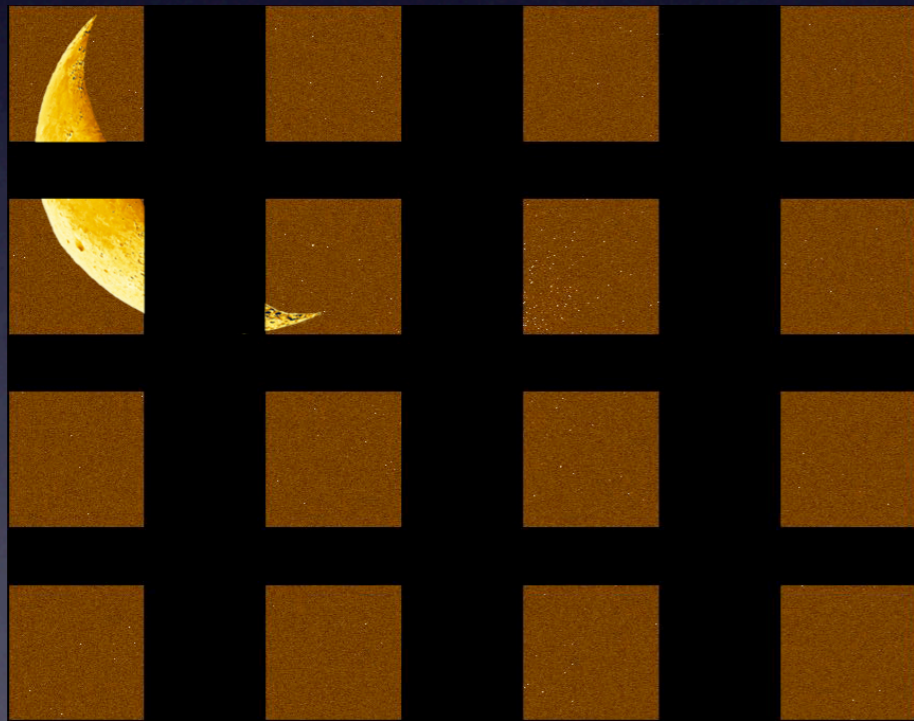


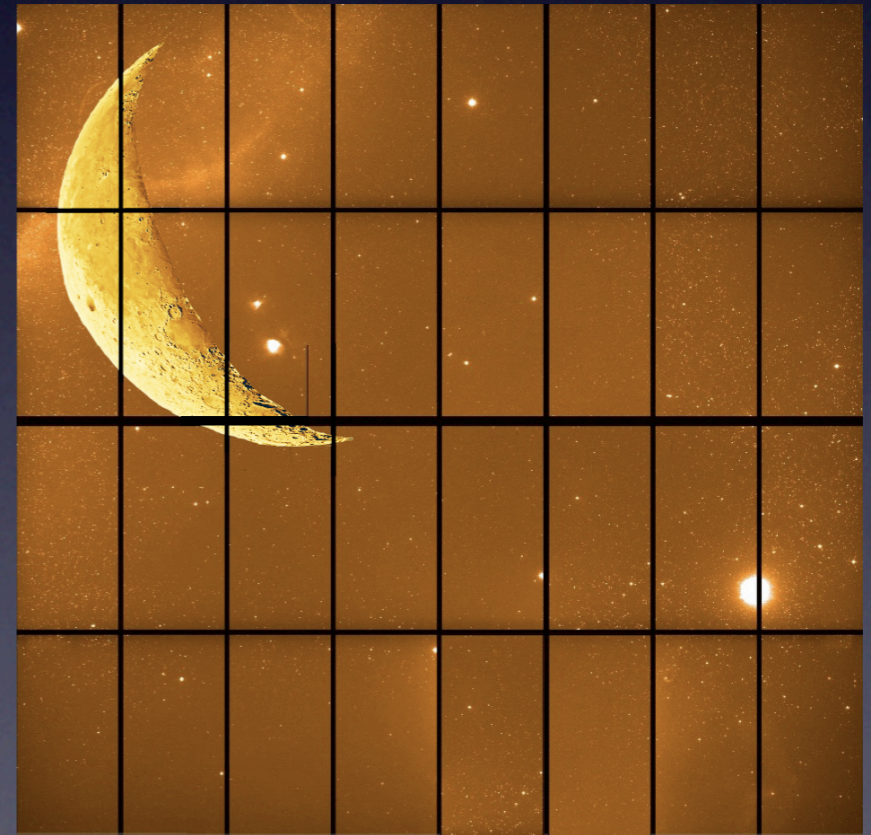
# ESO Public Surveys Phase 2 Workshop



## VISTA Public Surveys Simulating Phase 2



VIRCAM

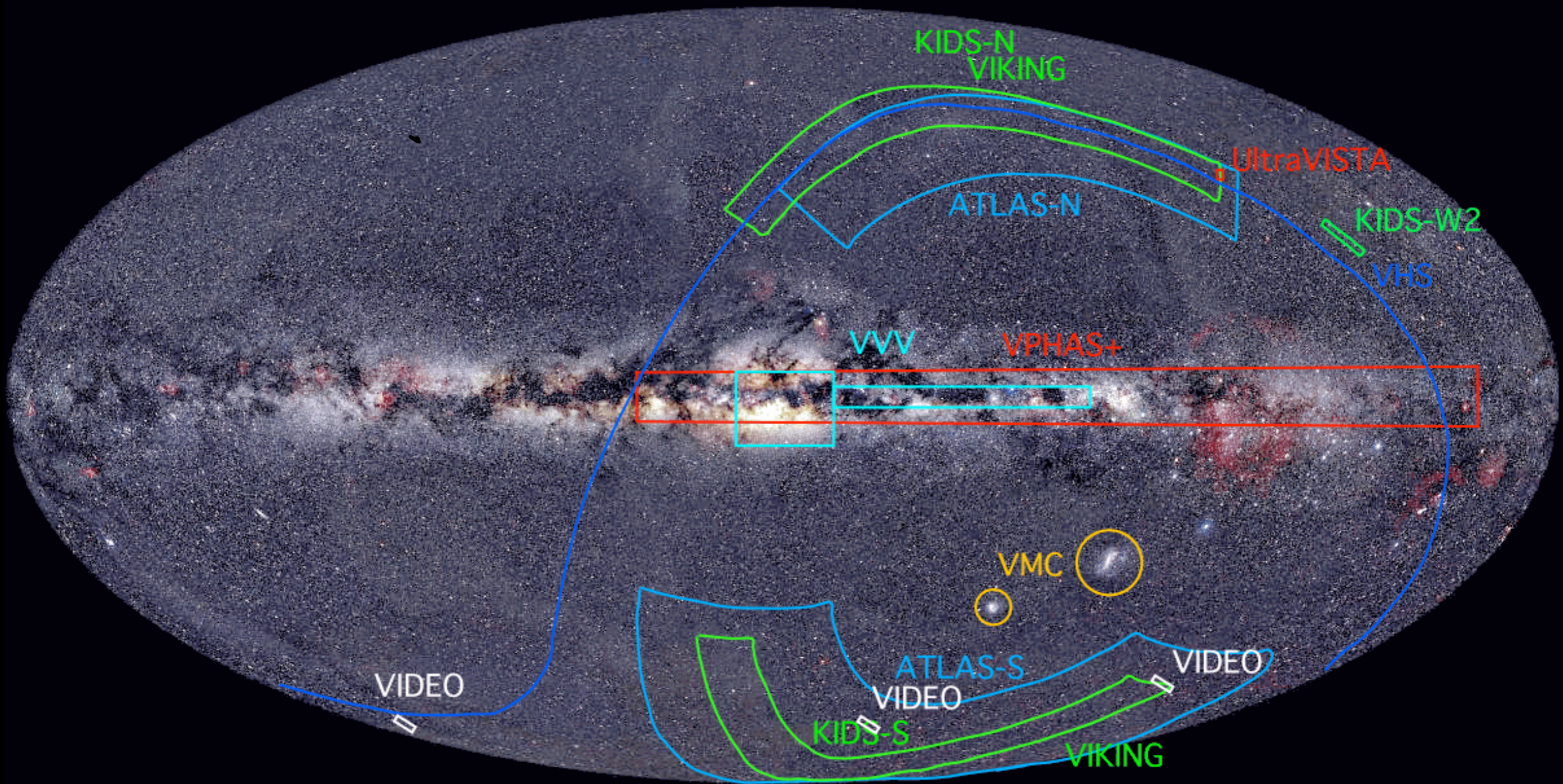


OmegaCAM

Mark Neeser  
ESO Survey Team



# Summary of VISTA/VST Public Surveys



VST and VISTA will image the equivalent of more than  $1\frac{1}{2}$  x full southern sky each year





# Survey Scheduling Project (mock phase 2)

ESO Public Surveys = 9 (6 VISTA / 3 VST) large Public Surveys covering a significant fraction of the southern sky in as many as 9 bands over 5 years.

~15 800 OB's/year

=> a significant challenge to scheduling logistics

Use EST familiarity with the SMP to model the first two semesters of VISTA operations. These OB's are the input for the VISTA scheduling simulation (afternoon talk by V. Ivanov)

Simulating phase two VISTA public surveys:

- VIKING
- VHS
- VVV



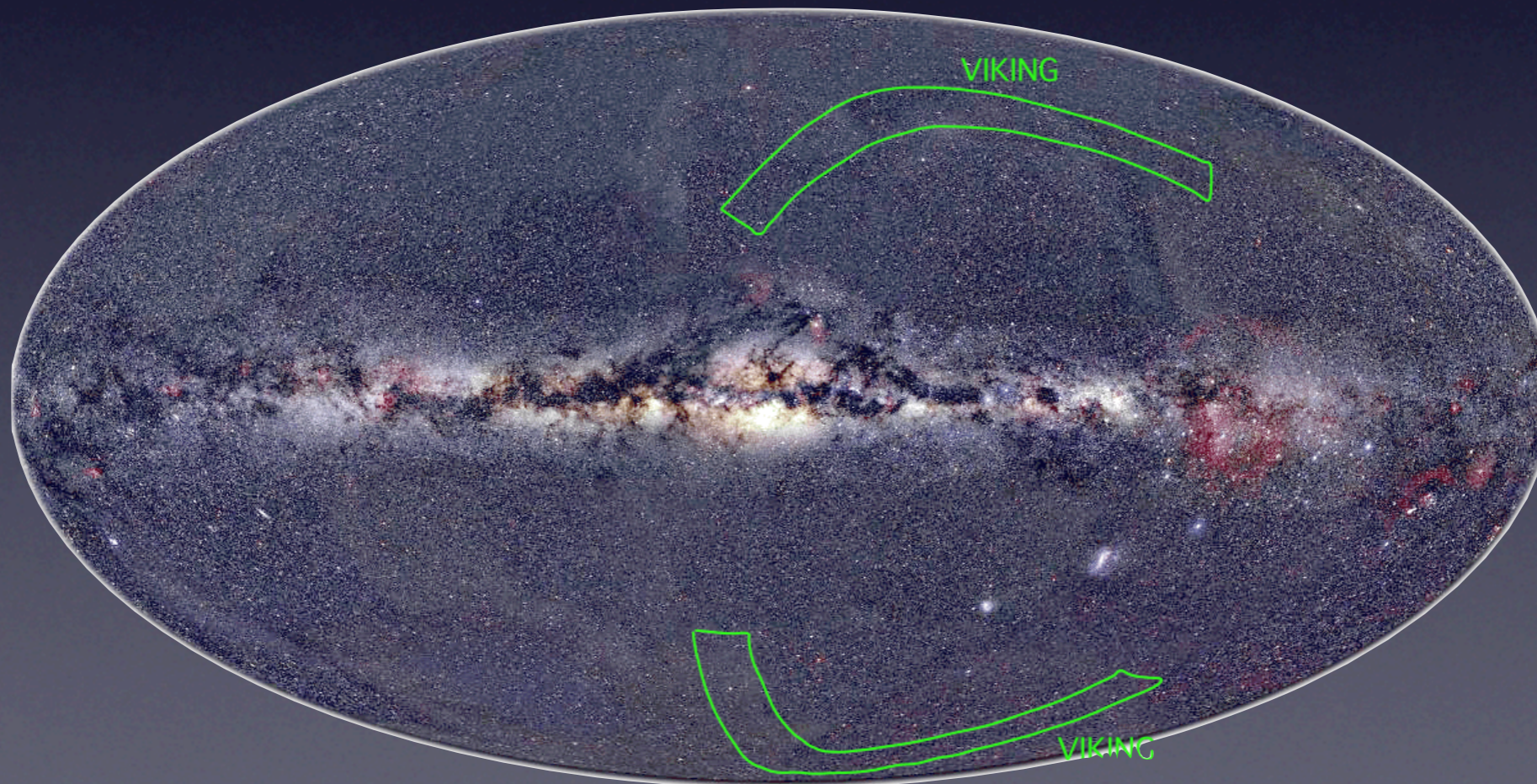
# VIKING: VISTA Kilo-Degree INfrared Galaxy Survey (PI: W. Sutherland / Cambridge)



## Science Case:

- key complement to VST/KIDS (9 bands => very accurate photo z's:  
 $\Delta z/(1+z) \sim 0.03$  to  $z = 1$ )
- with KIDS: weak lensing and baryonic oscillations  
detection of very high redshift QSO's ( $z > 7$ ), ultra-cool brown dwarfs, galaxy evolution and morphology, and clustering

1490 deg<sup>2</sup> covering all KIDS fields in: Z, Y, J, H, Ks





# VIKING



## Constraints:

- seeing  $\leq 1.0$  arcsec & THN
- 1 Tile  $\Rightarrow$  2 OB's:
  - OB<sub>1</sub>: Z, Y, J<sub>1</sub> (dark or grey)
  - OB<sub>2</sub>: J<sub>2</sub>, H, K<sub>s</sub> (any moon)
- OB<sub>1</sub> and OB<sub>2</sub> should be observed within one month of each other (addressed using p2pp groups)

## Strategy:

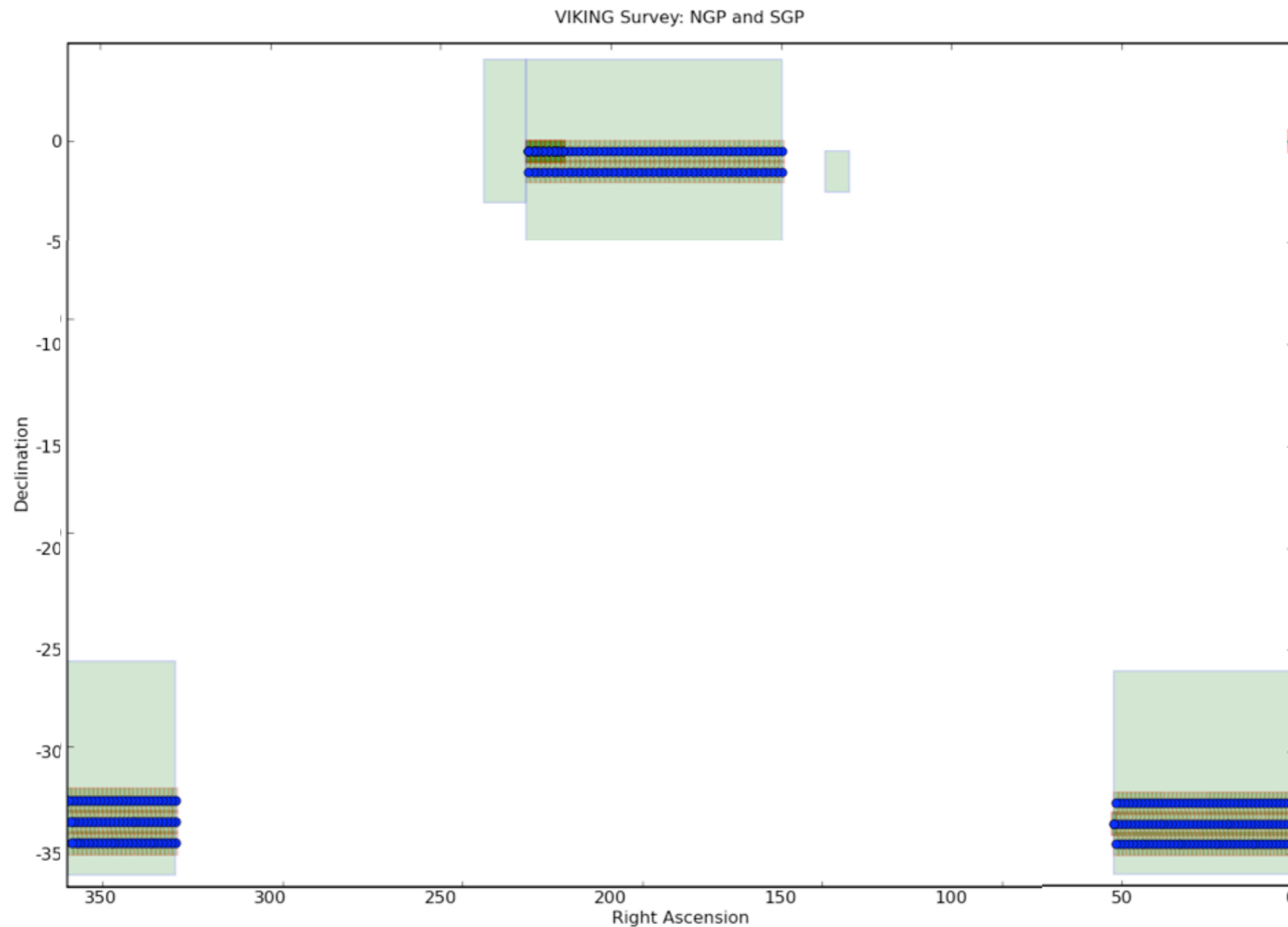
- locate field centers along *tramlines* of constant declination (matching those of KIDS)
  - $\Rightarrow$  2 arcmin overlaps (N/S); 1 arcmin overlaps (E/W)
  - $\Rightarrow$  49 x 10 tiles (SGP) and 61 x 9 tiles (NGP) x 1.435 deg<sup>2</sup> per tile = 1490 deg<sup>2</sup>

filter	Z	Y	J	H	K <sub>s</sub>
depth (vega 5 sigma)	22.6	21.7	21.3	20.2	19.4
DIT	50	50	25	10	10
nDIT x njitter x nPAW	1x5x6	1x4x6	2x2x6	5x3x6	6x4x6
Total Exp (sec)	1500	1200	600	900	1440

# VIKING

## Priority Fields:

- 600 deg<sup>2</sup> subset with maximal overlap with ongoing surveys
- SGP (KIDS, 2dFGRS, SPT, DES):  $-30^\circ < \delta < -36^\circ$
- NGP (KIDS, 2dFGRS, SDSS, GALEX):  $-2^\circ < \delta < 2^\circ$

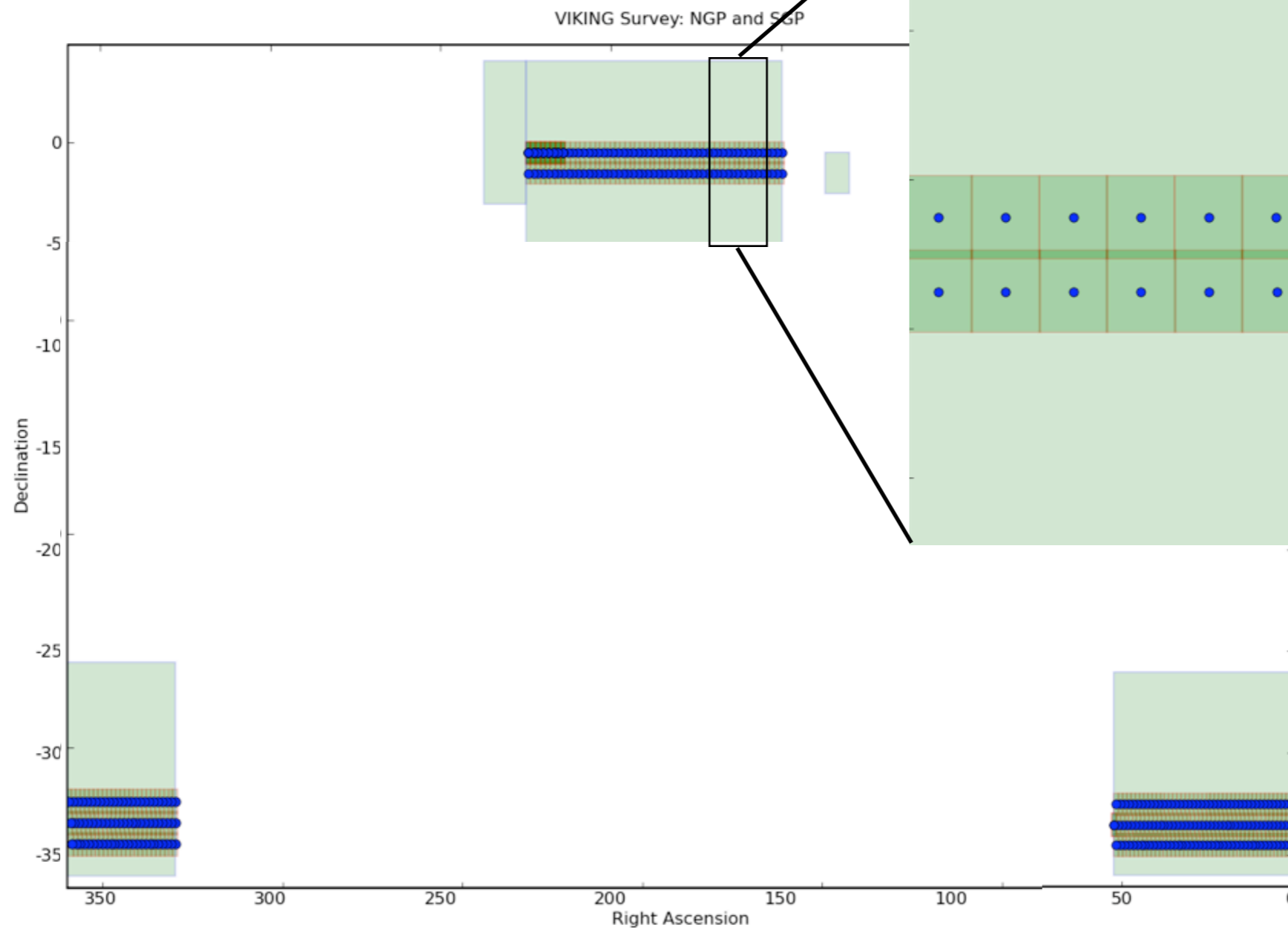




# VIKING

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## Compromises:

- fixed declination tiling needed to be coded by hand and fed to SADT as field centers
- restricted to one OB per filter (workshop version of p2pp now supports this)
- $N_{\text{jitter}}$  and  $N_{\text{dit}}$  as specified in the SMP not yet supported by p2pp  
=> (assumed DIT = total execution time)

## Results:

- 1866 OB's covering 454 deg<sup>2</sup>





## Observational Areas:

VHS - ATLAS (5000 deg<sup>2</sup>): divided ~evenly between N & S Galactic caps  
60 sec. exposures in Y, J, H, and Ks

VHS - Dark Energy Survey (4500 deg<sup>2</sup>): SGC  
120 sec. exposures in J, H, and Ks

VHS - GPS (8200 deg<sup>2</sup>): Galactic Plane Survey (excl. VVV)  
60 sec. exposures in J, and Ks



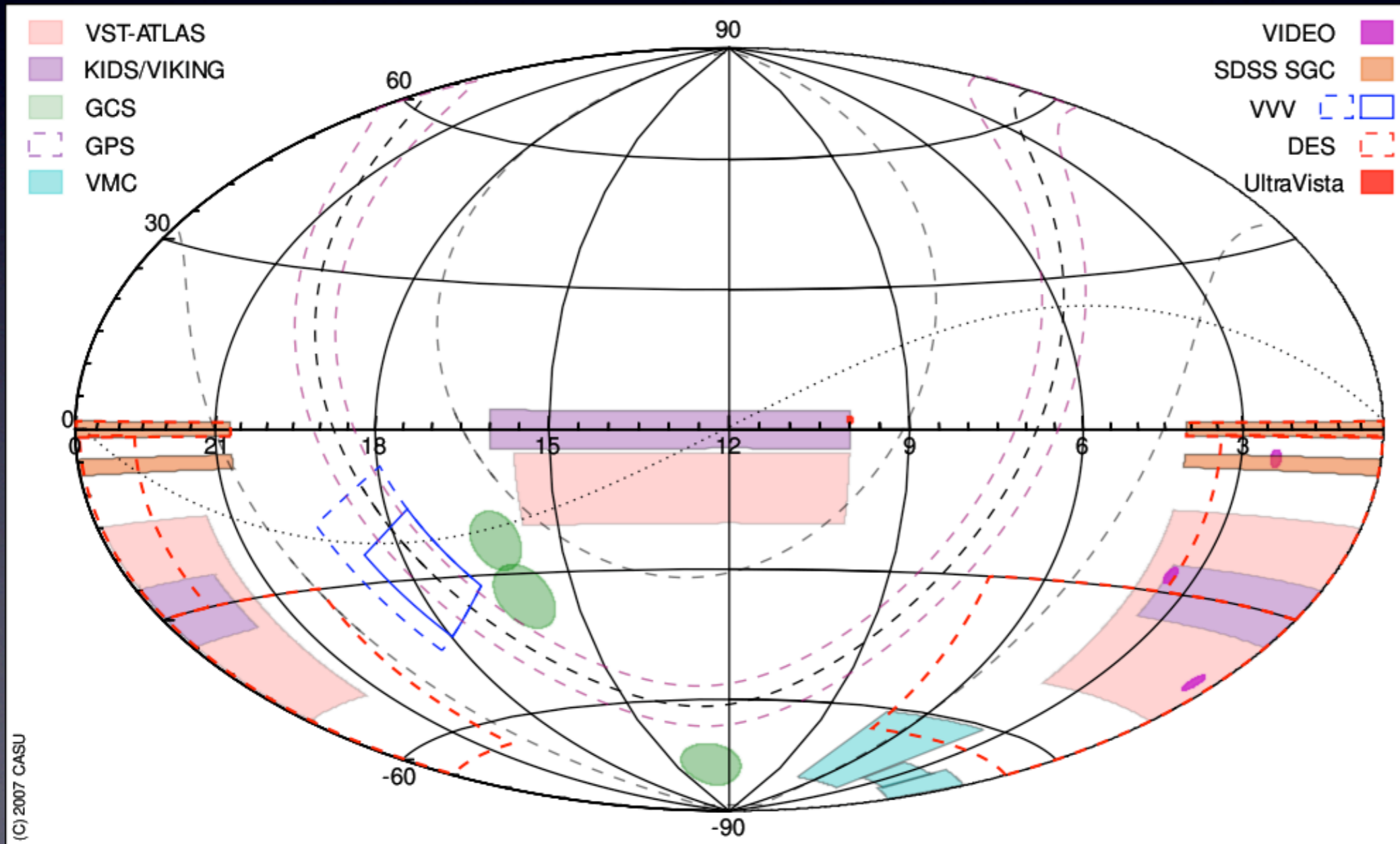
# VHS



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120 sec. exposures in J, H, and Ks



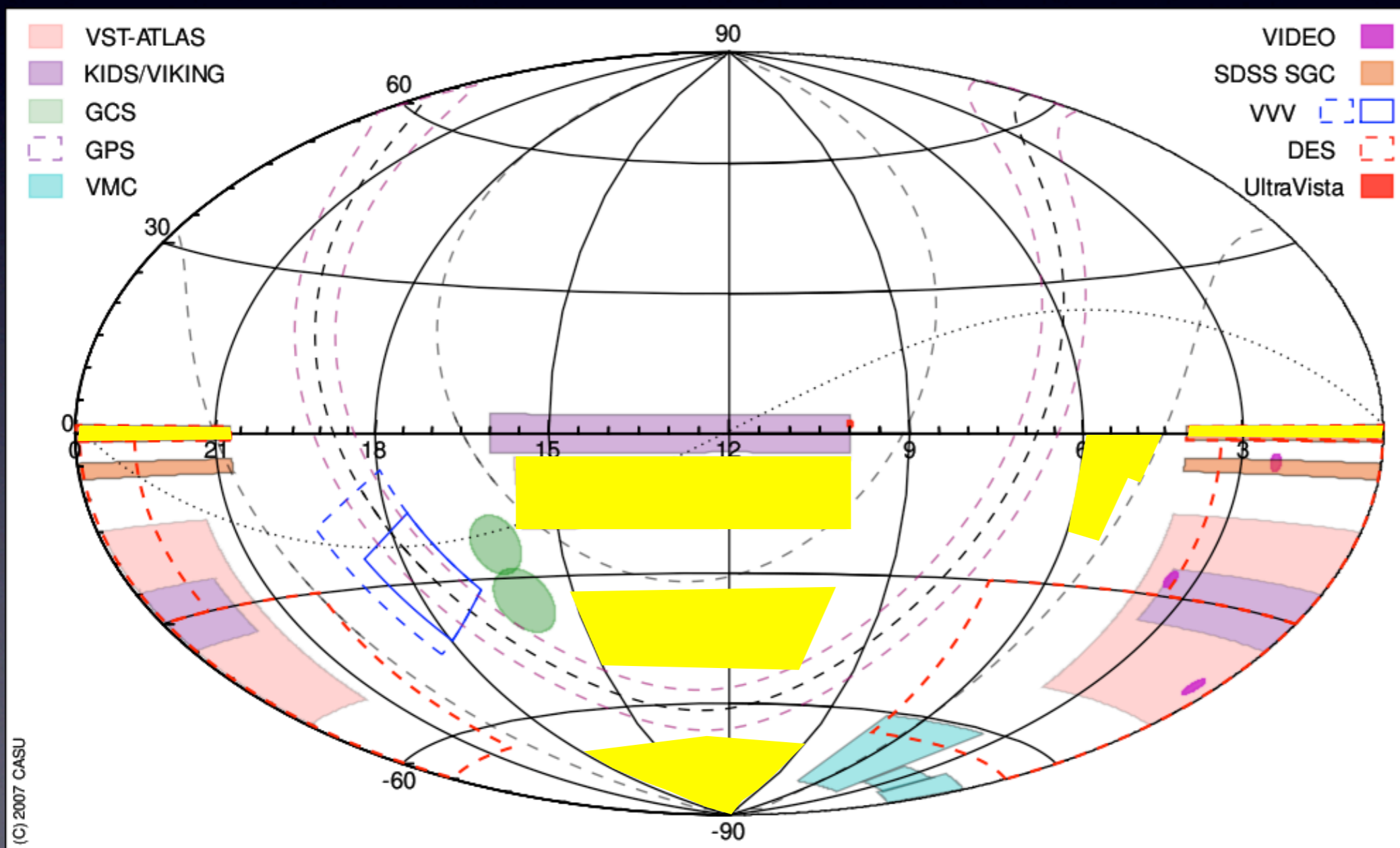


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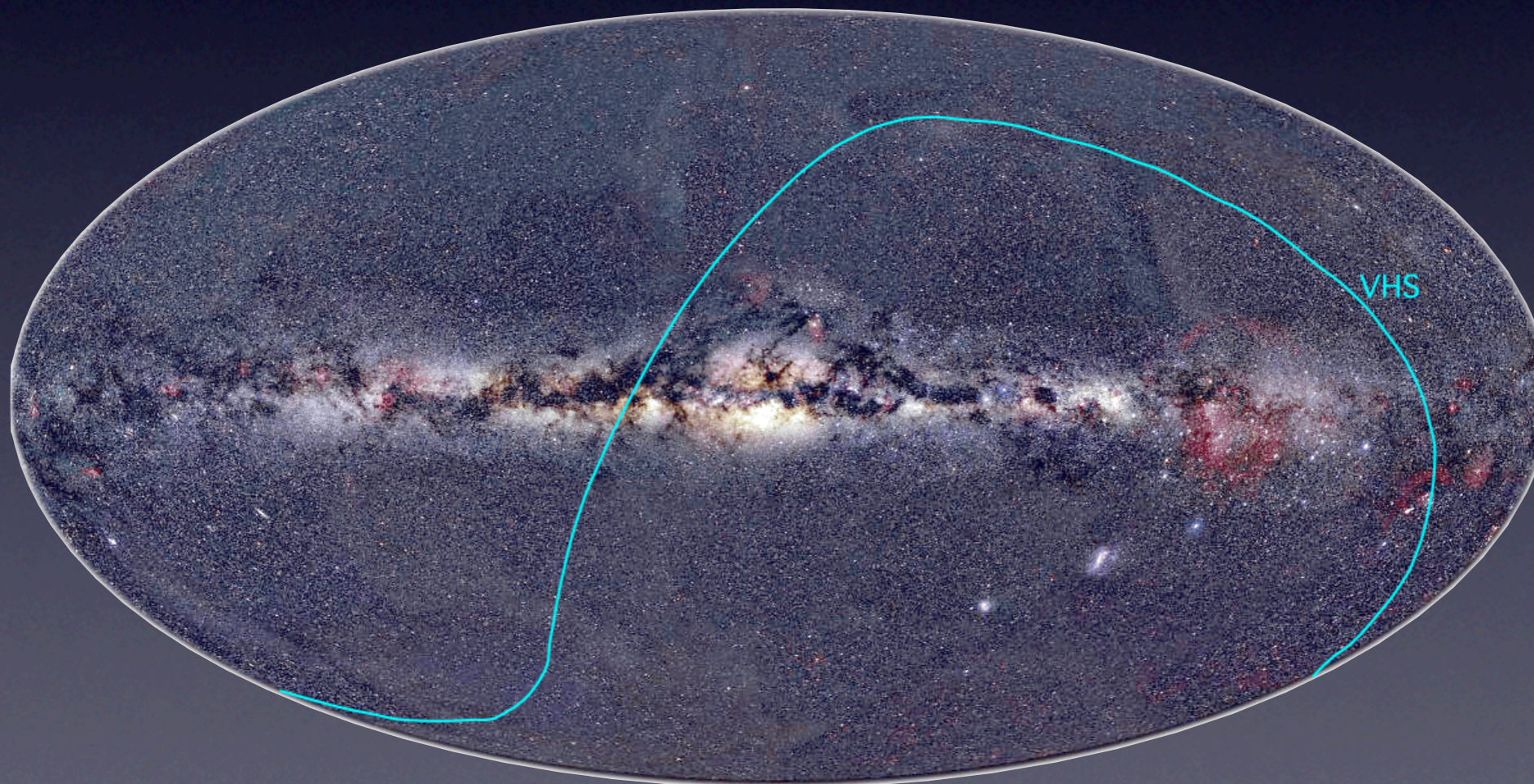
areas sampled in  
mock phase 2



# VHS: VISTA Hemisphere Survey (PI: R. McMahon / Cambridge)

## Science Case:

- catalogue of low-mass and nearby stars and merger history of our Galaxy
- properties of dark energy via the large-scale structure to  $z \sim 1$
- search for extreme redshift quasars ( $z > 7$ )





# VHS

## Constraints:

- avoid observing in **both** worst seeing and in best conditions:  
THN: seeing  $\leq 1.2$  and CLR: seeing  $\leq 1.4$  arcsec
- J, H, and Ks (any moon); Y and J for ATLAS (grey)

## Strategy:

- create OB's over 7000 deg<sup>2</sup> covering a wide range of RA and DEC
- Y (and/or J) and H and Ks tiles *concatenated* to ensure good sky subtraction
- time-linked so that all filters are observed within one month

## Results:

- 4830 tiles covering: ATLAS (2800 deg<sup>2</sup>); DES (650 deg<sup>2</sup>); and GPS (3550 deg<sup>2</sup>)

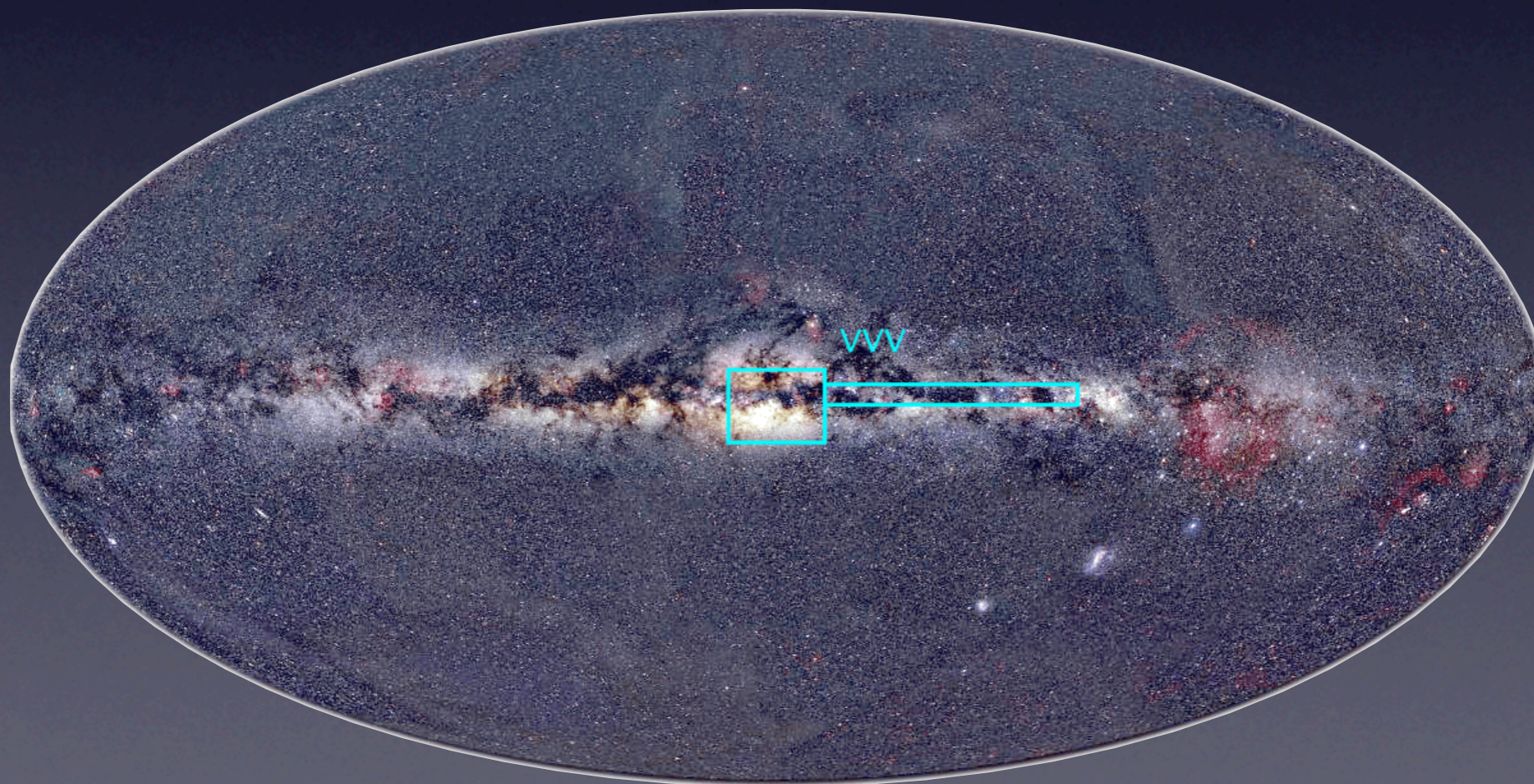


# VVV: VISTA Variables in Via Lactea (PI: D. Minniti / Univ. Catolica)

## Science Case:

- multi-epoch survey: Catalogue variable objects + high proper motion stars
- create a 3-d map of the Galactic bulge (RR Lyrae stars)
- cluster evolution (350 open and 33 globular clusters)
- ages of stellar populations and stellar IMF

520 deg<sup>2</sup> of Galactic bulge and adjacent plane





## Constraints:

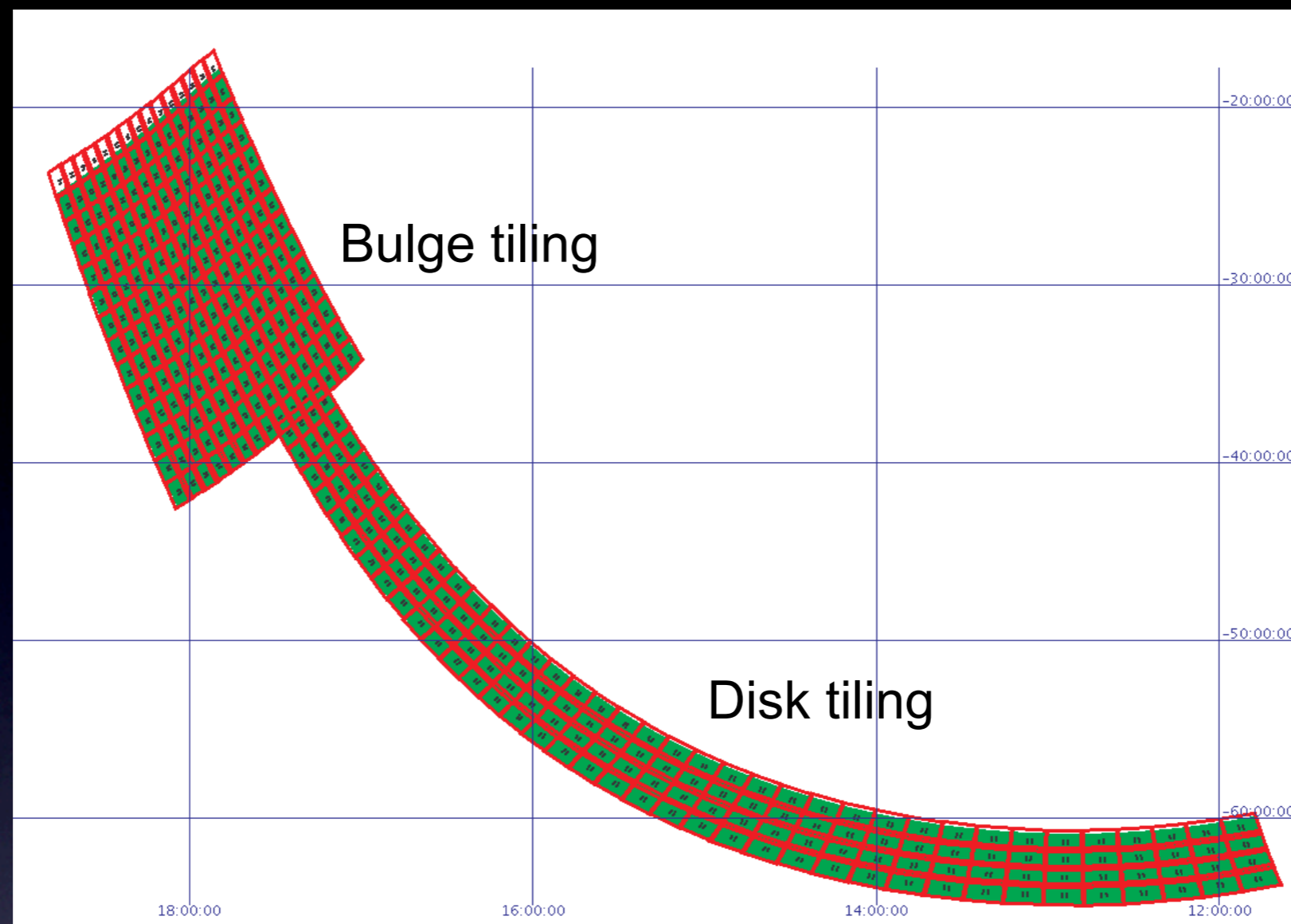
- seeing  $\leq 0.8$  arcsec / CLR / any moon applicable for both bulge and disk

## Strategy:

- mock first year covers entire bulge/disk area ( $520 \text{ deg}^2$ ) in: all 5 filters (Z, Y, J, H, and  $K_s$ )  $\Rightarrow$  concatenation then when complete repeat tiling in  $K_s$  at 5 further epochs with a 3 day time interval between successive epochs  $\Rightarrow$  time link

		Z	Y	J	H	$K_s$
depth:	bulge	21.6	20.9	20.6	19.0	18.0
	disk	21.5	20.7	20.2	19.3	18.3
DIT:	bulge	10	10	6	4	4
	disk	20	20	10	10	10
nDIT x njitter x nPAW:	bulge	1x2x6	1x2x6	2x2x6	1x2x6	1x2x6
	disk	1x2x6	1x2x6	2x2x6	2x2x6	2x2x6
Total Exp. (sec):	bulge	120	120	144	48	48 x 6 epochs
	disk	240	240	240	240	48 x 6 epochs





### Compromises:

- needed to give *concatenation* a higher priority over *time-links* for constraints to work

### Results:

- 5720 OB's covering 520 deg<sup>2</sup>







# Summary of Public Surveys

Survey <sup>synergy</sup>	Area (deg <sup>2</sup> )	Filters and limits (5 $\sigma$ AB mag.)										
		u'	g'	H $\alpha$	r'	i'	z	Y	J	H	Ks	NB
1. KIDS <sup>2,8</sup>	1500+	24.8	25.4	-	25.2	24.2	-	-	-	-	-	-
2. ATLAS <sup>1,5</sup>	4500	22.7	22.9	-	22.9	22.0	21.2	-	-	-	-	-
3. VPHAS+ <sup>7</sup>	1800	22.5	23.2	23.2	23.2	22.5	-	-	-	-	-	-
4. Ultra-VISTA	0.73	-	-	-	-	-	-	26.7	26.6	26.1	25.6	24.1
5. VHS <sup>1,2,8</sup>	20000	-	-	-	-	-	-	21.2	21.1	20.6	20.0	-
6. VIDEO	12	-	-	-	-	-	25.7	24.6	24.5	24.0	23.5	-
7. VVV <sup>3</sup>	520	-	-	-	-	-	22.5	21.9	21.1	19.6	20.0	-
8. VIKING <sup>1</sup>	1500	-	-	-	-	-	23.1	22.3	22.1	21.5	21.2	-
9. VMC	184	-	-	-	-	-	-	23.3	23.0	-	22.9	-



# Paranal Monthly Data Rates

