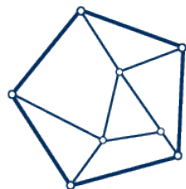
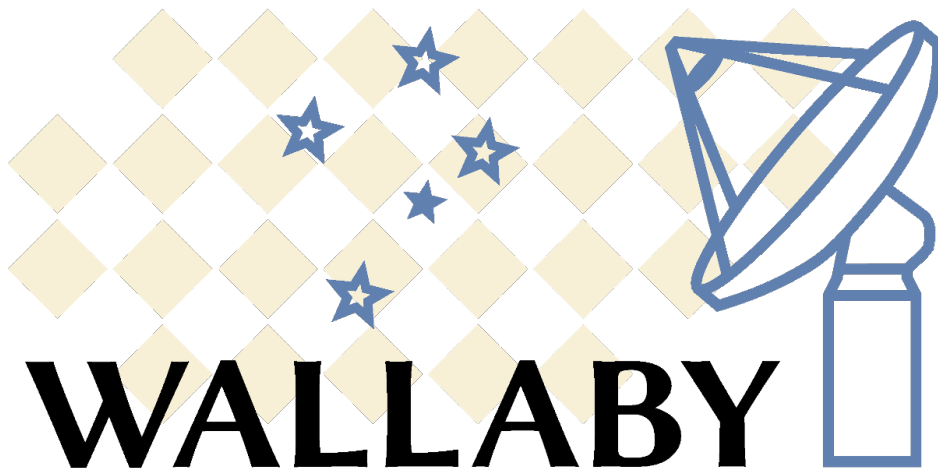




International
Centre for
Radio
Astronomy
Research



CAASTRO
ARC CENTRE OF EXCELLENCE
FOR ALL-SKY ASTROPHYSICS



Lister Staveley-Smith (ICRAR/UWA)
on behalf of the team



Curtin University



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**



Government of **Western Australia**
Department of the Premier and Cabinet
Office of Science



Outline

Wallaby

- Status
- BETA science

Tools and Techniques

- Progress

Survey status

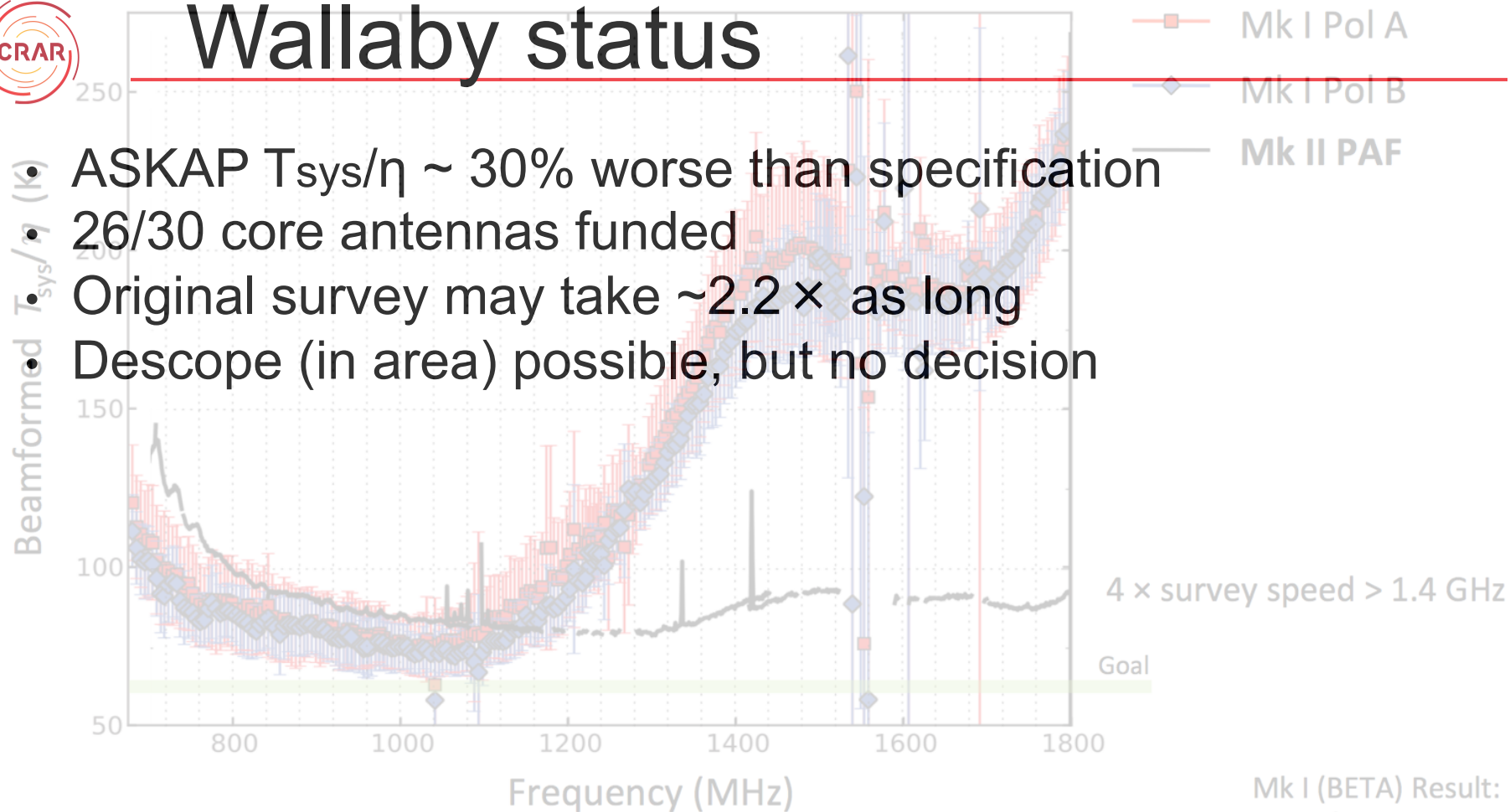
- Tiling

What's next

- Priorities
- Early science

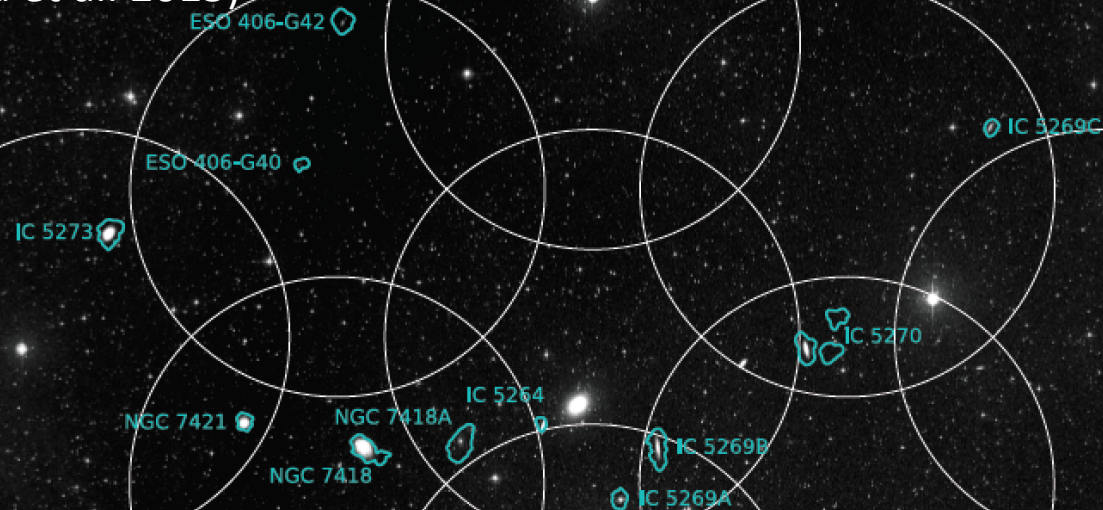
Wallaby status

- ASKAP $T_{\text{sys}}/\eta \sim 30\%$ worse than specification
- 26/30 core antennas funded
- Original survey may take $\sim 2.2 \times$ as long
- Descope (in area) possible, but no decision

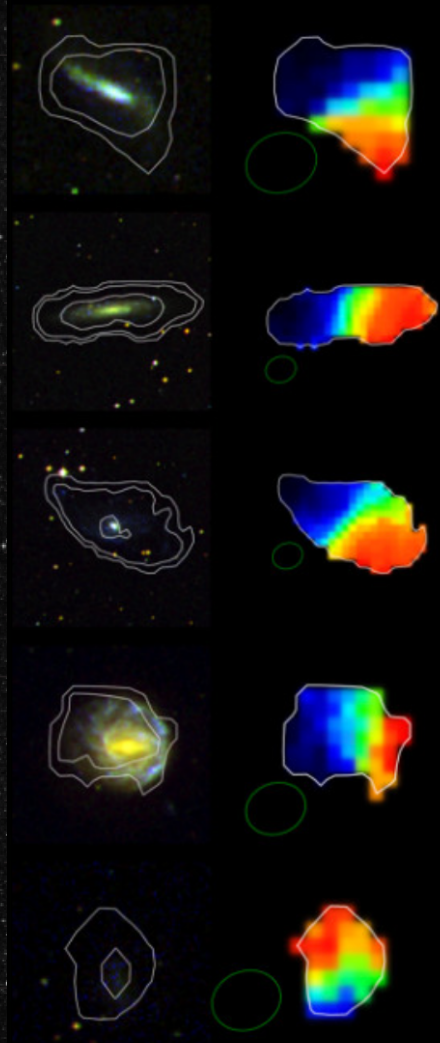


Mk I (BETA) Result:
Hotan et al., PASA 2014

First ASKAP+Wallaby
science paper!
(Serra et al. 2015)



IC 1459 group



Tools and techniques

Wallaby activities

- Dataflow
- Cloud processing (Popping talk)
- Source-finding (Westmeier talk)
- Parameterisation
- Kinematic analysis (Spekkens, Jozsa, Oh talks)
- Stacking
- Visualisation (Malareck, van der Hulst talks)
- Simulations (Welker talk)
- SAMI (Obreschkow talk)
- Multiwavelength
- Mass functions (Zwaan talk)
- RFI mitigation (Heywood talk)



Workshops/busy weeks



Joint source-finding and kinematics WG meeting: Rutgers, March 2011



Wallaby break-out meeting, ASKAP early science workshop: Sydney, Oct 2016

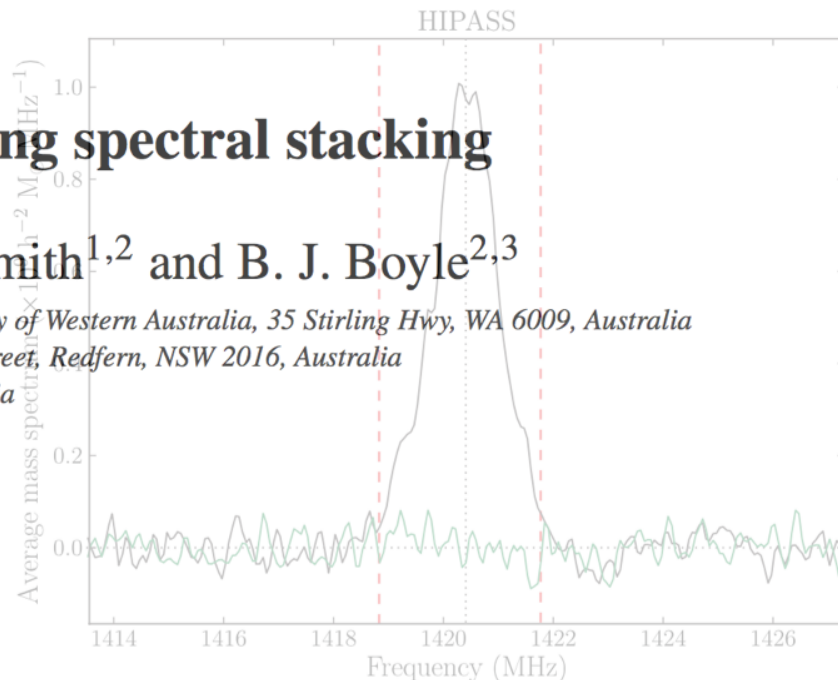
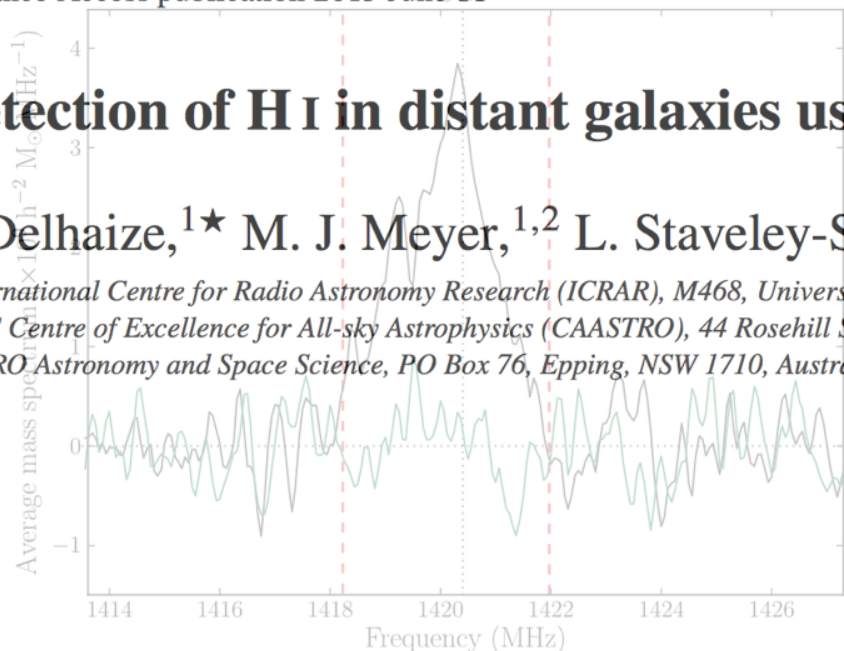
Detection of H I in distant galaxies using spectral stacking

J. Delhaize,¹★ M. J. Meyer,^{1,2} L. Staveley-Smith^{1,2} and B. J. Boyle^{2,3}

¹International Centre for Radio Astronomy Research (ICRAR), M468, University of Western Australia, 35 Stirling Hwy, WA 6009, Australia

²ARC Centre of Excellence for All-sky Astrophysics (CAASTRO), 44 Rosehill Street, Redfern, NSW 2016, Australia

³CSIRO Astronomy and Space Science, PO Box 76, Epping, NSW 1710, Australia

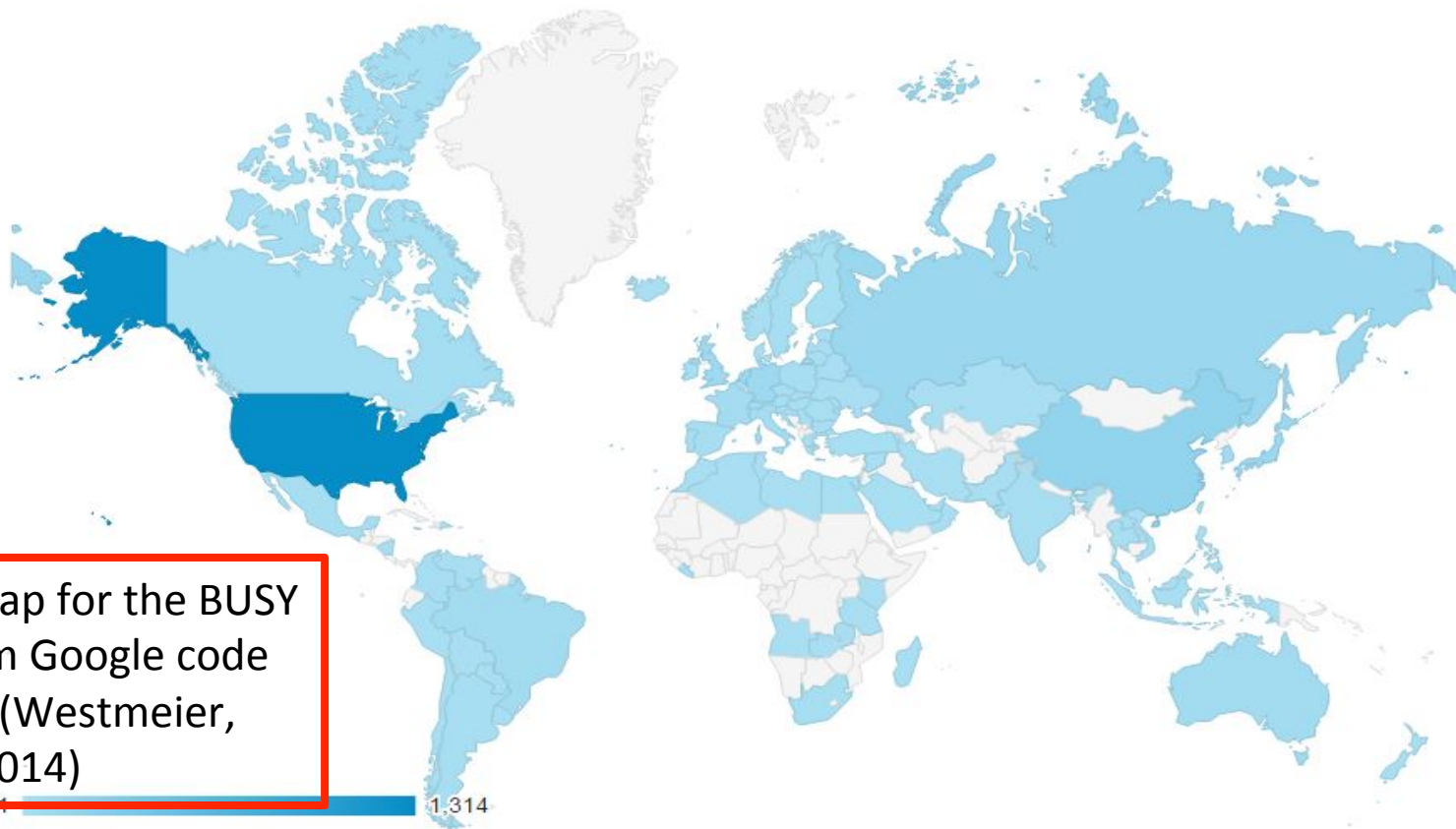


Sky Tessellation Patterns for Field Placement for the All-Sky HI Survey WALLABY

Bradley E. Warren

*International Centre for Radio Astronomy Research, University of Western Australia,
M468, 35 Stirling Highway, Crawley WA 6009, Australia; bradley.warren@icrar.org*

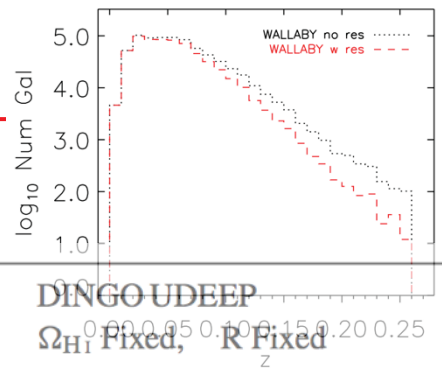
Public software



Download map for the BUSY
function from Google code
and GITHUB (Westmeier,
Jurek at al. 2014)



Simulated surveys

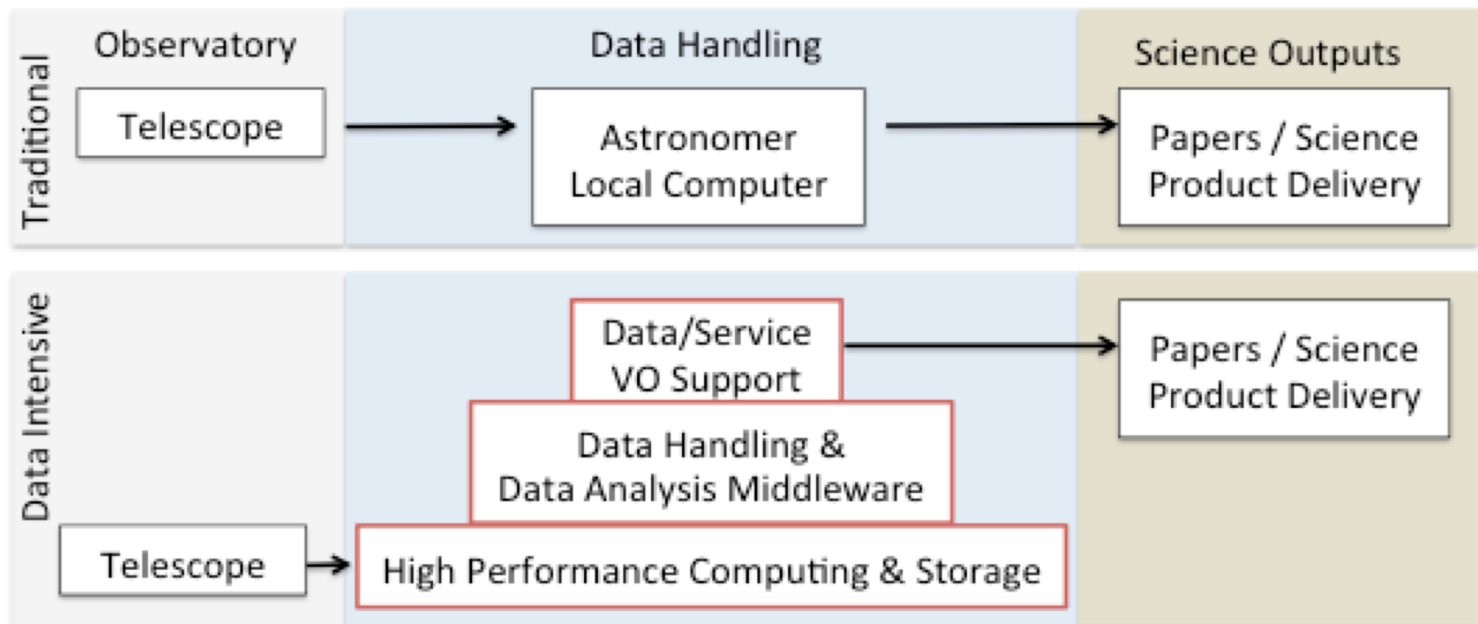


S/N	Distribution	WALLABY	ALL SKY	WNSHS	DINGO DEEP	DINGO UDEEP
						Ω_{HI} Fixed, R Fixed
5	n_{gal}	620 123 (738121)	829 843 (988145)	524 921 (583 976)	54 697 (55 679)	53 896 (54 544), 59 408 (60 092)
	$\bar{z}$	0.054 (0.059)	0.054 (0.059)	0.071 (0.075)	0.130 (0.131)	0.217 (0.218), 0.220 (0.221)
6	n_{gal}	462 923 (558084)	619 174 (746740)	397 288 (450 584)	43 614 (44 690)	41 126 (41 720), 45 446 (46 145)
	$\bar{z}$	0.049 (0.053)	0.049 (0.053)	0.065 (0.069)	0.123 (0.125)	0.208 (0.209), 0.211 (0.212)
7	n_{gal}	359 394 (455654)	480 476 (609595)	312 469 (361 622)	35 600 (36 652)	32 514 (33 111), 36 079 (36 763)
	$\bar{z}$	0.045 (0.050)	0.045 (0.050)	0.060 (0.065)	0.118 (0.119)	0.201 (0.202), 0.203 (0.204)
8	n_{gal}	287 390 (376405)	384 325 (503236)	253 222 (298 782)	29 693 (30 663)	26 556 (27 104), 29 337 (29 955)
	$\bar{z}$	0.041 (0.047)	0.041 (0.047)	0.056 (0.061)	0.112 (0.114)	0.194 (0.196), 0.196 (0.198)
9	n_{gal}	235 502 (317191)	314 858 (424281)	209 555 (252 324)	25 386 (26 377)	21 838 (22 389), 24 411 (25 000)
	$\bar{z}$	0.038 (0.045)	0.038 (0.045)	0.052 (0.058)	0.107 (0.109)	0.189 (0.190), 0.191 (0.192)

Duffy et al. (2012)

Data handling prototypes

- Arecibo/AUDS: 0.02 TB/hr ✓
- JVLA/CHILES: 0.1 TB/hr ✓
- MWA/GLEAM: 1.2 TB/hr ✓
- ASKAP/Wallaby: 4 TB/hr



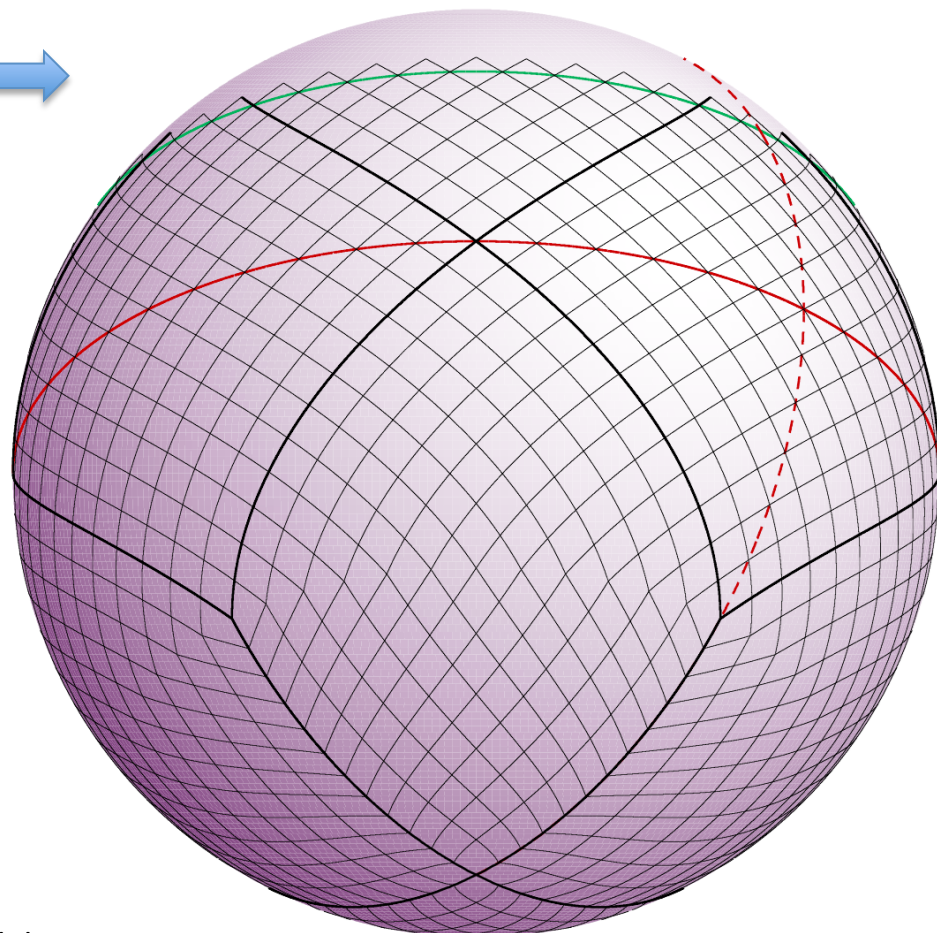
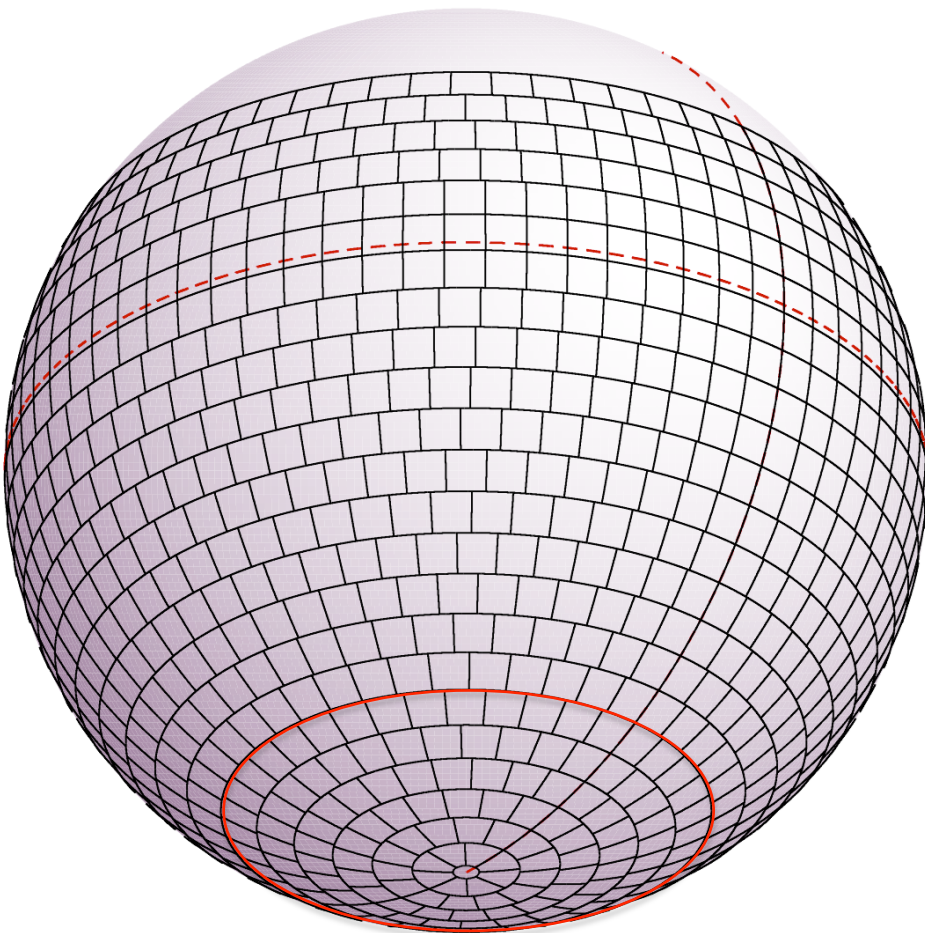
ICRAR/
CAASTRO-3D/
Wicenec/
Meyer



Tiling the sky

Dec band: best for observing ($\eta=95.34\%-95.66\%$)

HEALpix tiling: best for analysis ($\eta=86.74\%$)



Packing shapes on a sphere

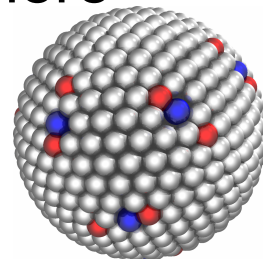
Few analytic solutions, even for 'easy' problems:

Thomson problem

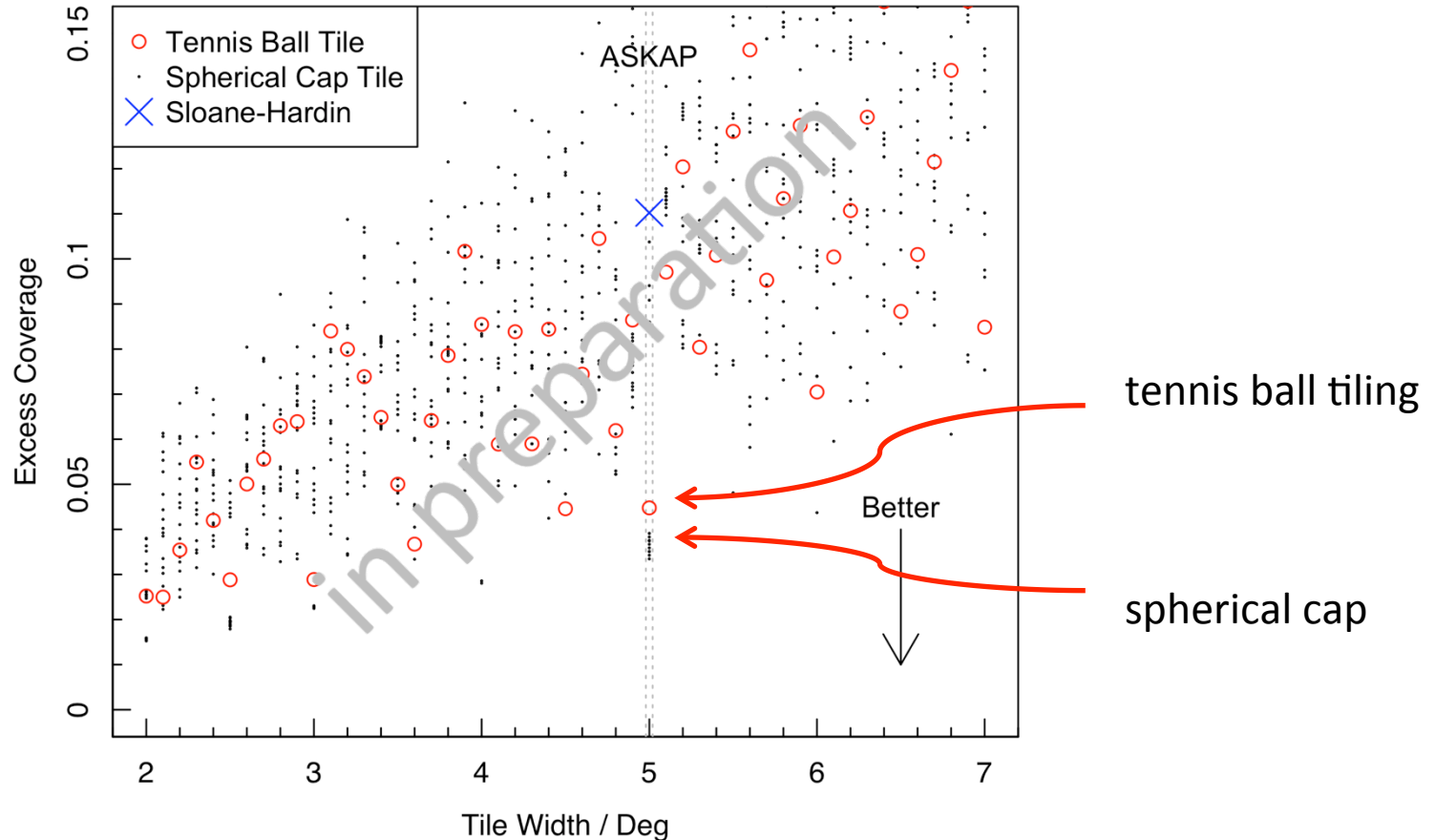
- Minimum energy configuration for charges on a sphere
- Exact solutions for $N=1$ to 6, 12 only

Fejes Tóth (packing) problem

- Minimise maximum distance of points on a sphere
- Exact solutions for $N=3, 4, 6, 12$

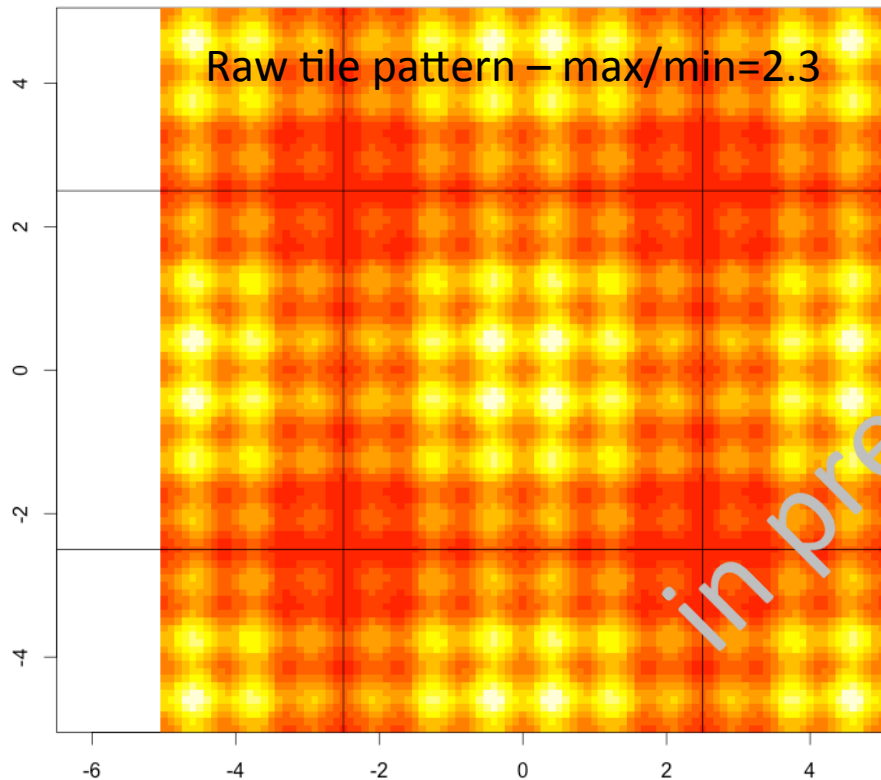


Wallaby tiling efficiency (Robotham)

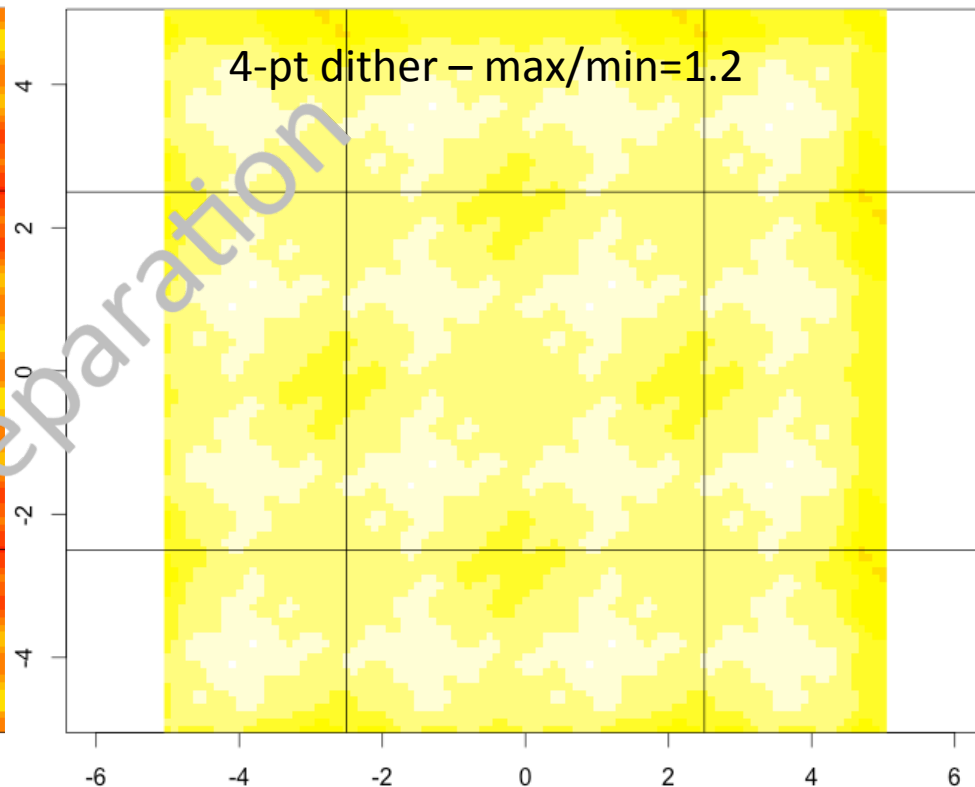


Sensitivity images (Robotham)

Raw tile pattern – max/min=2.3



4-pt dither – max/min=1.2





Summary: what's remaining?

Tiling

- Need ADE beam shapes, beam pattern, beam sensitivity function
- Discuss with EMU and APERTIF (Hess)

RFI

- Nulling tests on Parkes
- Can ASKAP use adaptive nulling?

Kinematic fitting

- Release 2DBAT
- Enhance performance of 

Summary: what's remaining?

Source-finding and parameterisation

- Performance improvements

Pipeline and archive

- Verification
- Flagging, QA, ISVO

Visualisation

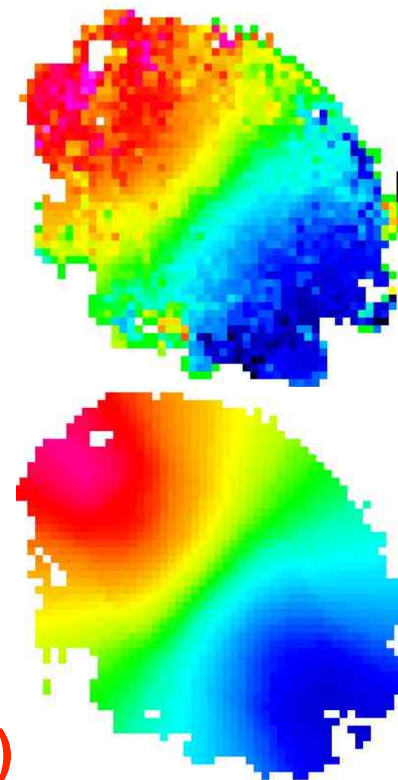
- New codecs, big data solutions

Middleware and systems integration

- Putting it all together

Most important

- **EARLY SCIENCE!** (planning week Feb 15-19)



2DBAT (Oh)