VISTA

Bryce Kalmbach

Astro 597

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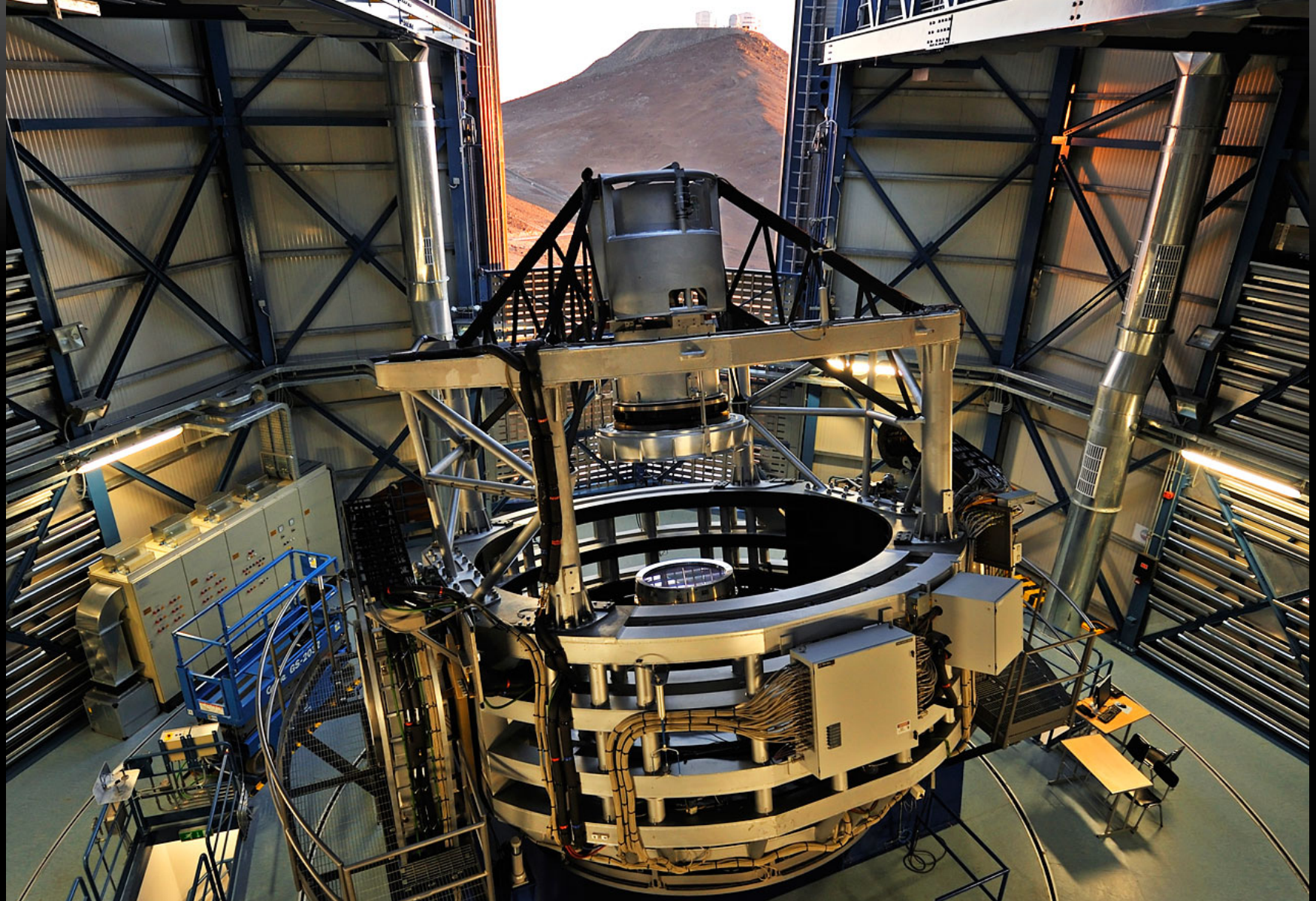
What is VISTA?

- Visible and Infrared Survey Telescope for Astronomy
- Really should be called ISTA
  - No visible-wavelength camera
  - Infrared Camera (VIRCAM) w/ 5 main filters and 2 narrow-band filters
- Located at Paranal in Chile near VLT array
- Current focus is to serve 6 different public survey missions

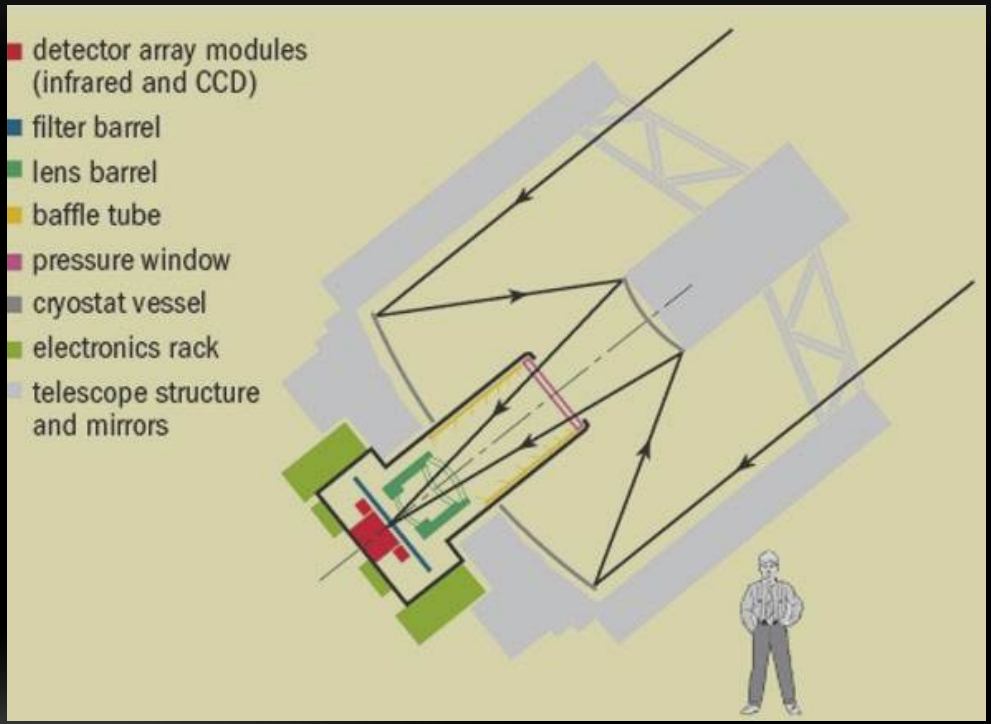
Brief Timeline

- 1998:
  - Joint proposal from 18 UK universities for new Southern Hemisphere based multicolor imaging telescope
- 2000:
  - Start of ‘Phase A’ design
- 2003:
  - First construction work begins at Paranal site
- 2009:
  - Science operations begin. Formal handover to ESO.



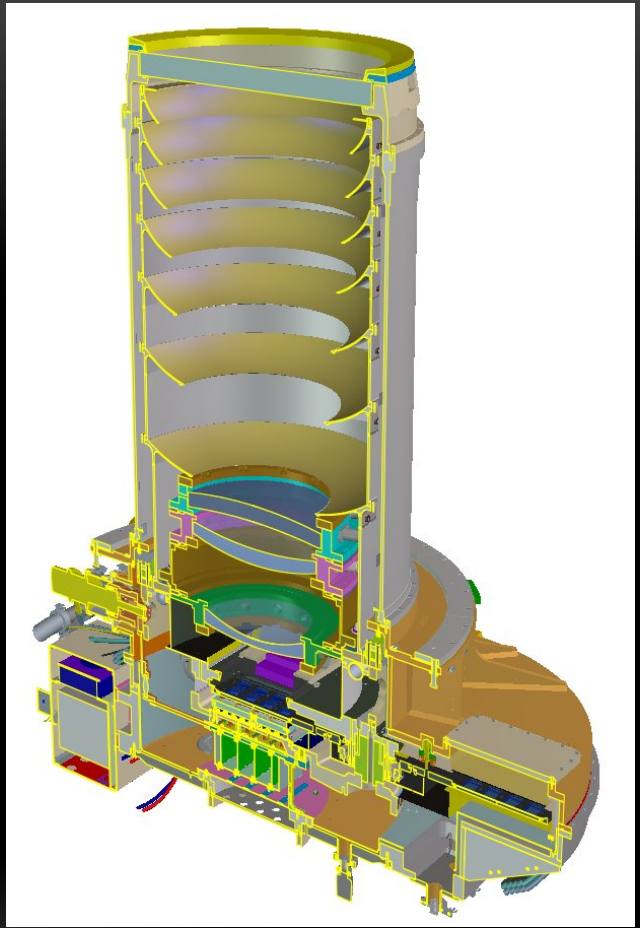
Telescope Optics

- Quasi-Ritchey-Chretien 2-mirror telescope
- Mirrors are silver coated
- M1
  - Diameter: 4.1 m
  - Inner Hole Diameter: 1.2 m
- M2
  - Diameter: 1.24 m

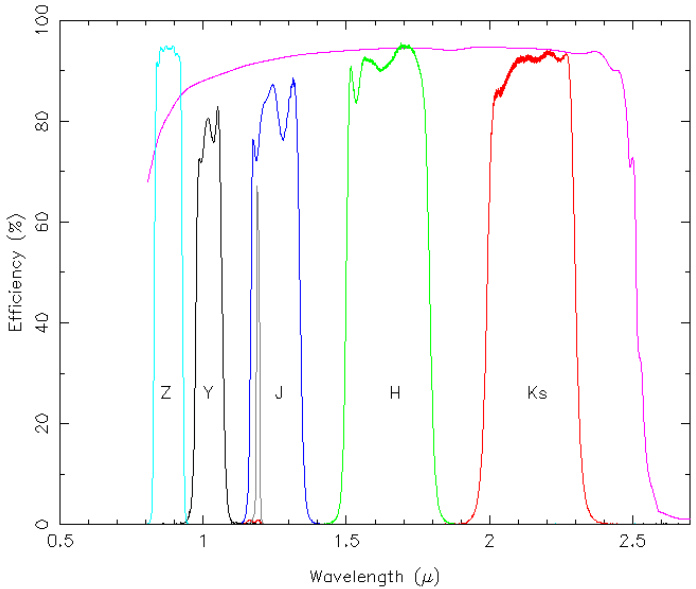


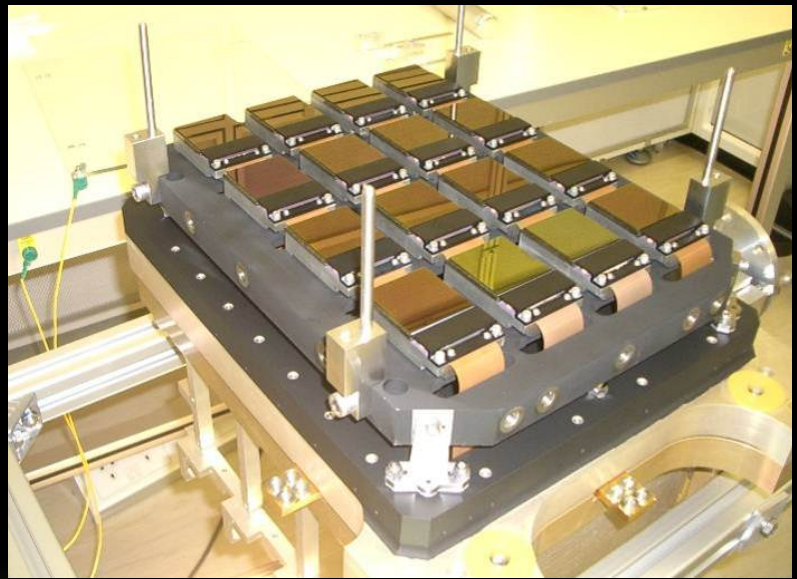
VIRCAM (Vista IR CAMera)

- 3 Infrasil lenses and Infrasil Vacuum Window
- Cooled by helium cryostats
  - Mean Detector Temperature ~72K
- Filter Wheel is the only internal moving part



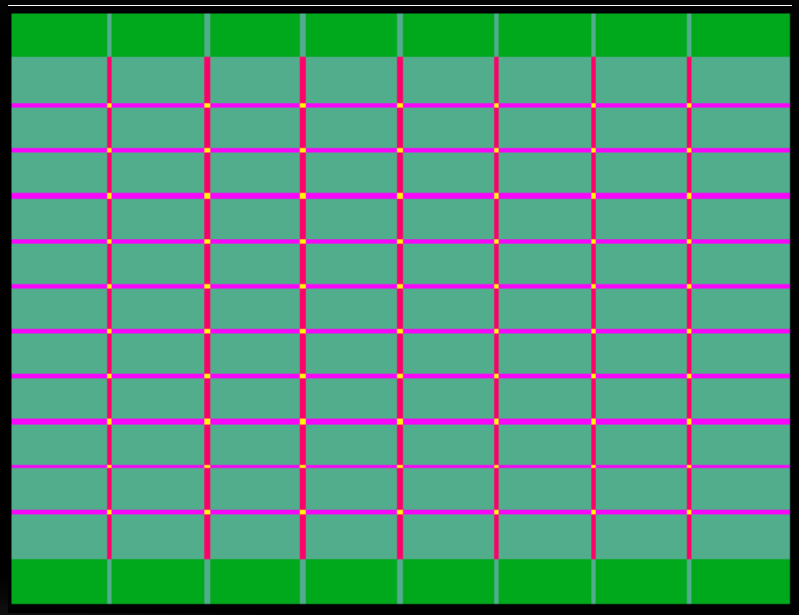
IR Filters and Detector

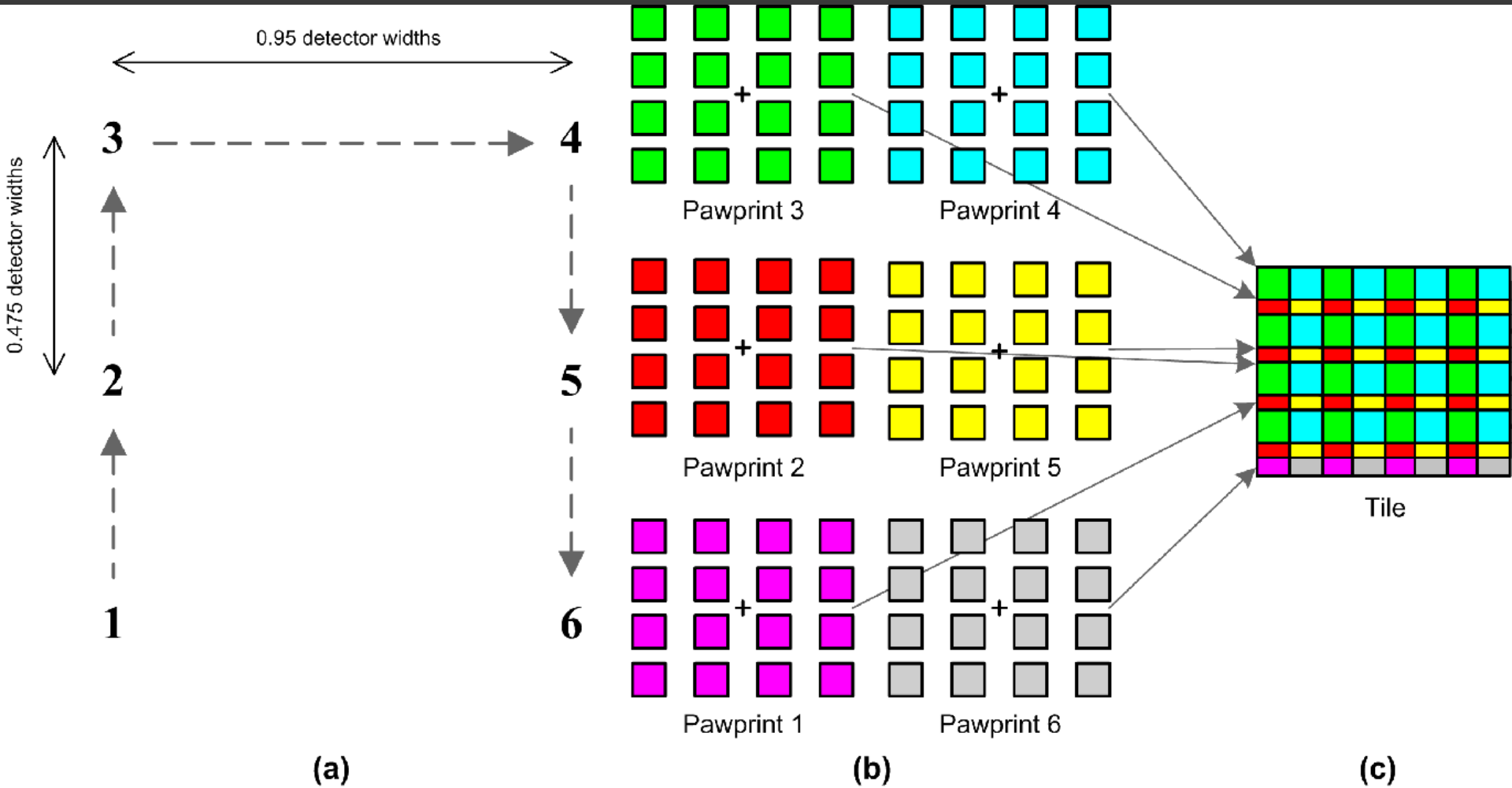




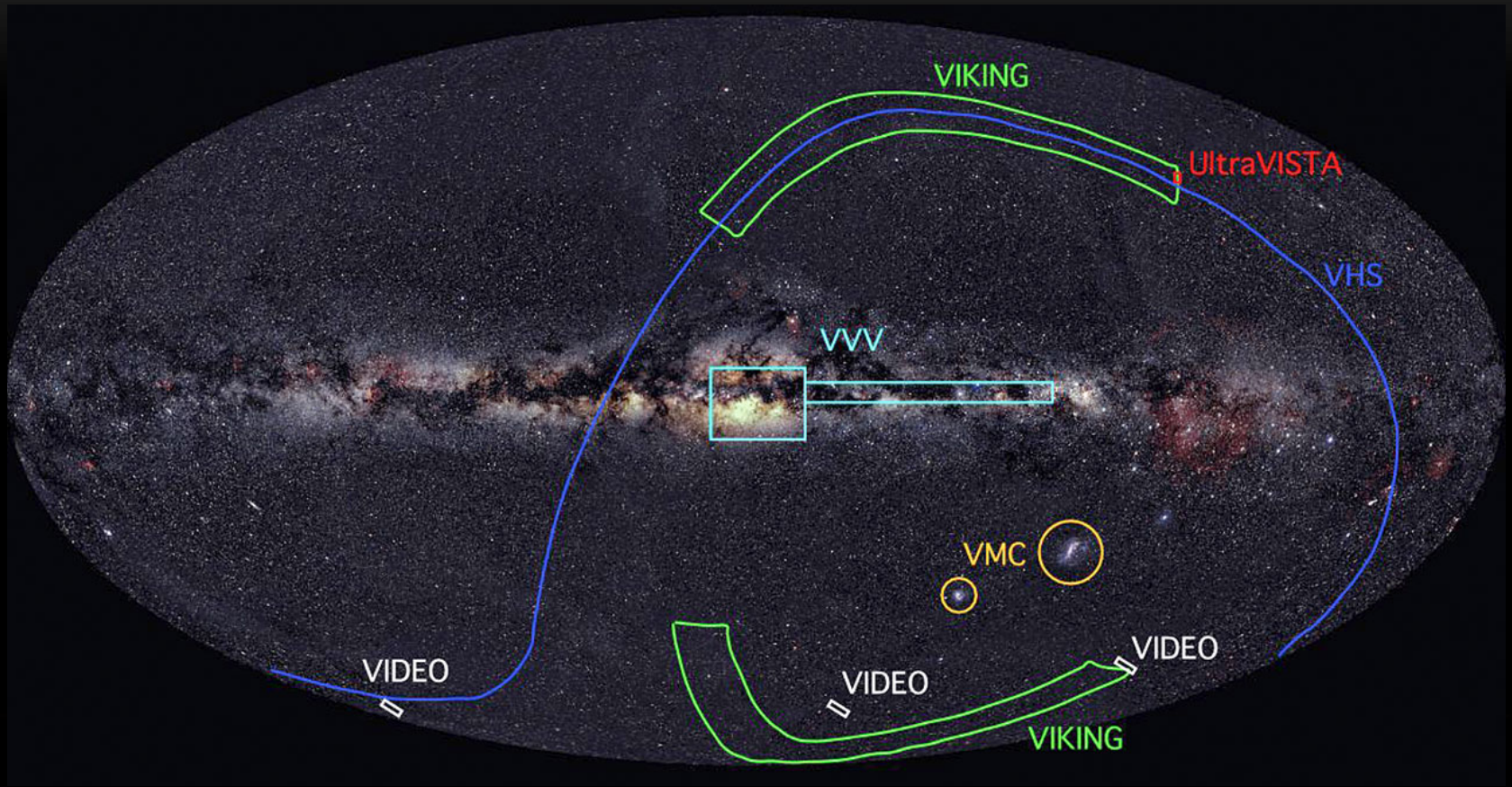
Observing Pattern

- Each single detector pointing is called a “pawprint”
- Six pawprints are imaged to create a “tile”
- Each tile covers 1.501 deg^2 of sky




0.95 detector widths
0.475 detector widths
3
4
2
5
1
6
Pawprint 3
Pawprint 4
Pawprint 2
Pawprint 5
Pawprint 1
Pawprint 6
Tile
(a)
(b)
(c)

6 Public Surveys



VHS (VISTA Hemisphere Survey)

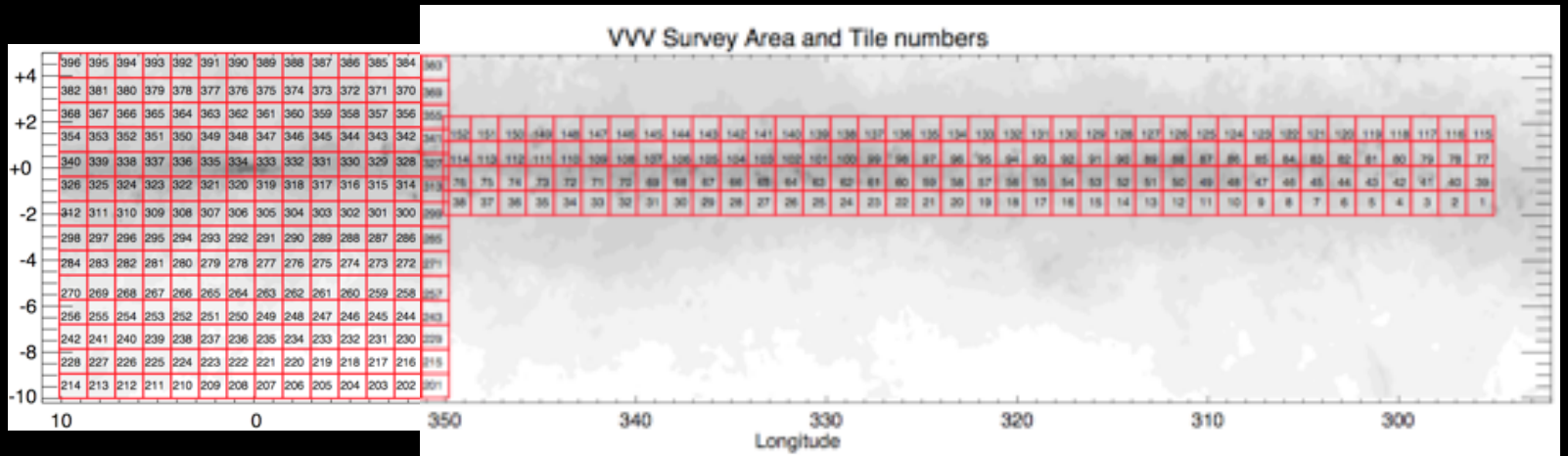
- Will cover almost the whole Southern Celestial Hemisphere in at least J and K wavebands
  - When combined with other VISTA surveys will have complete coverage of Southern Celestial Hemisphere. (~20,000 deg^2)
- 3 sub-sections defined by overlap with optical surveys
  - VHS-DES
  - VHS ATLAS
  - VHS-GPS

Survey	Area (deg^2)	5σ point source depth (AB mag)				
		Z	Y	J	H	K_s
VHS (required depths)	**18, 000**			**21.2**		**19.8**
1. VHS-DES	4500	*24.7*	*23.0*	21.6		20.2
2. VHS ATLAS	5000		20.9	21.2	20.6	19.8
3. VHS-GPS (5°<|b|<30°)	8000			21.2		19.8

VVV (VISTA Variables in Via Lactea)

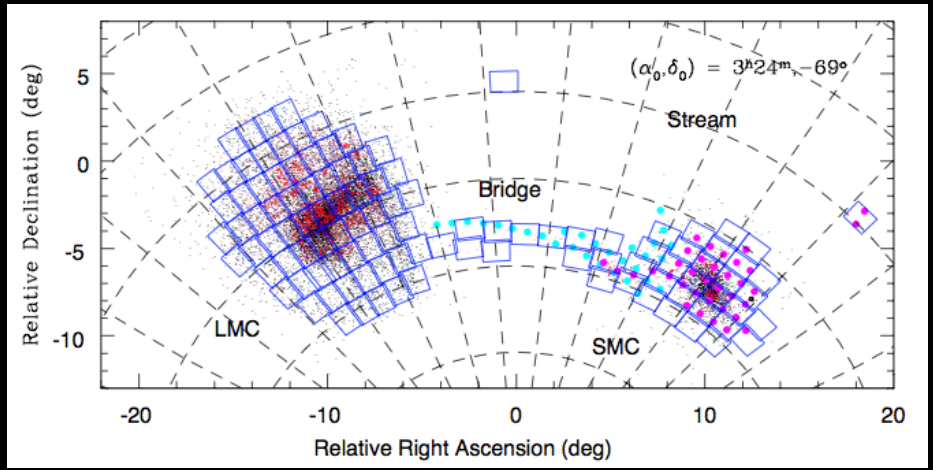
- 5 year variability campaign along the Galactic Equator in the K_s band
  - Also a single epoch pass through the region in Z, Y, J and H during 1st year
- Years 3 and 4 will have most of the epochs
  - Year 3: 80 epochs of survey bulge area
  - Year 4: 70 epochs of survey disk area
  - Each year will have a subset of areas with 4-8 images a night for detection of shorter timescale variables and microlensing events
- Year 5 will have some fields imaged up to 40 times per night

VVV Footprint



VMC (VISTA Magellanic Cloud Survey)

- Covers LMC, SMC, Bridge and Stream
- Y, J, K_s filters
- Ideal Time Interval between K_s epochs will be 1, 3, 5, 17 days after initial observation



VIKING (VISTA Kilo-degree Infrared Galaxy Survey)

- Joint Survey with VST-KIDS to cover 1500 deg^2 in 9 filters
  - VST provides ugri data
  - VISTA provides zyJHK_s data
- Together with VST-KIDS will cover area previously covered by SDSS but ~2 mag deeper and by UKIDSS-LAS in the near-IR ~1.4 mags deeper
- Aims to be middle of the road observational survey between larger and shallower VHS and deeper but smaller VIDEO

VIDEO (VISTA Deep Extragalactic Observations)

- Aimed at deep ZYJHK$_s$ coverage in fields where there are complementary deep surveys
- 3 different fields to match:
  - ELAIS-S1 field
  - XMM-Newton Large Scale Structure field
  - Chandra Deep Field South

UltraVISTA (Ultra deep VISTA survey)

- Imaging in the YJHK$_s$ filters
- Three parts:
  - 1.5 deg^2 deep survey centered on the COSMOS field
  - 0.73 deg^2 ultra deep field
  - Same ultra deep field with narrow-band 1.18 μm filter

Accessing the Data

- Accessible through the VISTA Science Archive (VSA)
  - http://horus.roe.ac.uk/vsa/index.html
- Submit SQL queries directly through web, will receive email upon completion and can download results
- Tips to keep in mind:
  - Maximum number of result rows limited:
    - Max Rows Written to File = nint(150000/(# of parameters)) * 1000
  - Tables do not have NULL values. If an object does not have an available value then the default values found in the schema browser are used

The Future

- Completion of current surveys by 2017

- 4MOST
  - A fiber-fed spectroscopic instrument that will use the VISTA telescope
  - Will run continuously on a 5 year mission ~2.5 years after completion of current public surveys
  - Predicted yield of ~25 million spectra

THANK YOU