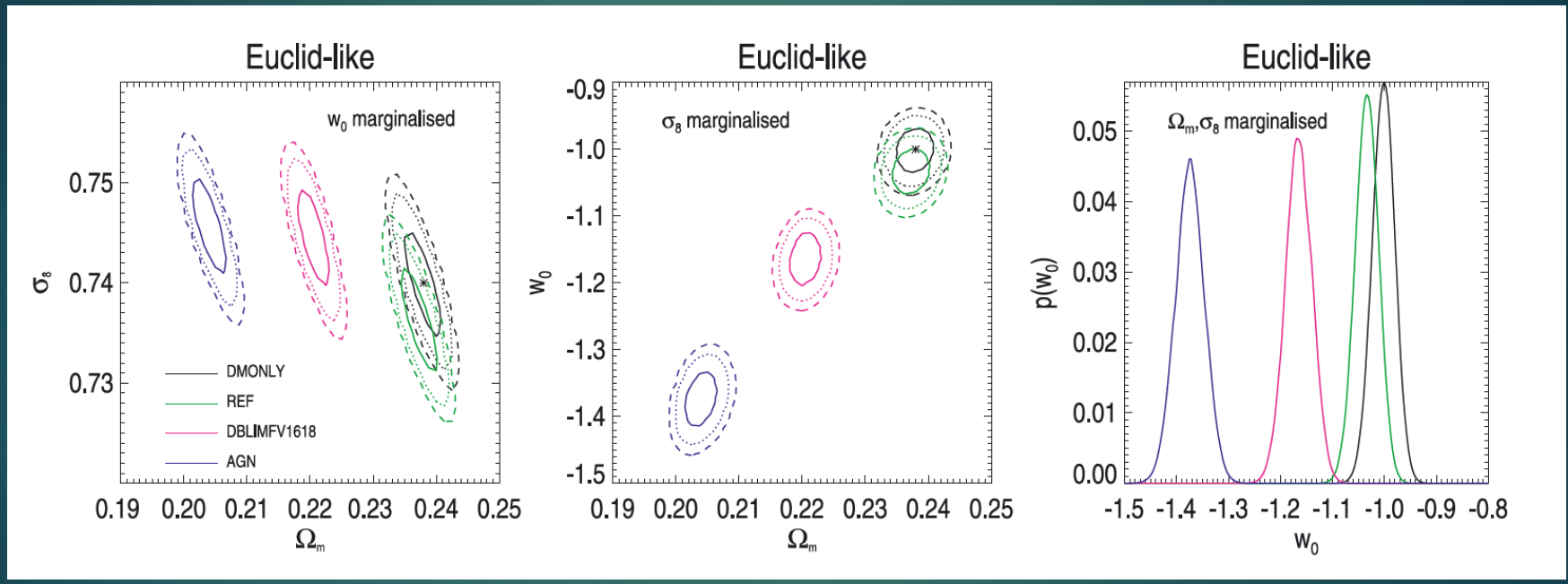
Spectroscopic surveys offer a unique capability of resolving the fine elements of large-scale structure of the Universe, such as galaxy groups, filaments and voids. We have constructed the BEST4MOST survey that corresponds to and complements Euclid cosmology goals of surveying large volumes reached by covering the redshift range $0.2<z<0.8$ of the southern 6117 sq.degree Euclid field and providing sufficiently high sampling of density fields of the Universe with an average of 1 galaxy per 10 cubic Mpc. With the 90% targeting completeness we aim at achieving a four-member group detection down to virial masses of $10^{13.3}$ $M_\odot$ at z~0.4 and $10^{13.5}$ $M_\odot$ at z~0.7, extending the mass range accessible for Euclid studies by an order of magnitude. BEST4MOST provides LSS characterization required to understand the effect of baryons on the cosmology of Euclid shear signal.

BEST4MOST improves Euclid shear power spectrum cosmology



Semboloni et al. 2012

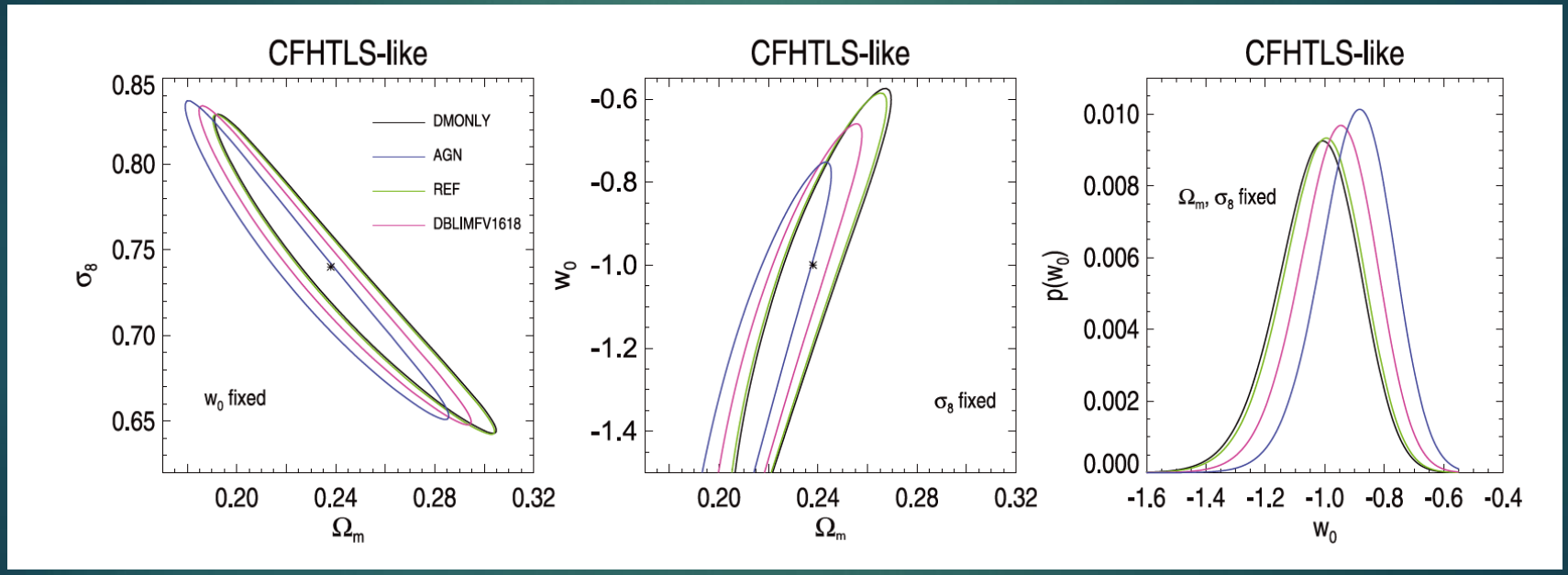
Barionic effects and cosmology



Semboloni et al. 2012

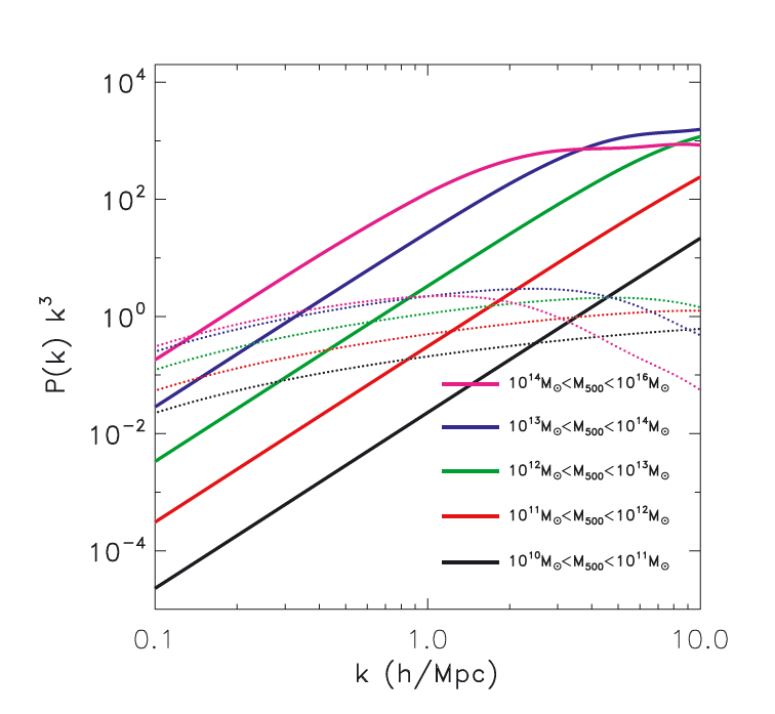
Need to cover the full Euclid area.

Barionic effects form a subset of the signal and can't be constrained better than full signal. Uncertainty of small areas is too large:

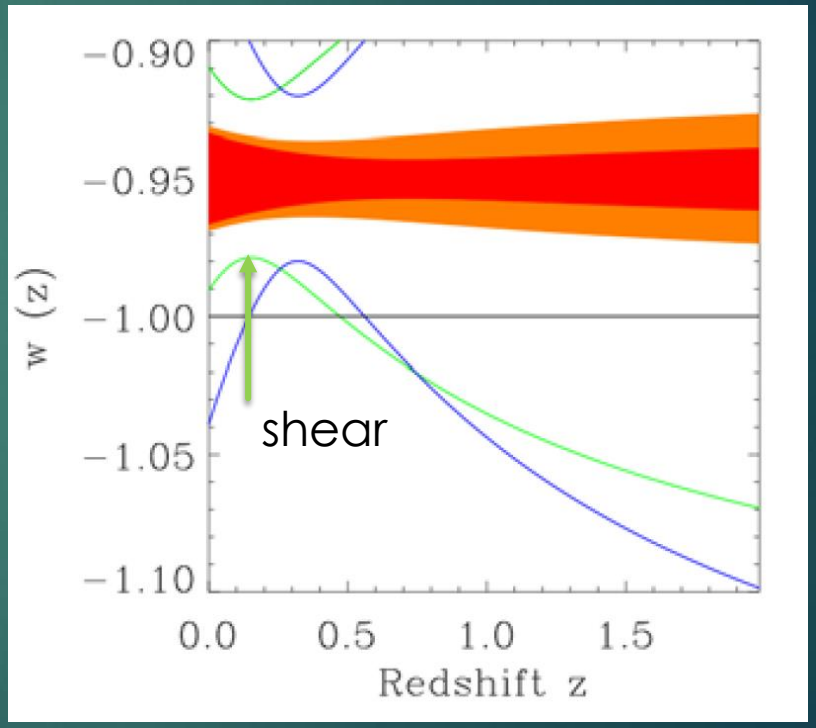


Semboloni et al. 2012

Which systems do we need to understand: galaxy groups z<0.7



Semboloni et al. 2012

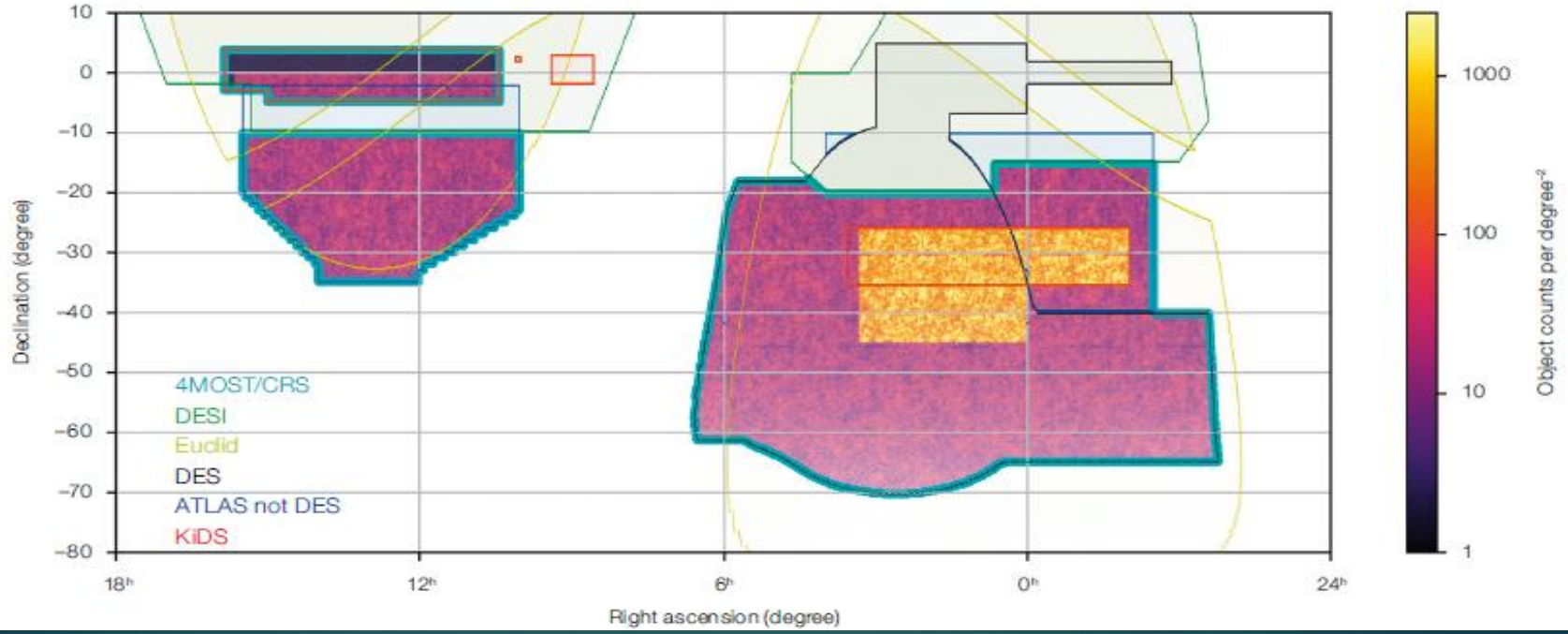


Euclid Definition Study Report 2011

Sky and Synergy

Table 1. Properties of each target category in CRS.

Name	z	Selected (AB) magnitude range	R-band (magnitude [AB])	Sky area (deg^2)	Density (deg^2)	Colour selection	Redshift completeness	Number of targets (10^6)
BG	0.15–0.4	$16 < J < 18$	20.2 ± 0.4	7500	250	J–Ks, J–$W1$	95%	1.88
LRG	0.4–0.7	$18.0 < J < 19.5$	21.8 ± 0.7	7500	400	J–Ks, J–$W1$	75%	3.00
ELG	0.6–1.1	$21.0 < g < 23.2$	23.9 ± 0.3	1000	1200	g–r, r–i	80%	1.20
QSO	0.9–2.2	$g < 22.5$	22.2 ± 0.7	7500	190	g–i,i–$W1$,$W1$–$W2$	65%	1.43
QSO-Lyα	2.2–3.5	$r < 22.7$	22.2 ± 0.7	7500	50	g–i,i–$W1$,$W1$–$W2$	90%	0.38



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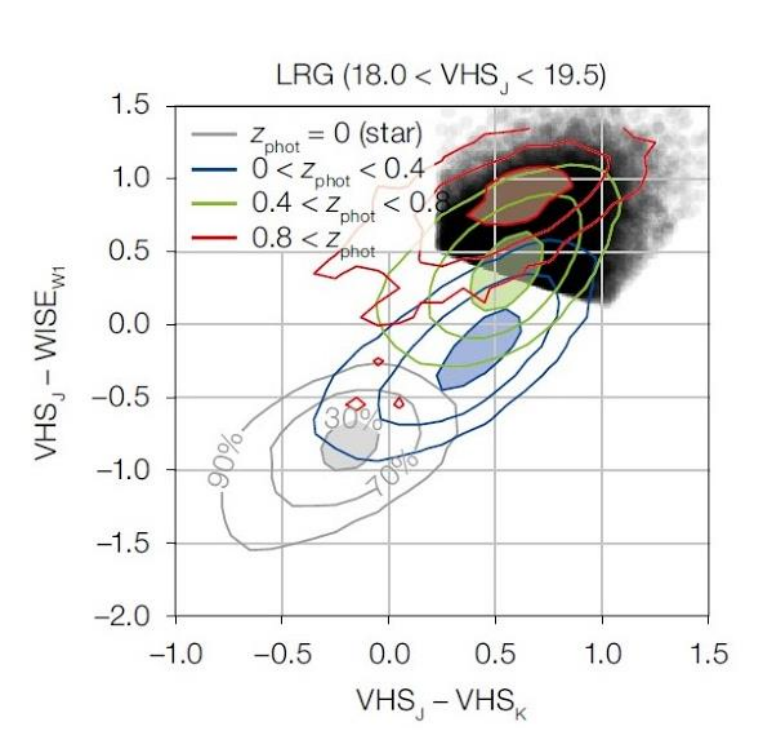
Targetting J<20

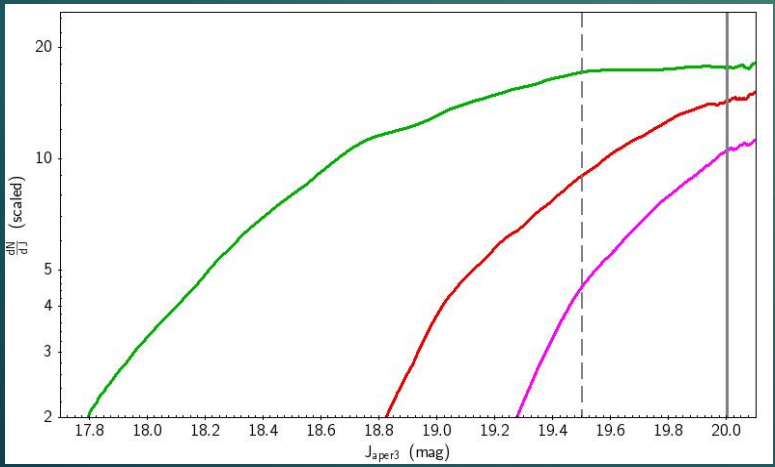
target priotisation:

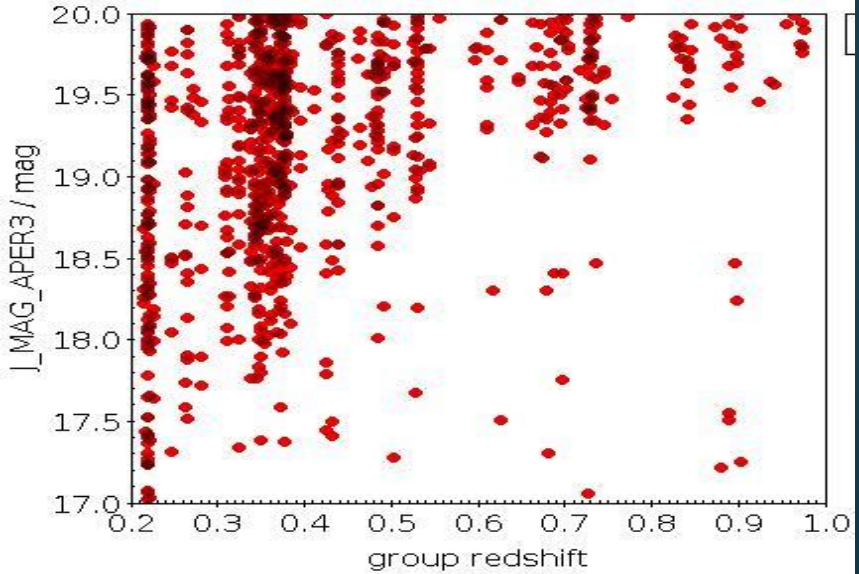
J-W1 color:

0.3:0.6 - highest

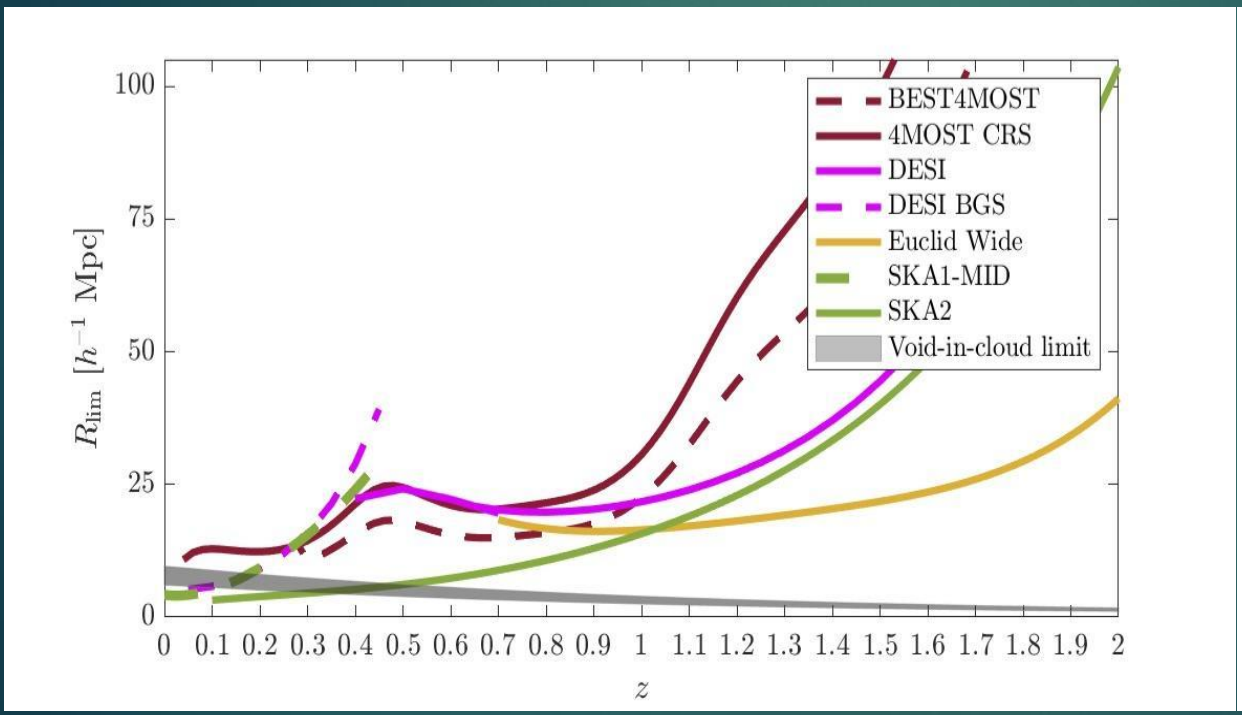
-0.3:0.3,>0.6 - lowest

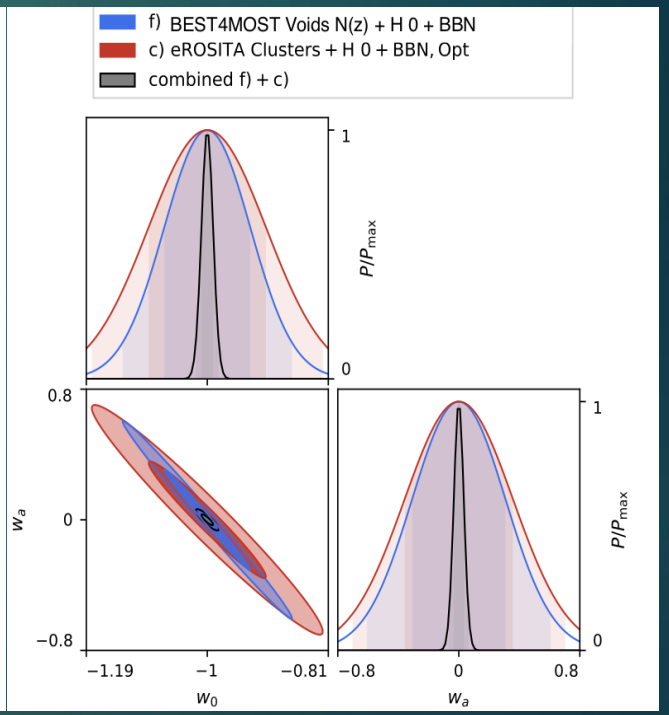




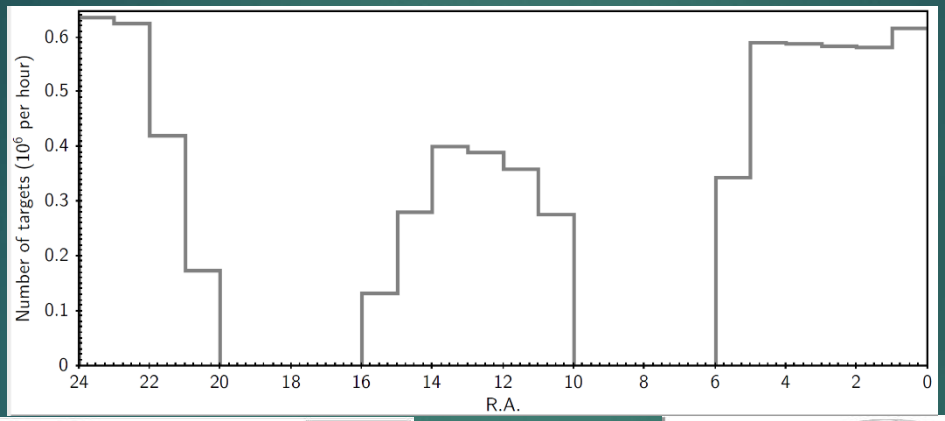


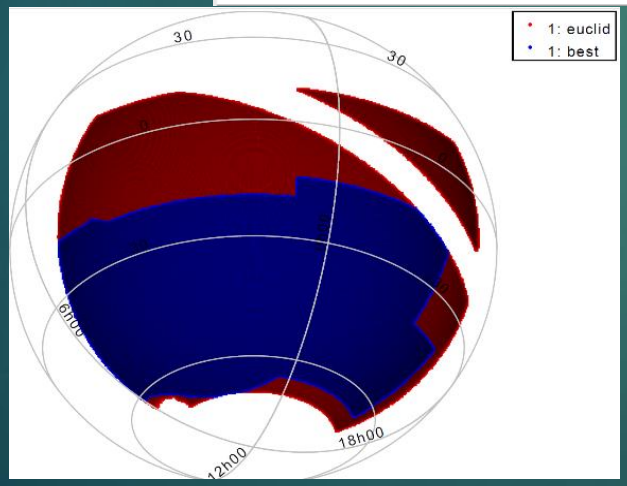
Additional cosmology probe: Voids

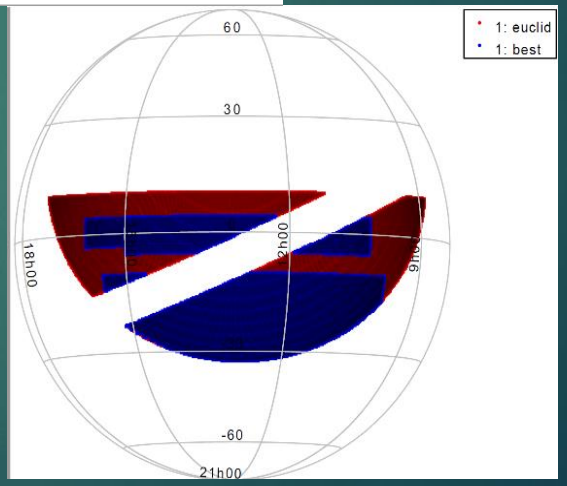




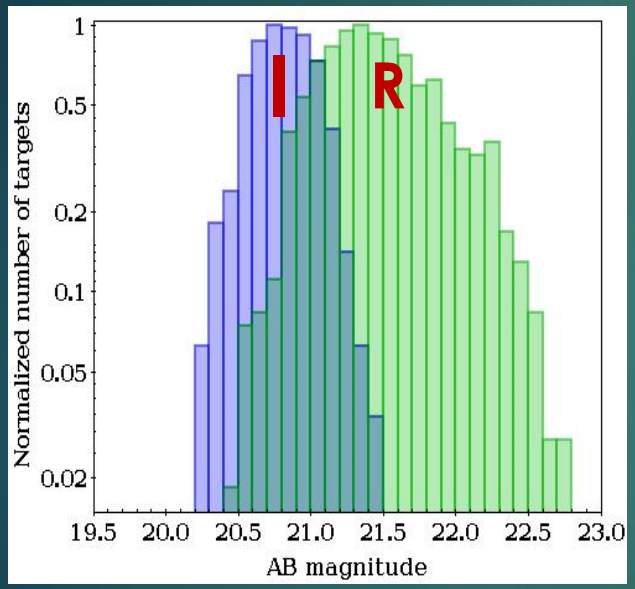
Target density: 1000/sq.degs
Area: 5000 sq.degs.

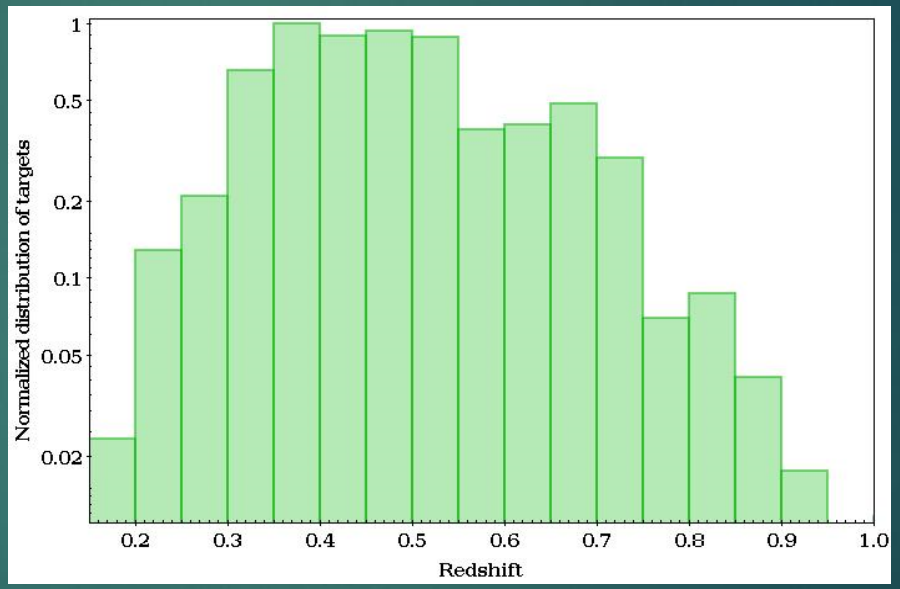






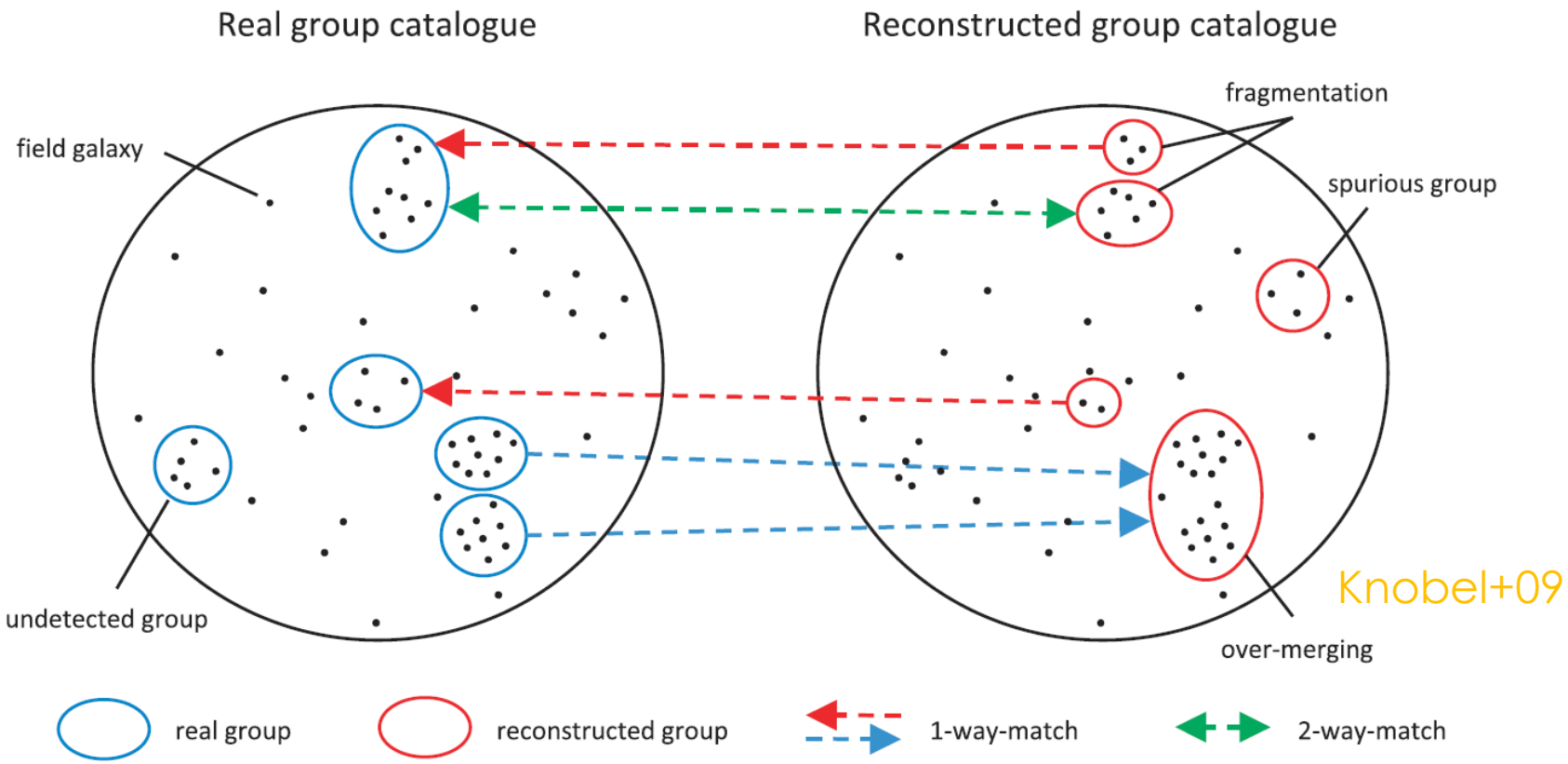
Targets: extended, 6M





FoM: A*C^5, 500 sq.degs patches.

Defining FoM of survey: detection of galaxy groups using Amico and Pzwav + VT



S/N~3 or 100km/s redshift precision, C=0.9

L2 products to be delivered to ESO/public

- Group catalog
- Voids catalog

L2 pipeline requests

Courtesy of Michael Balogh

column	parameter name	description
1	Cluster	Short name of each cluster; matches the entry in Table 2
2	SPEC_ID	A unique identification number. The first digit identifies the origin of the spectrum: 1 for GOGREEN and 2 for GCLASS. The next two digits correspond to the **cluster_id** identifier in the Cluster catalogue, that specify the photometric field. The remaining digits are the galaxy ID (only unique for a given field and source).
3,4	RA(J2000), DEC(J2000)	Target coordinates, in J2000 degrees. For GOGREEN, these coordinates correspond to the z' image coordinates used for mask design. These have been transformed to align with the K_s images; however positions will not match exactly with coordinates in the photometric catalogues.
5	OBJClass	This has a value of 1 for GOGREEN primary targets, i.e. those that match our photometric selection criteria. A value of 3 corresponds to a GOGREEN "mask filler" object, and 4 identifies a GCLASS spectrum. (OBJClass=2 was reserved for stellar sources used for telluric correction, and these are not included in the catalogue).
6	Redshift	The redshift measured from the spectrum
7	Redshift_Quality	The redshift quality flag. Both quality 3 and 4 are secure galaxy redshifts and can be used for scientific analysis; the difference between them is subjective and not rigorously defined. Quality 2 is a "best guess" but should be used with caution; this includes cases where there is plausible consistency with the photometric redshift, but no clearly identifiable spectral features. Quality 1 means no redshift is available.
8	EXTVER	This is the science extension number in the FITS files with the 1D and 2D spectra (see § 6.5).
9	Spec_Flag	An integer used to identify spectra that have problems that might compromise the ability to measure a redshift or line indices of a spectrum. Flags are assigned for the following: 1: Mild slit contamination or artefacts that should not strongly affect measurements 2: Non-galaxy-like spectrum and/or image 4: Significant slit contamination from neighbouring objects. Redshift and features may be compromised. 8: Poor telluric correction or sky subtraction, due for example to inadequate correction for the stray light effect described in Appendix A. 16: Major artefacts or large masked regions that render the spectrum nearly useless. Flags can be added. So, for example, a flag of 12 means there is both contamination from neighbouring objects, and poor sky subtraction.
10	SNR_8500_VAR	The signal-to-noise ratio per pixel, measured in the range $750 < \lambda < 950$ nm. The noise estimate is taken from the VAR array associated with the spectrum.
11	SNR_8500_RMS	The signal-to-noise ratio per pixel, measured in the range $750 < \lambda < 950$ nm. The noise estimate is taken from the *rms* in the science spectrum over the same range.
12,13	D4000, eD4000	The D_n4000 index and its uncertainty. See § 4.2.2
14,15	EWHdelta, eEWHdelta	The equivalent width of the Hδ absorption line and its uncertainty, in Å. Positive values represent absorption. See § 4.2.2
16,17	EWOII, eEWOII	The equivalent width of the [OII] emission line and its uncertainty, in Å. Positive values represent emission. See § 4.2.2
18,19	fOII,eFOII	The integrated flux of the [OII] emission line and its uncertainty, in ergs/s/cm^2/Å.
20	delta_BIC	The difference in Bayesian Information Criterion used to identify the presence of [OII] emission ($\Delta BIC > 10$) or its absence ($\Delta BIC < -10$). See Old et al. (2020) for more details.

Table 4. A description of the contents of the spectroscopic redshift catalogue, which contains and entry for every unique object with a GOGREEN or GCLAS spectrum.

Overview of the redshift surveys II

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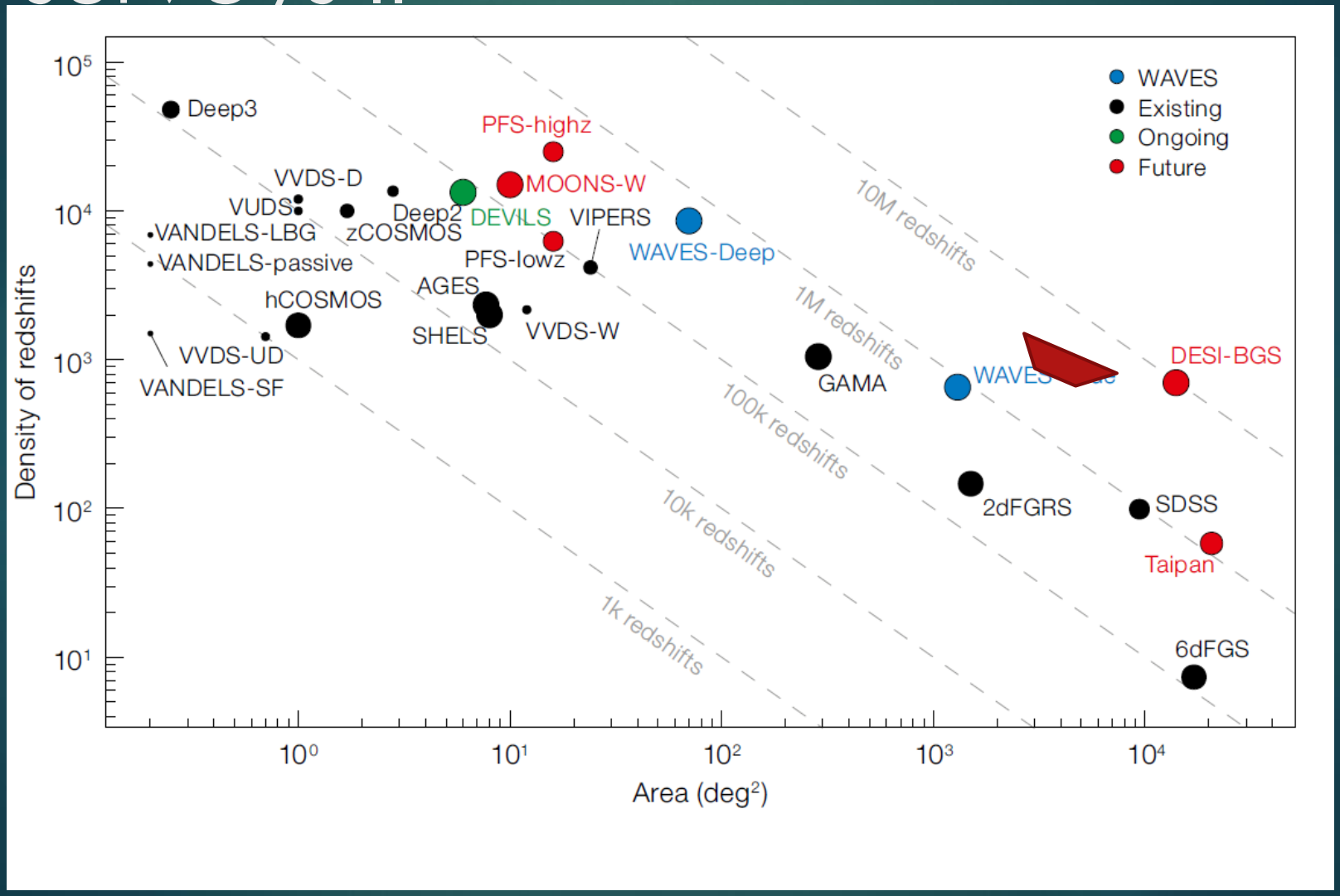
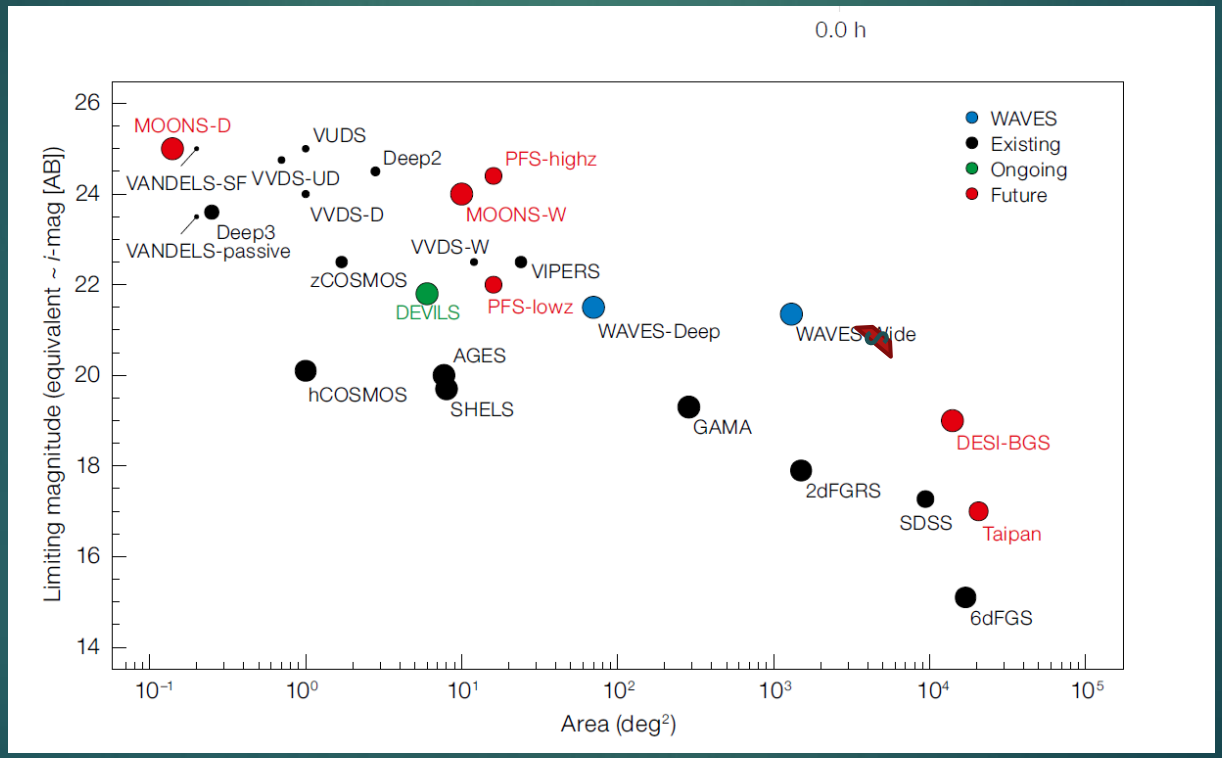


Overview of galaxy redshift surveys



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