

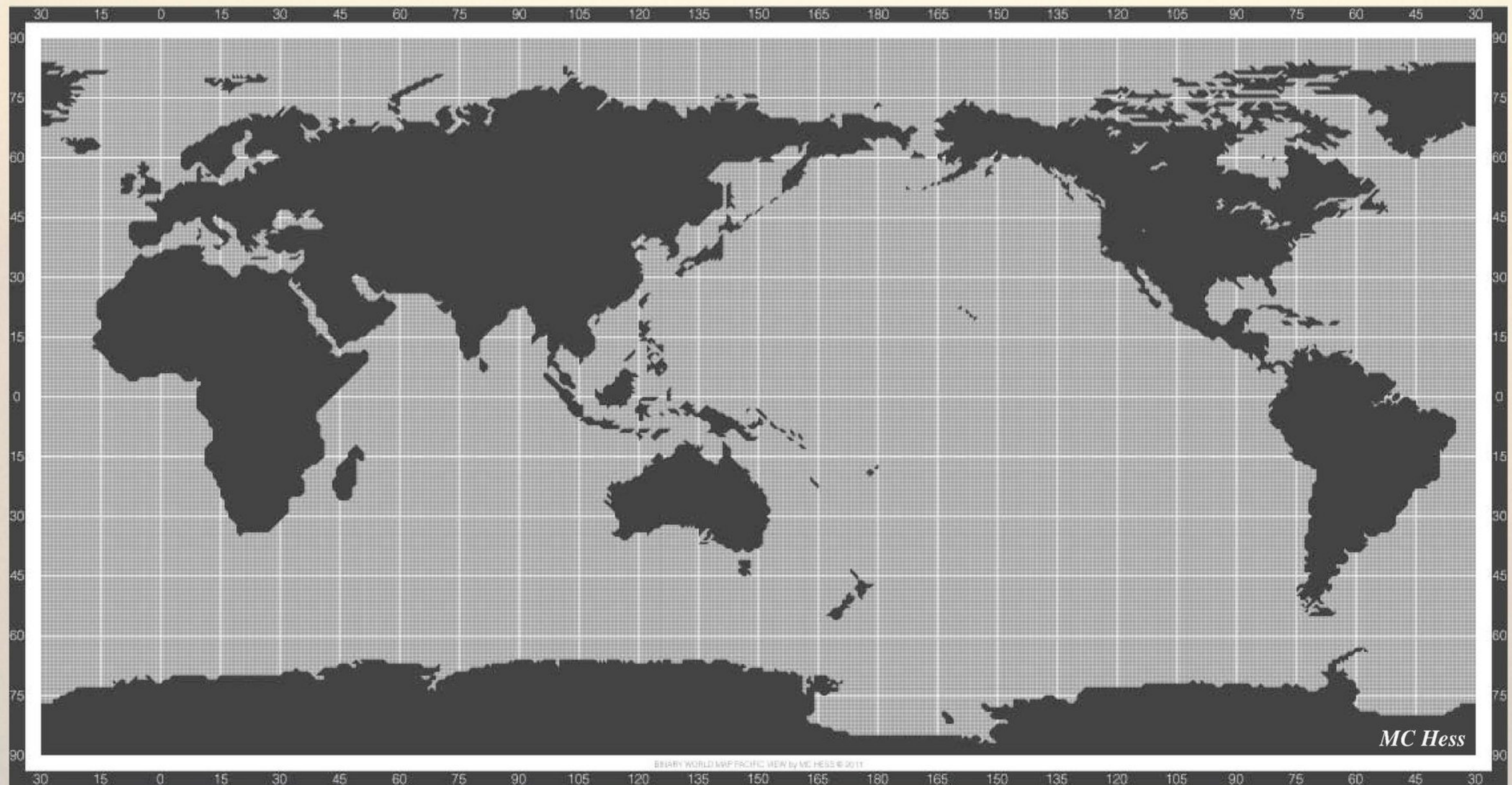
Euclid Wide ground-based surveys: an overview

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CEA-Saclay / Obs. de Paris

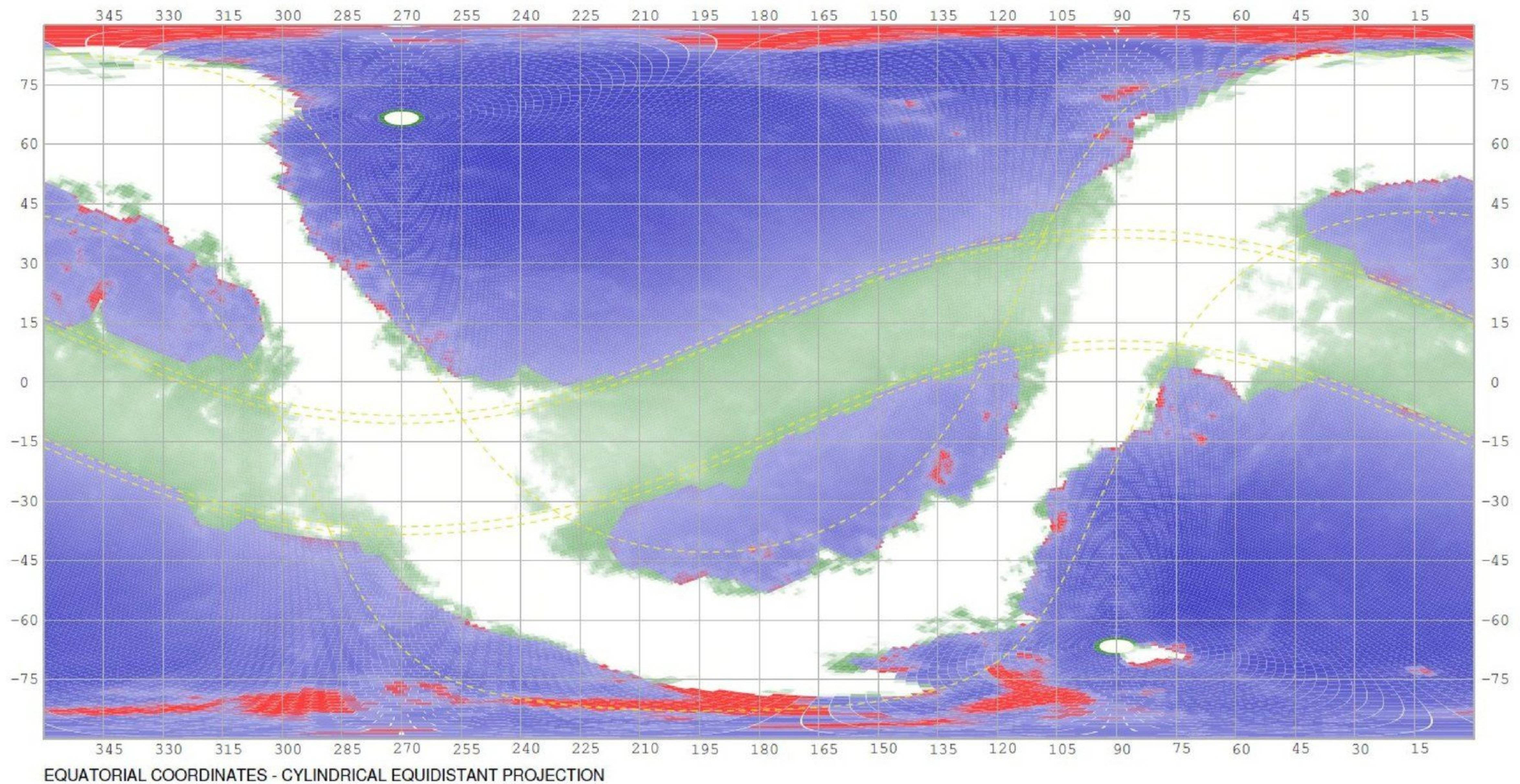
IAP

with contributions from S. Arnouts, J. Dinis, T. Dwelly, E. Magnier



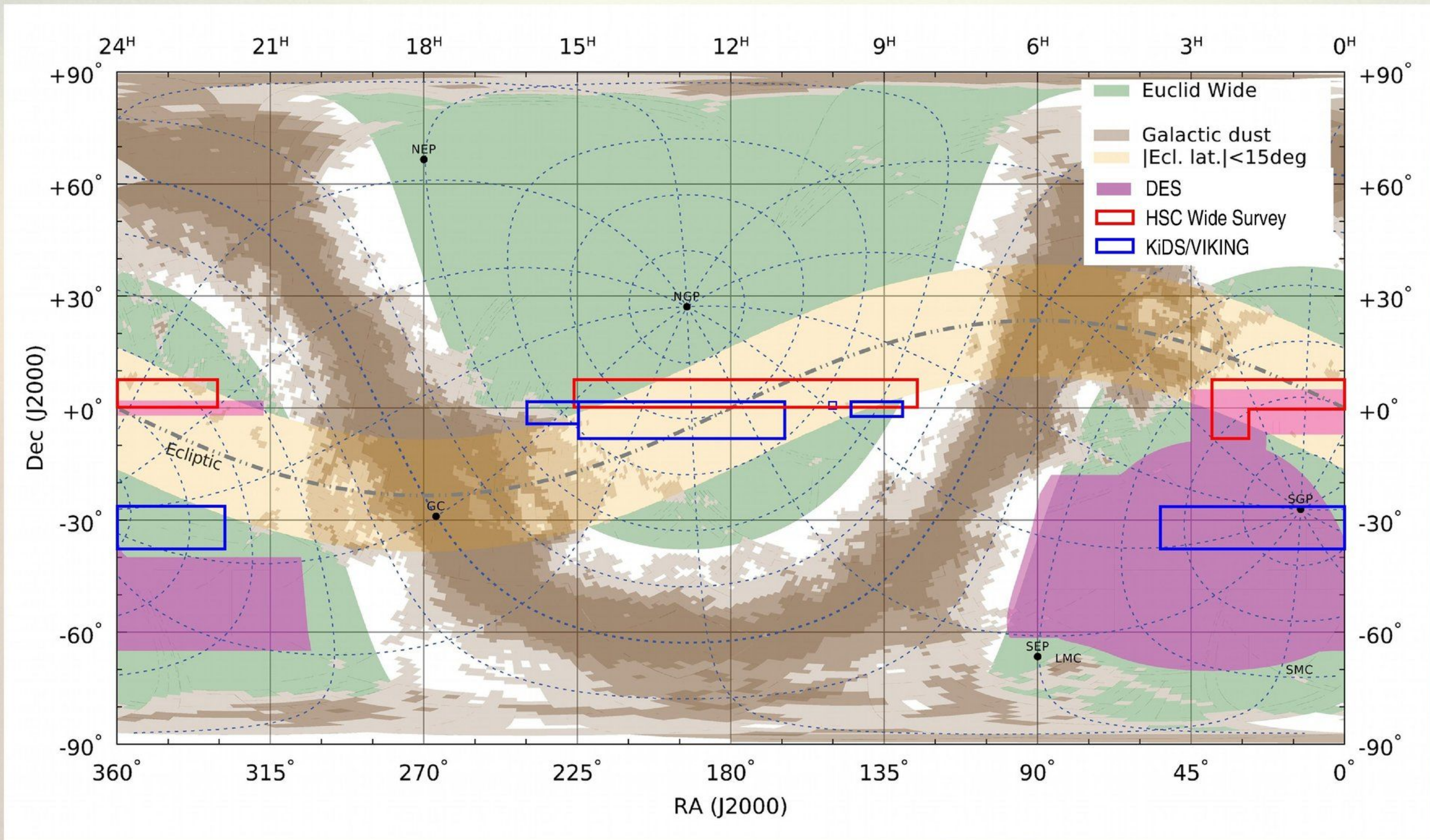
Fine tuning the Euclid Wide space survey

Map by J. Dinis (ECSURV)



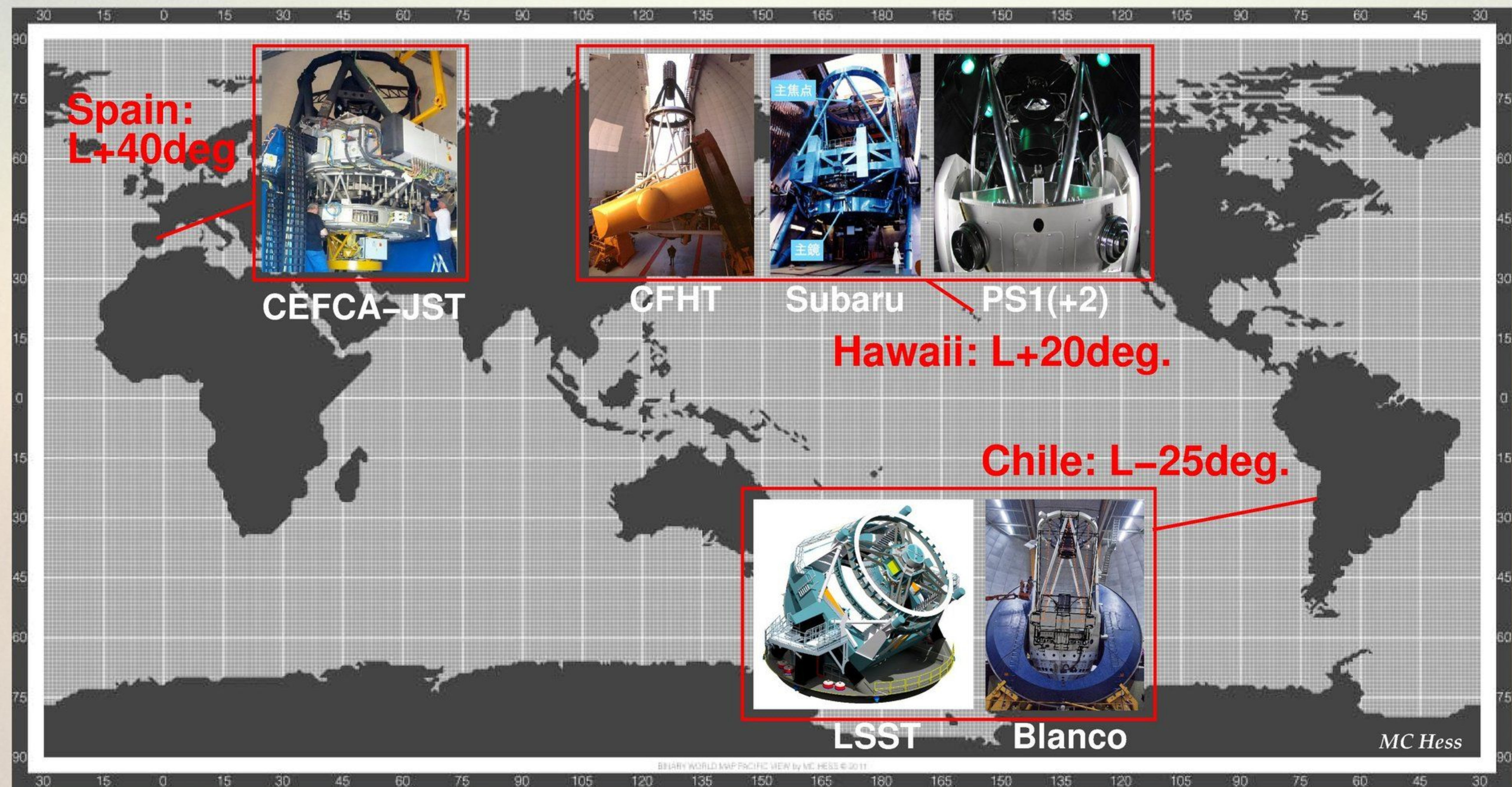
- Current spacecraft performance open $\sim 20,000 \text{deg}^2$ (blue) based on SNR specifications only
- Clustering constraints on NISP will cut it down to $\sim 18,000 \text{deg}^2$
- The yellow dotted lines indicate the Red Book clipping: $15,000 \text{deg}^2$ to be observed at least
- This opens for example $\sim 6,000 \text{deg}^2$ north of declination $+30$ (v.s. currently planned 5,000)

Euclid inherits sub-optimal unrelated surveys



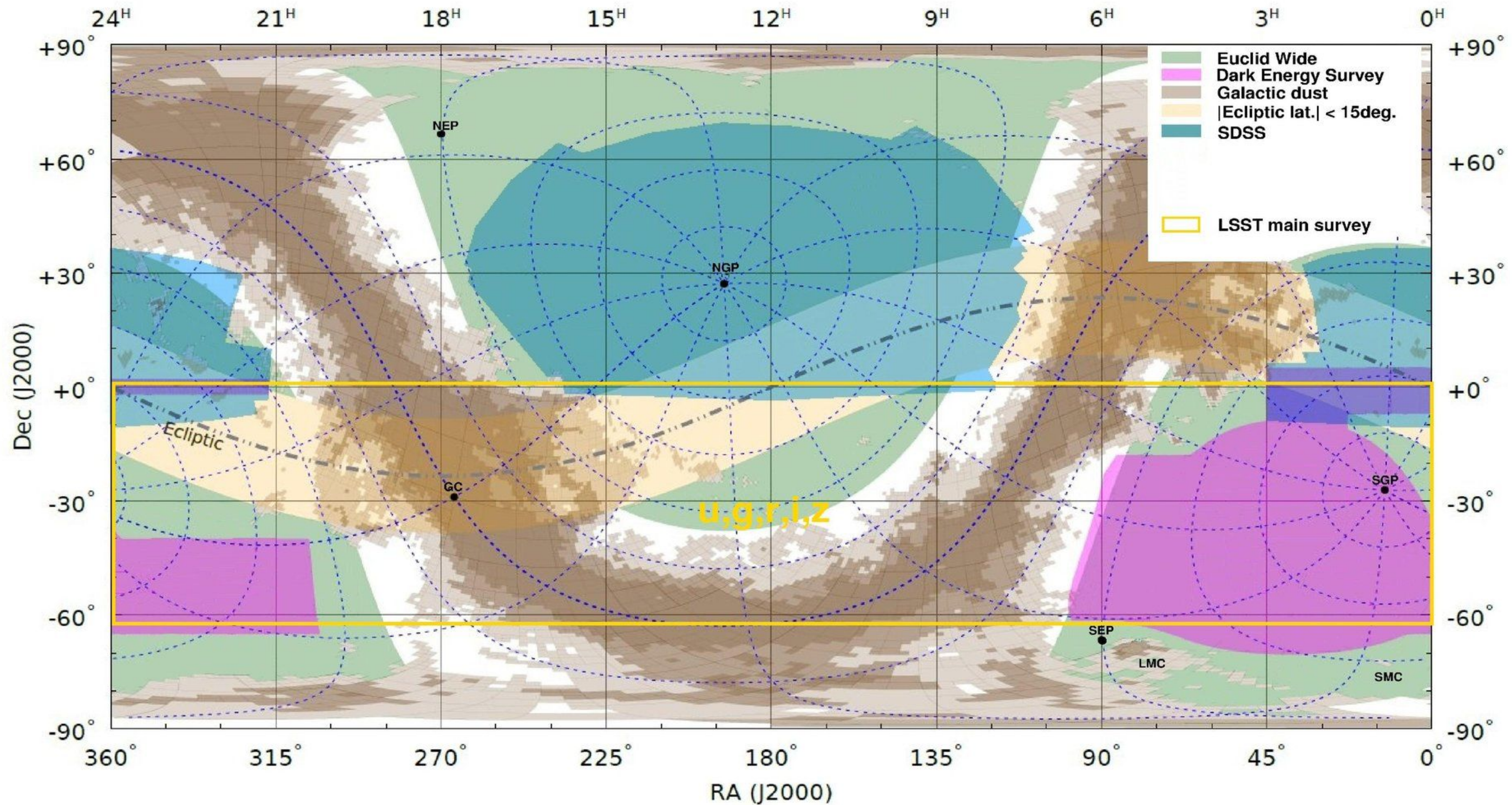
- Euclid Wide covers ~15,000 square degrees, avoiding the galactic and ecliptic planes
- The Subaru HSC Wide Survey is mostly useless: ~1,400deg² very deep on the ecliptic plane
- KiDS/VIKING has limited overlap in u,g,r,i (~800deg²) and is too shallow in the i-band
- DES has excellent overlap (~4,500deg²) in g,r,i,z but is too shallow in the red bands (i,z)

Present and upcoming wide-field imagers relevant to Euclid



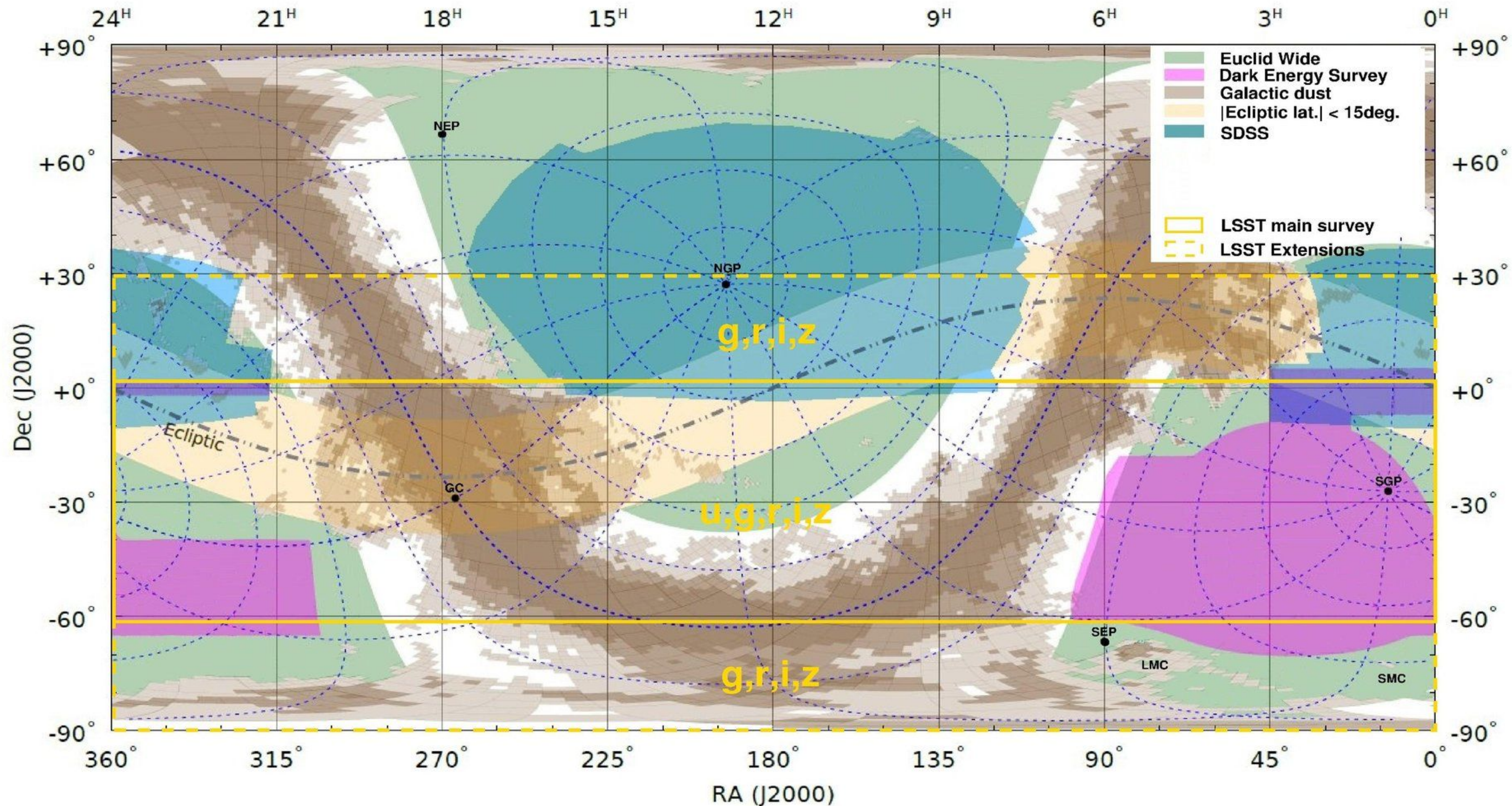
Etendue ↑	Facility	Year	Aper.	FOV	IQ	CCD class	Type	Hemisphere
	LSST	2021	6.6m	9.6 sq.deg.	0.8"	Deep depletion	Surveyor	South
	Subaru	2013	8.2m	1.8 sq.deg.	0.6"	Fully depleted	Observatory	North
	Blanco	2013	4.0m	3.0 sq.deg.	0.9"	Fully depleted	Observatory	South
	JST	2017	2.5m	4.8 sq.deg.	0.7"	Deep depletion	Surveyor	North
	CFHT	2003	3.6m	1.0 sq.deg.	0.6"	EPI	Observatory	North
	PS1	2008	1.5m	7.0 sq.deg.	1.0"	Fully depleted	Surveyor	North

Euclid Wide + LSST Main Survey [2021–24]



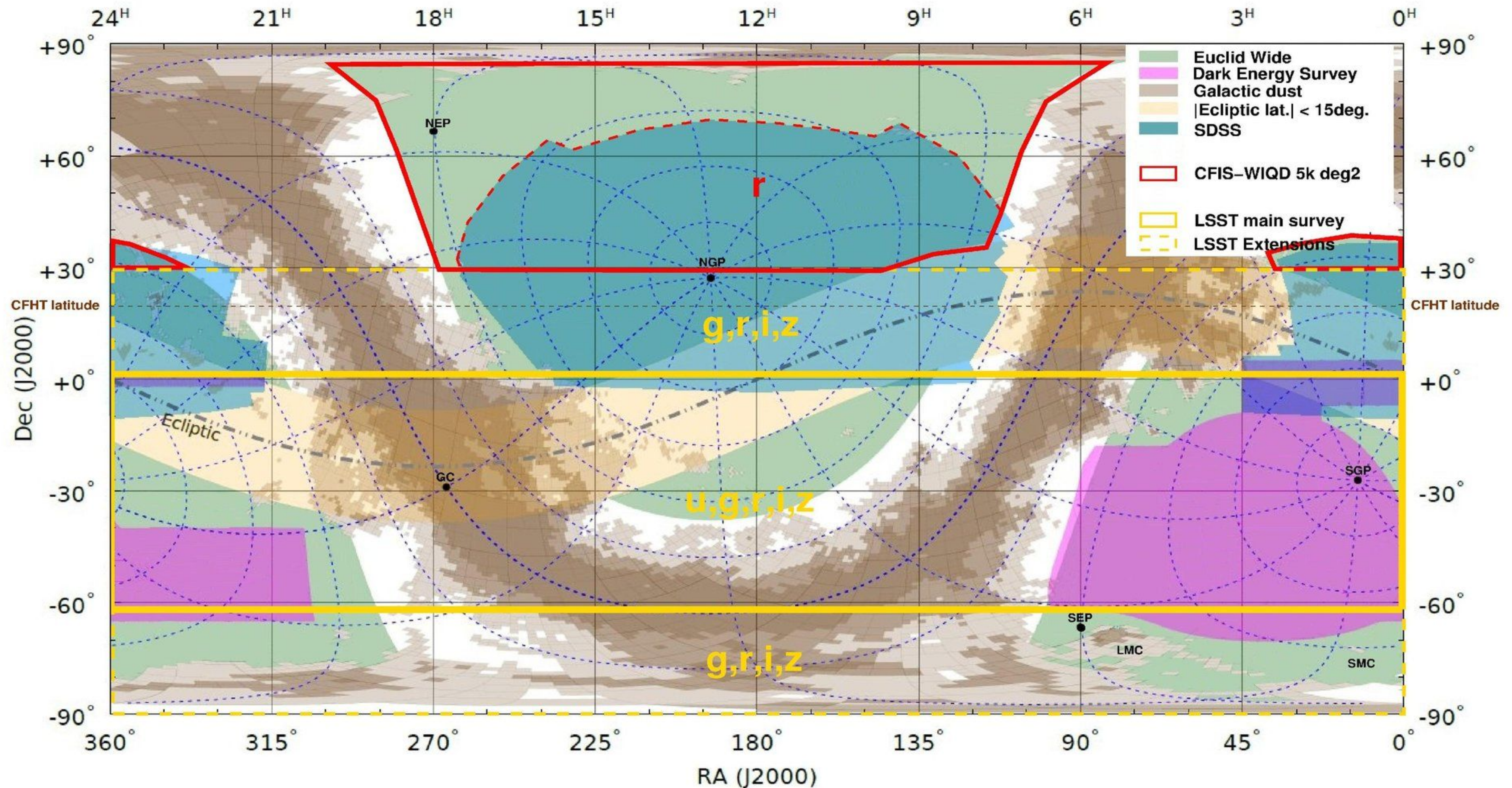
– LSST will cover to great depths in ugriz nearly 7,000 square degrees of Euclid Wide

Euclid Wide + LSST Main Survey + LSST Extensions [2021–24]



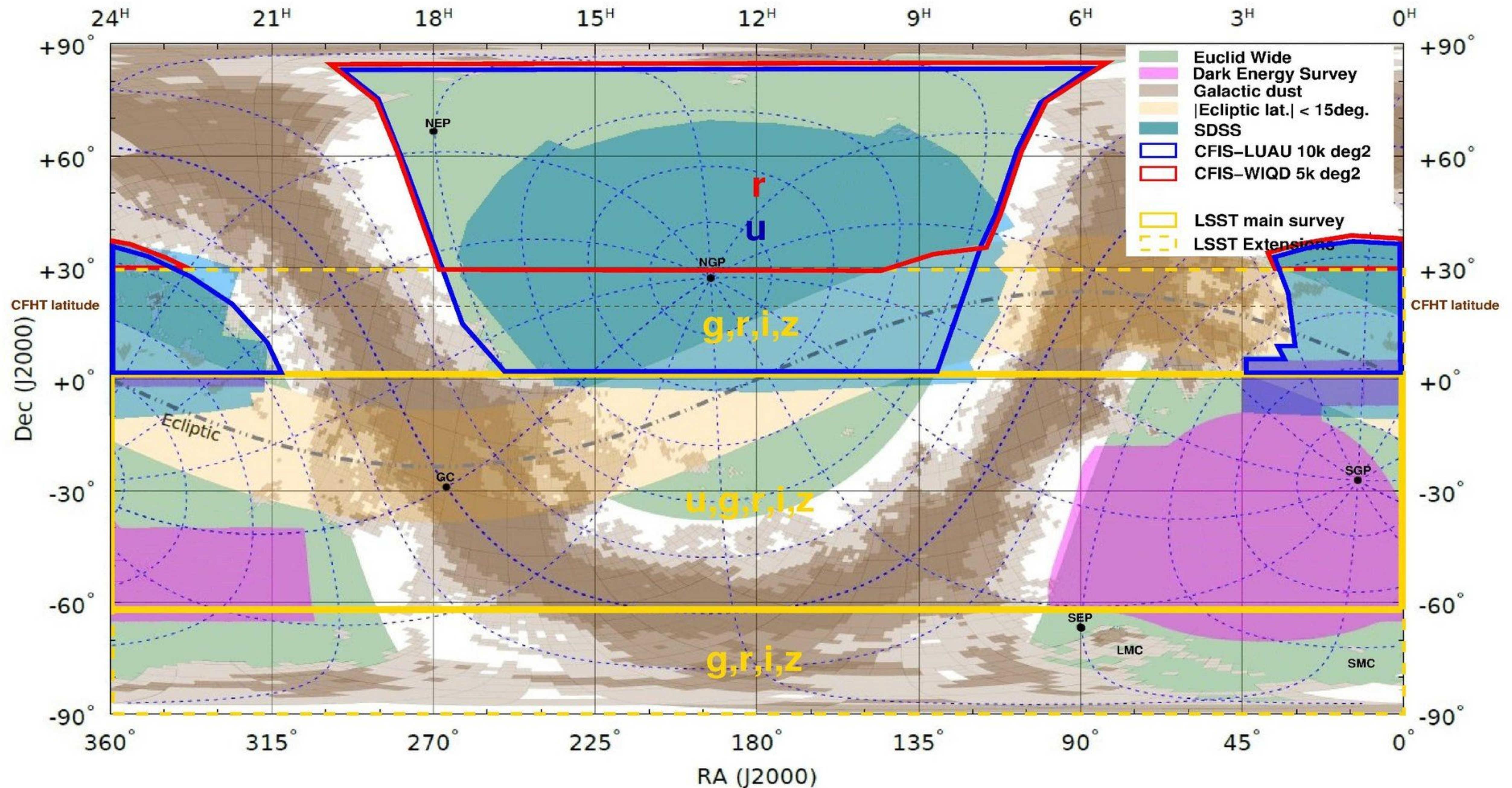
- LSST extensions to DEC -90° to +30° could bring an extra ~3,000 square degrees to Euclid Wide
- The southern extension (DEC -60° to -90°) already planned to depths greater than Euclid Wide
- The northern extension (DEC 0° to +30°) is discussed for the nominal Euclid Wide depths

Euclid Wide + CFHT-r [CFIS 271 nights 2017–9]



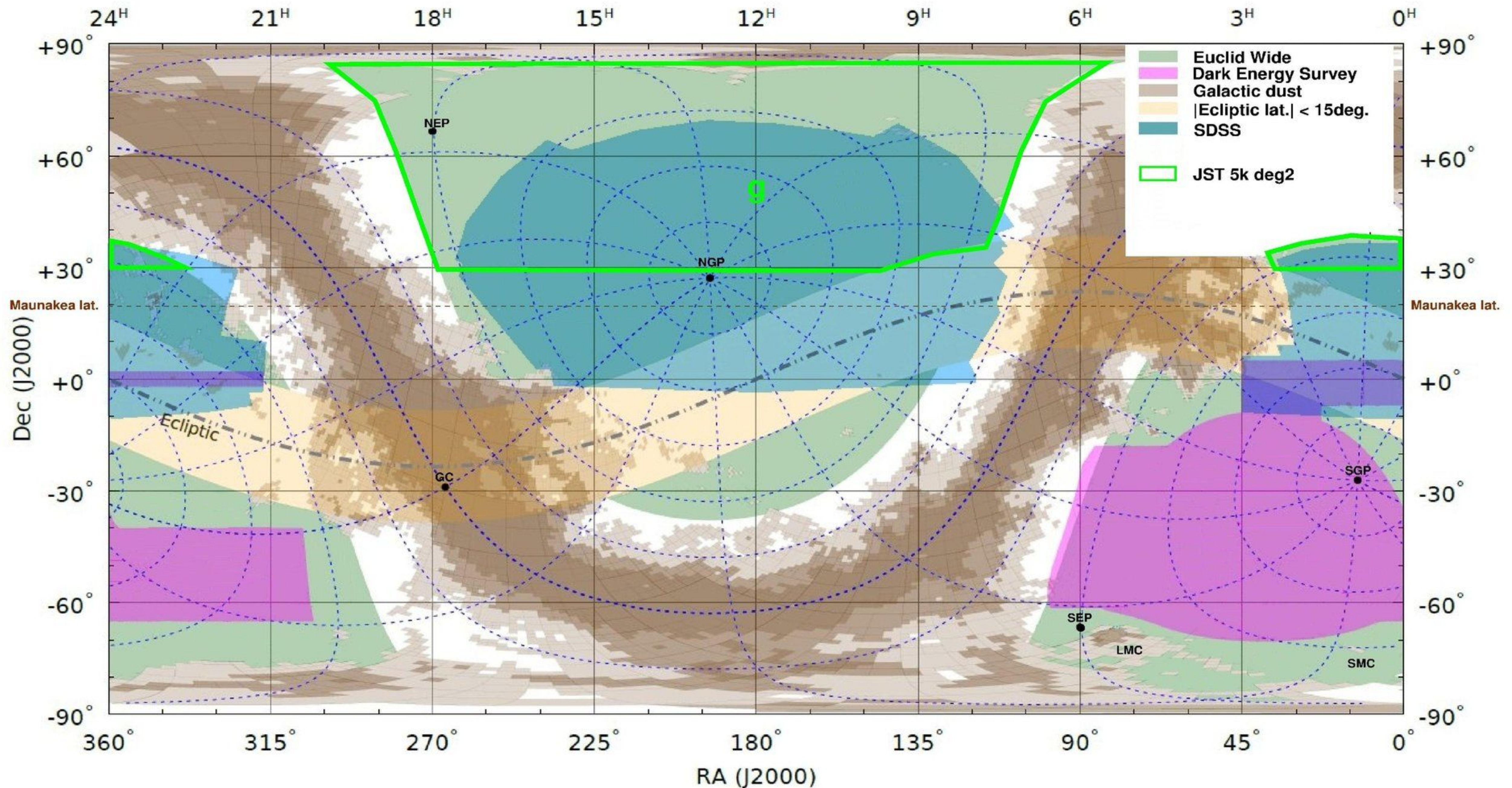
- The Canada–France Imaging Survey (CFIS) Wide/ImageQuality/Deep (WIQD)
- The 5,000 most northern Euclid Wide square degrees in r-band at the nominal Euclid depth

Euclid Wide + CFHT-u [CFIS 271 nights 2017–9]



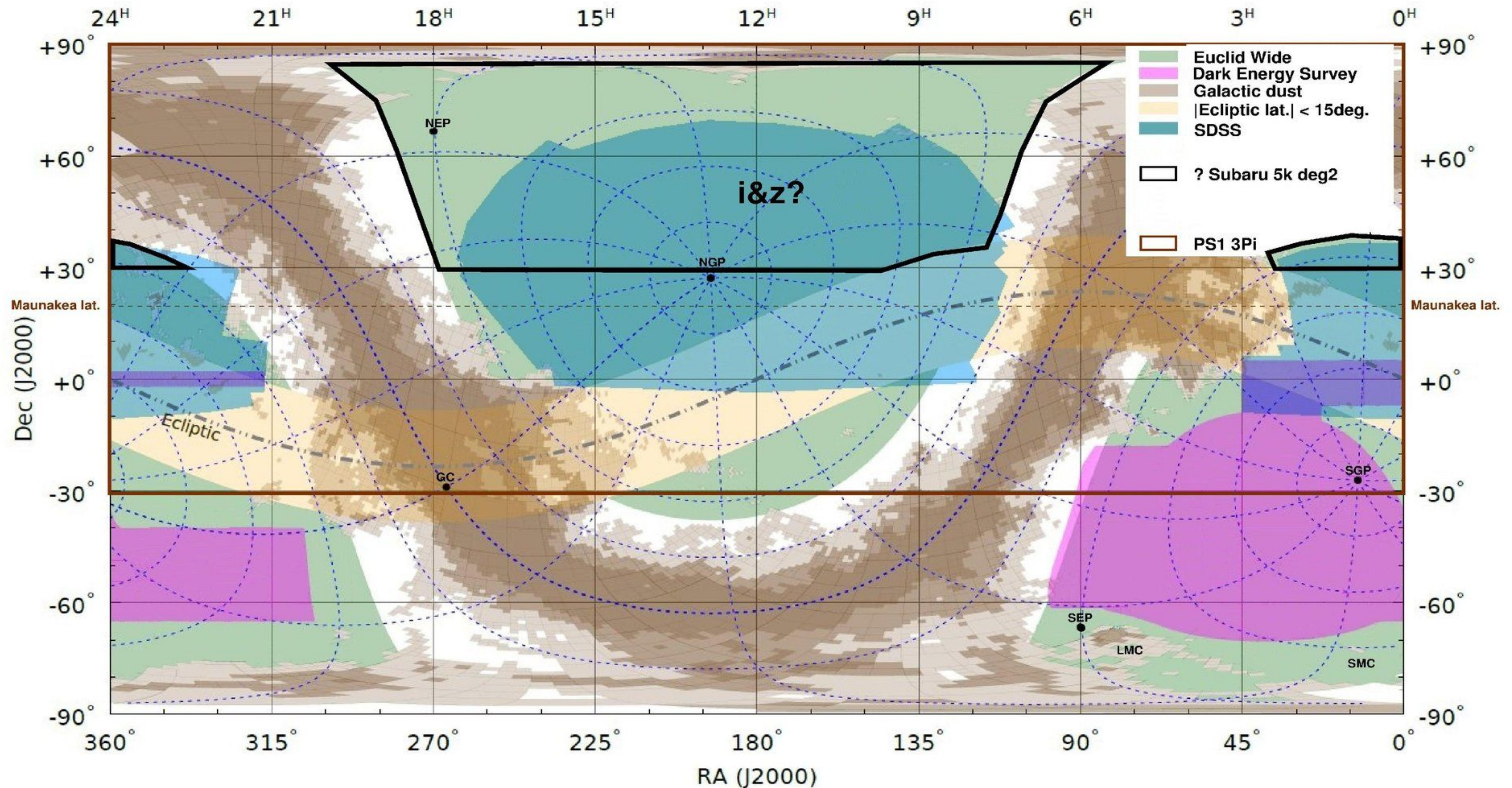
- The Canada–France Imaging Survey (CFIS) Legacy for the U–band All–sky Universe (LUAU)
- 10,000 northern square degrees in u–band above the galactic plane, shallow (240s total)

Euclid Wide + CEFCA JST [2017–24]



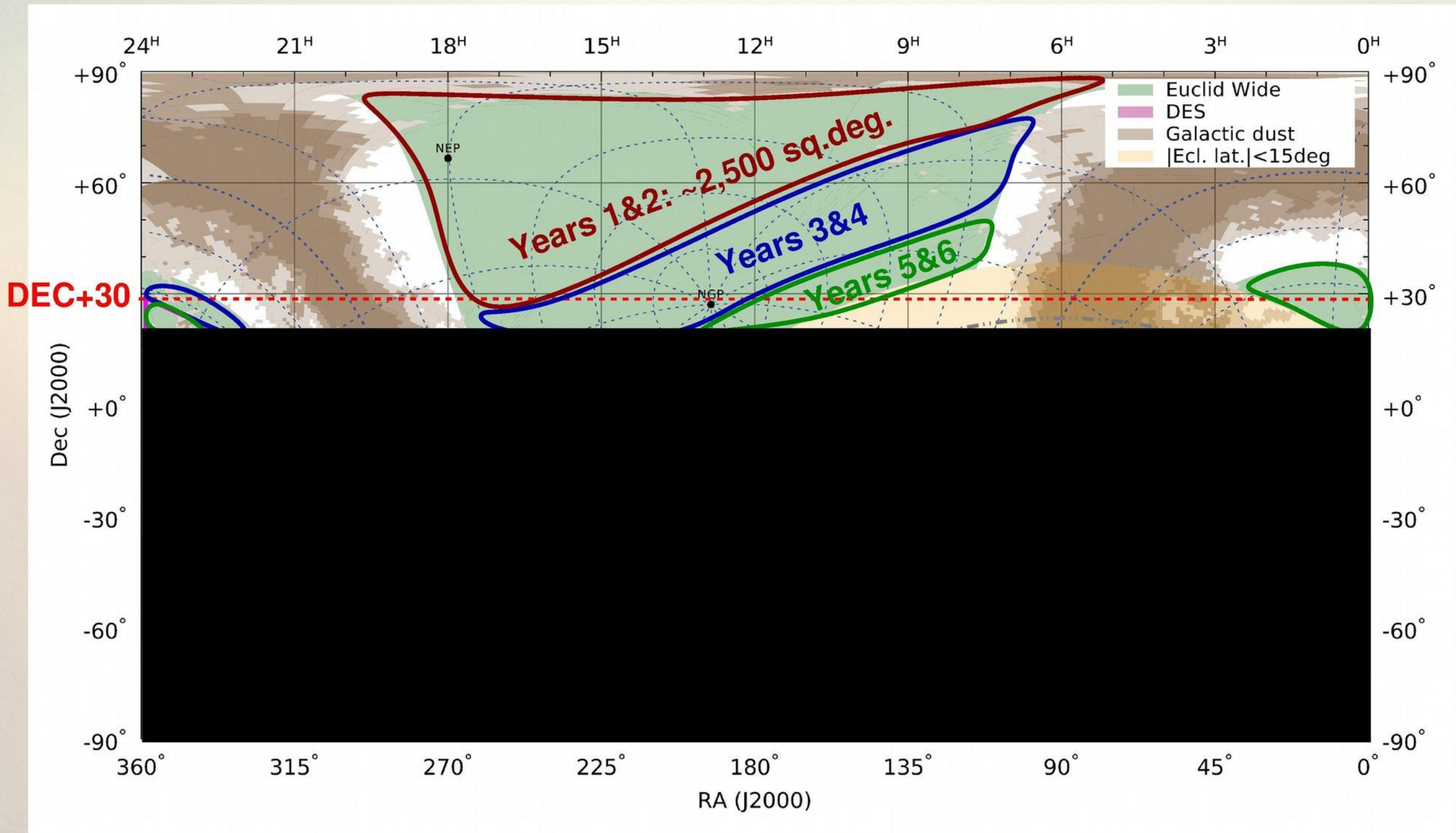
- JST will cover 5,000 deg² in the g-band, matching the CFIS footprint
- Sky coverage will be driven by the Euclid data releases (2022, etc.)

Euclid Wide + Subaru 2017–24 (?)



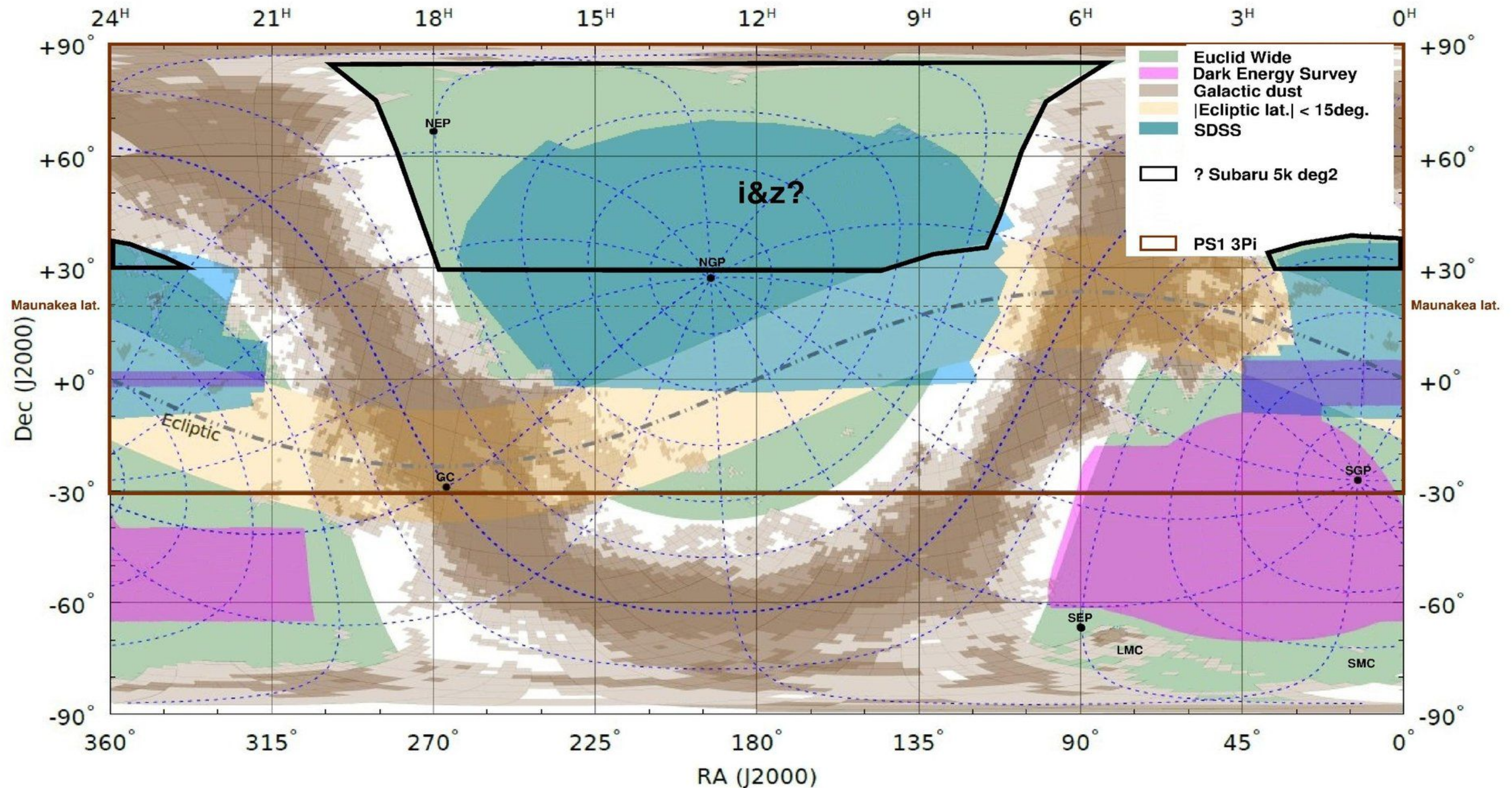
- Proposal submitted 09/2016 to focus on the first 2,500 deg² for the 1st Euclid data release by 2022
- Goal announced to cover all northern 5,000 deg² by 2024 (total ~90 nights)

Euclid incremental coverage from the NEP & the northern sky



- Default Euclid scenario: start from the ecliptic poles where the zodi is the lowest
- Euclid survey area north of DEC+30: ~5,000deg²
- Years 1&2 are fully above DEC+30: Subaru–HSC proposal strategy for 2017–2019

Euclid Wide + Subaru 2017–24 (?)

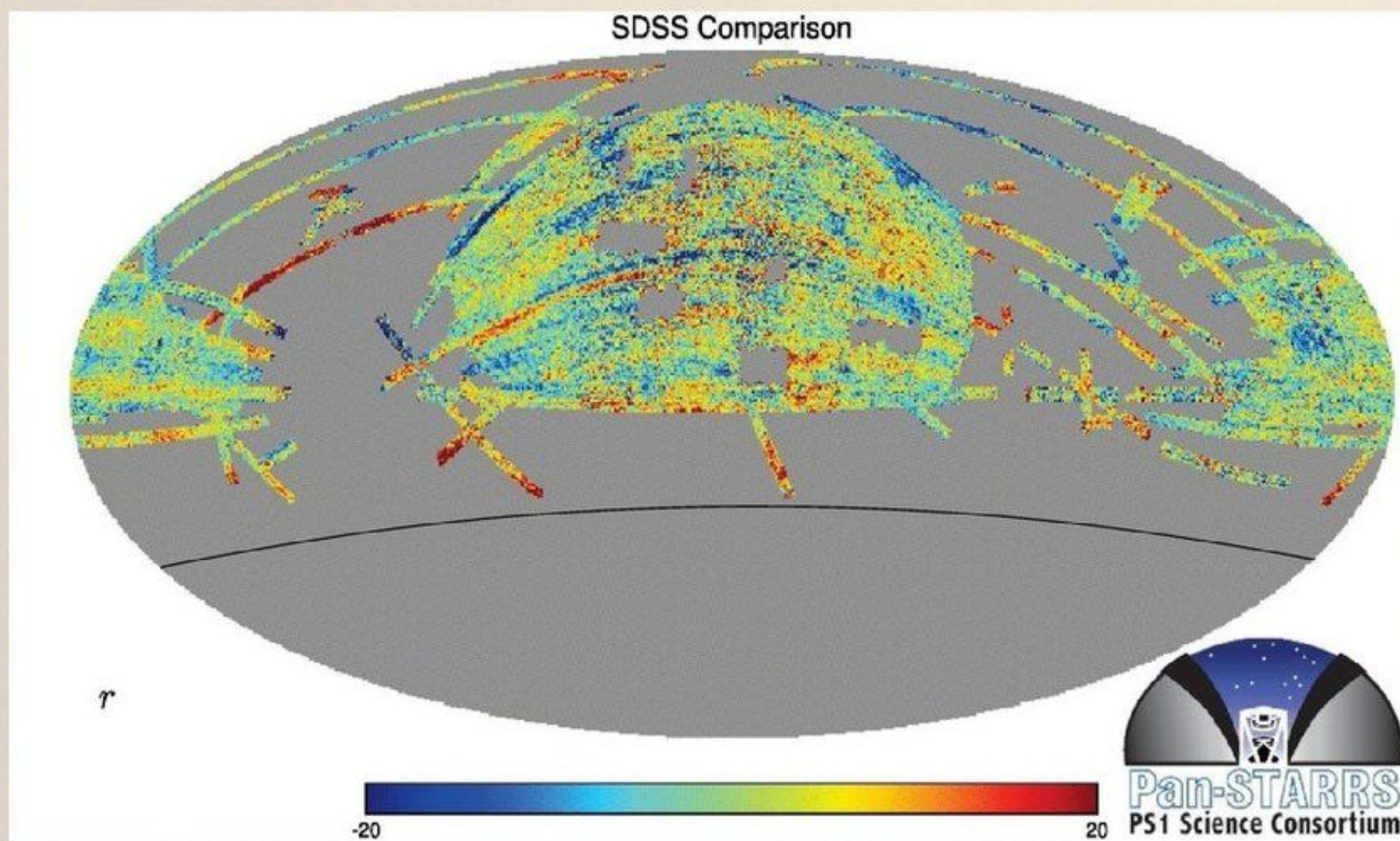


- Proposal submitted 09/2016 to focus on the first 2,500 deg² for the 1st Euclid data release by 2022
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Pan-STARRS 3Pi: 30,000 deg² in g,r,i,z at 4mmag. accuracy



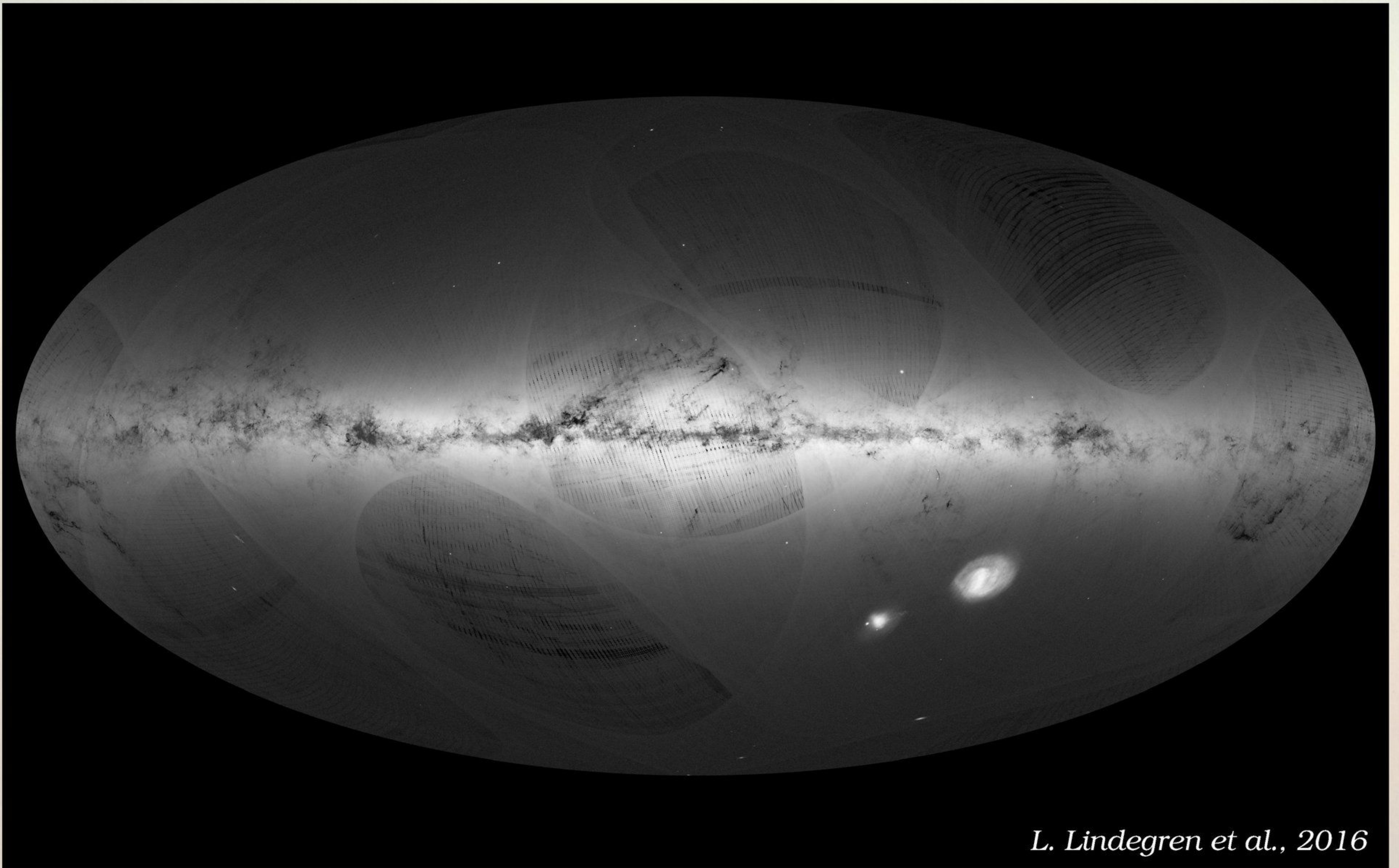
D. Farrow, N. Metcalfe and the PS1 Builders, 2016



E. Magnier, 2016

- Cover the declination range from -30 to $+90$ deg. in g,r,i,z,Y (30,000 deg²) at the 4 mmag. abs. level
- Photometric stars catalog to be released any time now, precursor of LSST for southern hemisphere

Gaia: a new paradigm for astrometry & optical photometry



L. Lindegren et al., 2016

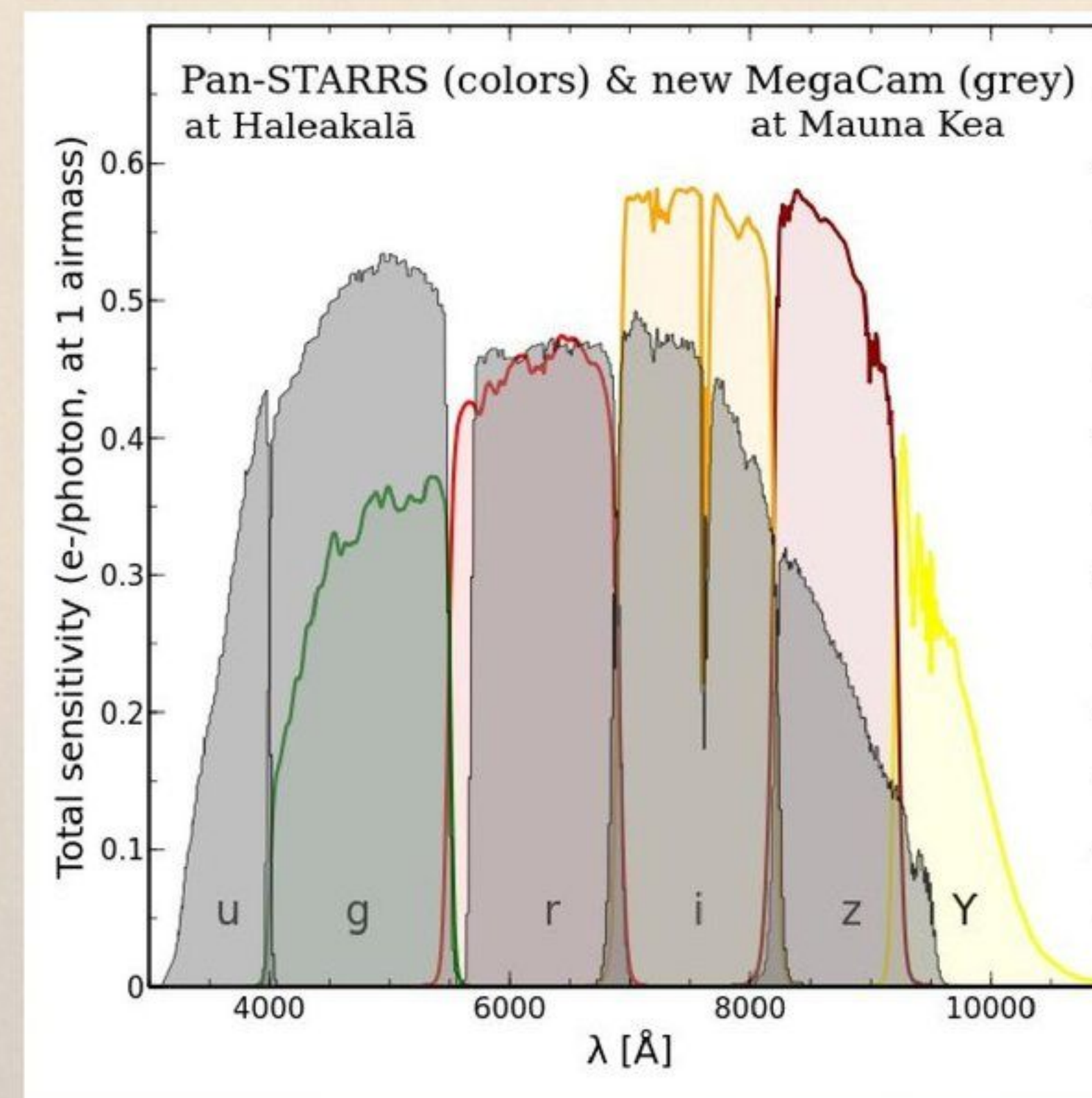
- All sky astrometry reference, path for arguably the best absolute photometry in the optical (g,r,i,z)
- DR1 is limited, the best has yet to come...

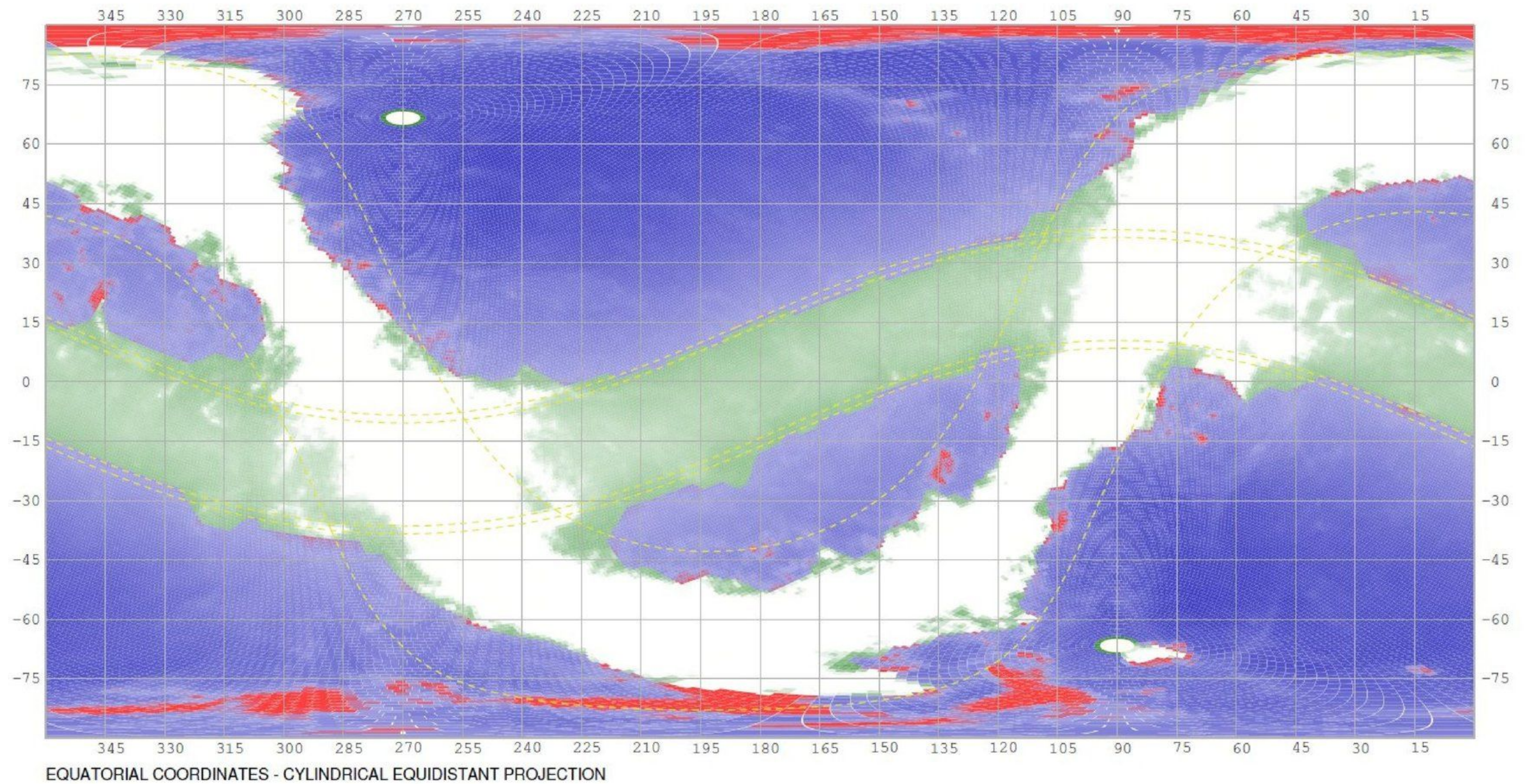
Summary of metrics and depths sought in the northern sky

- Depths derived from a COSMOS Euclid photo-z study (Euclid Red Book revisited):

g	r	i	z
24.5	23.9	23.6	23.4

- Use only total magnitudes to avoid confusion
- Metric: 10-sigma point source in a 2" diameter aperture (proxy for extended sources)
- Add +1.2 mag. to get the PSF photometry performance on point sources at 5-sigma
- Add +0.2 mag. when feeding these depths into a standard Exposure Time Calculator
- Main challenge for Euclid: blend data from various (varying) telescopes:





The hardest part for the ground-based plan is still to get photons...