

A night sky with the Milky Way galaxy and a large radio telescope dish illuminated from within.

JCMT OPERATIONS

What can the JCMT do for you today?

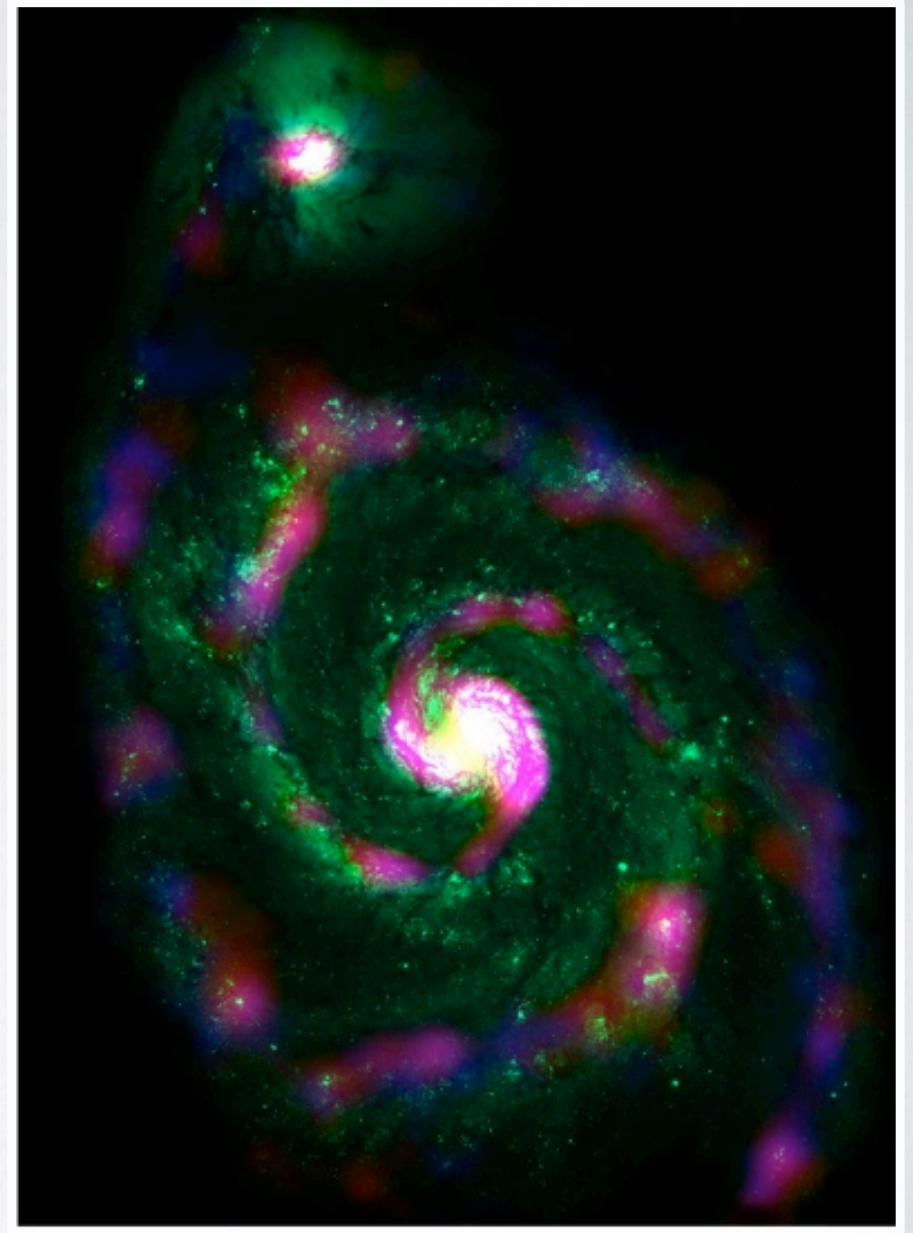
J Dempsey

- A little about me
- PhD at UNSW, five summer seasons at South Pole station: sub-mm and optical site-testing and telescope construction
- Winter-over Scientist for the ACBAR CMB experiment South Pole 2005
- JCMT Instrument Scientist: 2007 - 2012
- JCMT Head of Operations 2012 to present
- Specialties: multi-wavelength atmospheric and instrument calibration, large-scale sub-mm galactic surveys
- PI of the COHRS CO(3-2) survey using HARP (Dempsey et al, MNRAS, 2014)



OVERVIEW

- JCMT specifications
- Operations philosophy
- Weather bands and statistics
- A JCMT Observing night
- Science planning
- Flexible scheduling
- The Observing software
- JCMT Science Archive
- EAO Operations - the path forward



M51: HST Green, SCUBA-2 850 Red 450 Blue (STSci, JAC)

THE JCMT

- 15-m cassegrain focus telescope on Mauna Kea
- < 25 micron surface accuracy
- First light in 1987
- Heterodyne instruments at 230, 345 and 660 GHz
- SCUBA-2: 450/850 micron 10,000 bolometer sub-mm camera

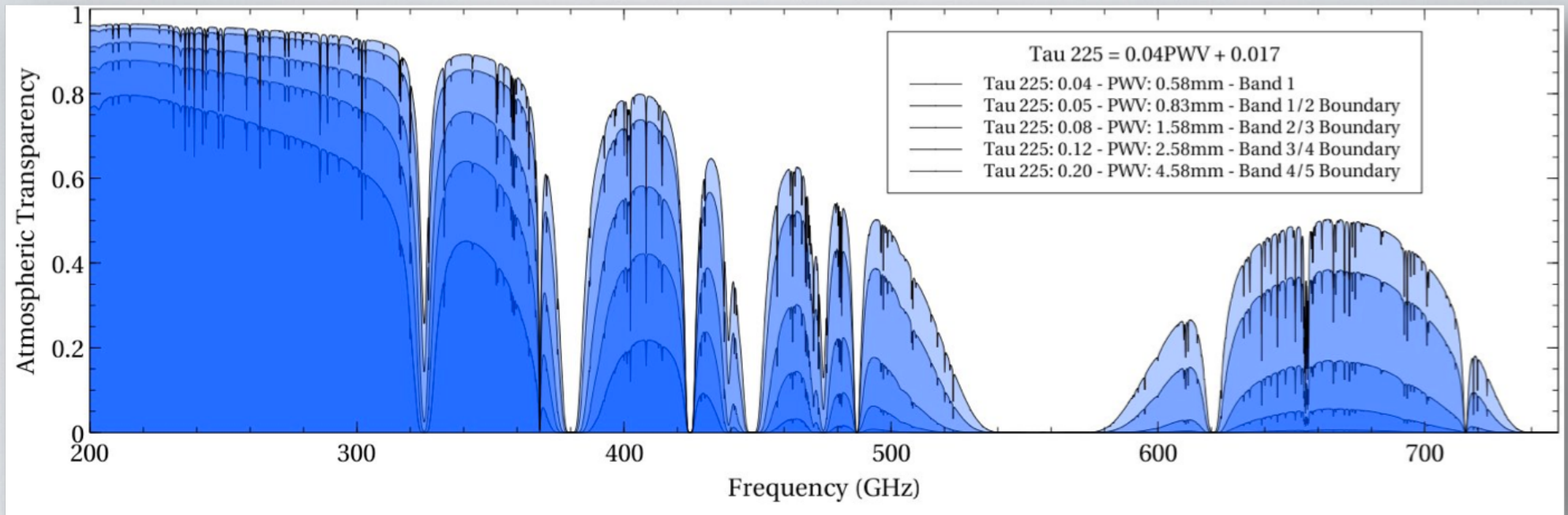


JCMT OPS PHILOSOPHY



- Submillimeter astronomy is difficult... so any photon wasted is a tragedy
- You waste photons when:
 - You fail to catch it in the first place
 - You don't do anything useful with it when you catch it
- Lesson from JCMT Ops: Be greedy, Be efficient

HOW MANY PHOTONS?

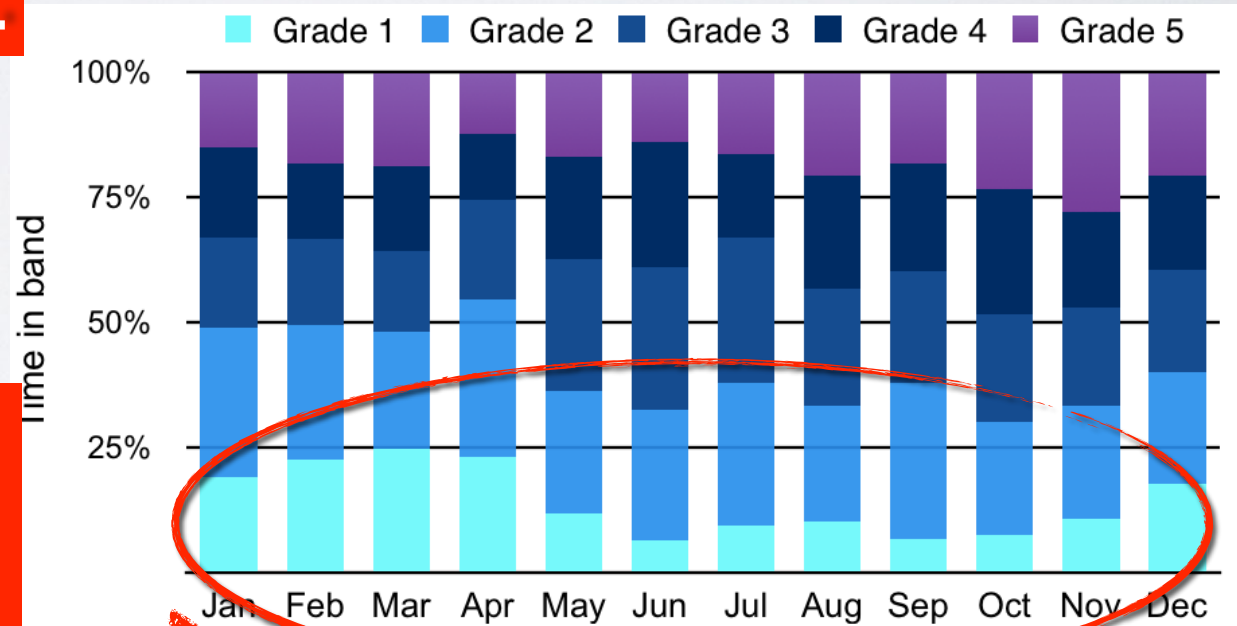


- Not many... but enough if you are careful
- Need instruments to take advantage of all the weather conditions
- Minimise down- and dead-time

Grade	PWV(mm)	225GHz τ	SCUBA-2 (850+450 μ m)	RxW(D) (690GHz)	HARP (345GHz)	RxA (230GHz)
1	< 1	$\tau < 0.05$	✓	✓	✓	
2	1.0 < 1.6	0.05 < τ < 0.08	✓	✓	✓	
3	1.6 < 2.4	0.08 < τ < 0.12	✓		✓	✓
4	2.4 < 4.0	0.12 < τ < 0.2	✓		✓	✓
5	> 4.0	0.2 < τ			✓	✓

Most proposals...

Which is
<50% of
the time



JCMT OBSERVING NIGHT

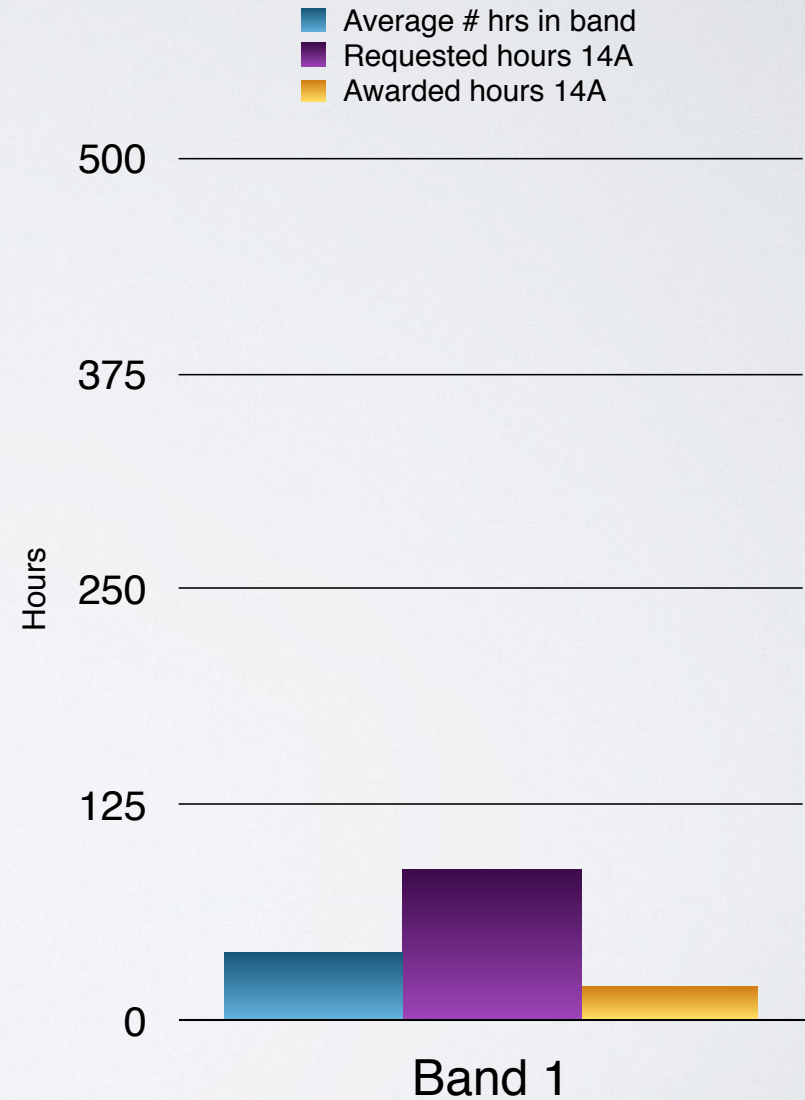
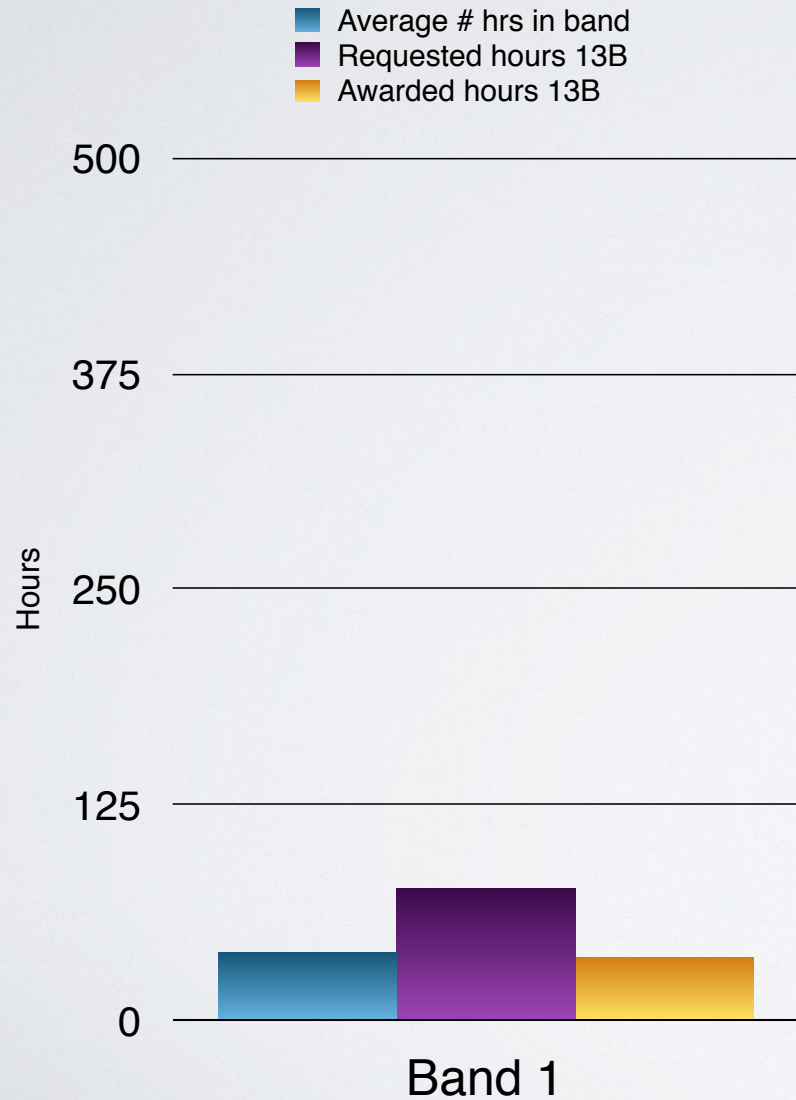
- 12 hour shift - faults \sim 2% and calcs $<$ 25% = up to 10 hours of project time per night
- Telescope system specialist (TSS) and a visiting observer at the telescope
- Flexible scheduling with preference given within reason to the observer present, if possible
- Handover to remote ops at 7:30am, if conditions permit - EO in place since January 2014 - over 300 additional hours of observing obtained in the calendar year



SCIENCE PLANNING

- The JCMT has run with two, six-month semesters starting in February and August of each year
- Proposals are submitted to the Northstar software system, given a technical review at the JCMT and then assessed by the Time Allocation Committee
- The time from the Call deadline to notification of time awards is typically four to five months
- Flexible scheduling requires that the P.I.s awarded time must submit their programs to the observatory by the start of the semester

- With a 400 hour allocation per semester, the UK TAC is provided typical statistics for weather performance in the semester




FLEXIBLE SCHEDULING

- Implemented at JCMT since early 2000's
- Queue ranked by: zenith opacity (weather grade), source availability, project priority from the TAC
- To optimise flexible scheduling you need:
 - Fast instrument switching
 - Sophisticated telescope - instrument - observer interface
 - Incoming instruments must support observing and telescope software (not the other way around)
 - Highly trained operators
 - Tight feedback loop between observer/operator and P.I.s

THE OMP (OBSERVING MANAGEMENT PROJECT)

- Observation preparation tool (OT)
- Database-generated webpages for P.I., observer and staff to access, assess and comment on data
- Advanced, automated pipeline with co-adds appearing in time for P.I. to close feedback loop



This is the JAC Observation Management Project (OMP) web portal.

The OMP provides tools and defines processes to aid with flexibly-scheduled observing at JCMT and UKIRT.

It builds upon the JCMT Observation Management Project and the UKIRT Observatory Reduction and Acquisition Control project.

General Access		
Project Feedback System	JCMT & UKIRT	
Access a Project		■
Comment on a Project		■
Issue a New Project Password		■
Instructional Documentation	JCMT	UKIRT
Preparing and Submitting with the OT	■	■
Acquiring and Installing the OT	■	■
Useful Links	JCMT	UKIRT
Telescope Web Site and Information	■	■
Telescope Observer Schedule	■	■
Telescope Observing Process	■	■

Restricted Access		
Observing Reports	JCMT	UKIRT
View an Observing Report	■	■
View Shift Log Comments	■	■
View an MSB Summary	■	■
View a Weekly Synopsis	■	■
Project Administration	JCMT & UKIRT	
View and Sort Projects		■
View and Edit User Details		■
View and Edit Project Details		■
View and Edit Support Contacts		■
Target Tools	JCMT & UKIRT	
View Target Observability		■
View Target Positioning		■
Useful Links	JCMT	UKIRT
Telescope Support Schedule	■	■
Telescope Queue Snapshot	■	■
Telescope Nightly Snapshot	■	■
Fault System	View	File
JCMT Faults	■	■
JCMT Events	■	■
UKIRT Faults	■	■
CSG Faults	■	■
OMP Faults	■	■
DR Faults	■	■
Facility Faults	■	■
Vehicle Incident Reporting	■	■
Safety Reporting	■	■
All Faults	■	■

One-stop for observation details, weather statistics, calibrations, QA, faults

Observing Report for 2014-06-17 at JCMT

[Go to previous](#) | [Go to next](#)

View report for

[Click here to view a report for multiple nights](#)

Weather information: [JAC meteogram](#) [Mauna Kea opacity](#) [UKIRT K-band seeing](#) [UKIRT extinction](#) [CFHT transparency](#) [MKWC forecast](#)

[View WORF thumbnails](#)

[Fault Summary](#)

[Shift Log Comments](#) / [Add shift log comment](#)

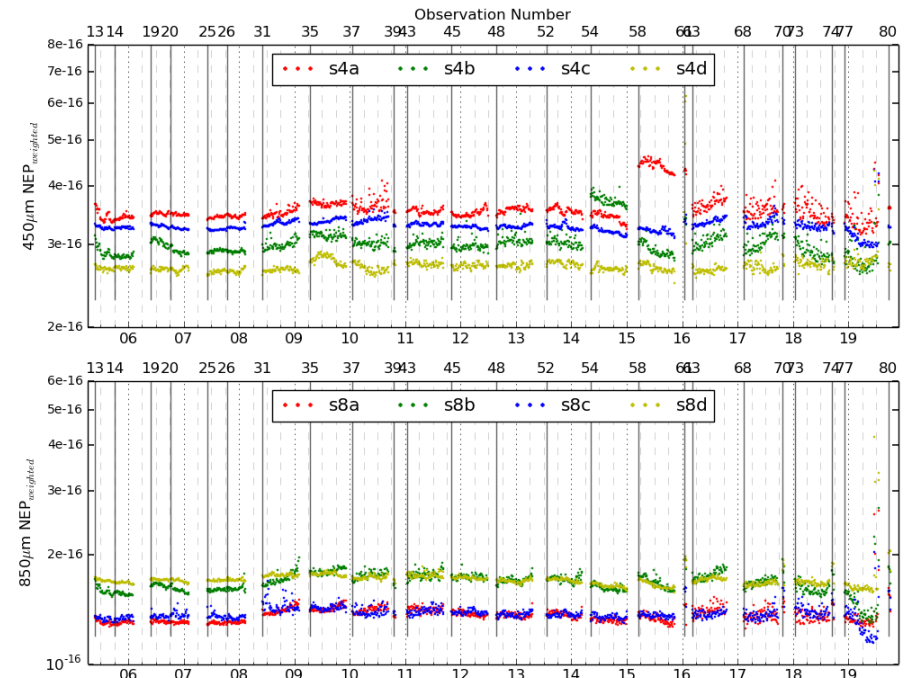
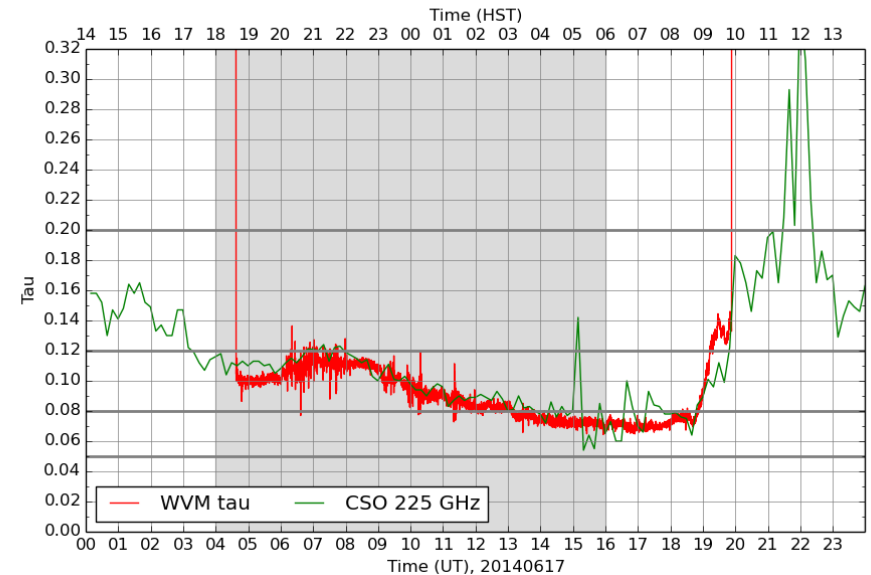
[Observation Log](#)

Project Time Summary

Time lost to technical faults	0.15 hrs	
Time lost to non-technical faults	0.00 hrs	
Total time lost to faults	0.15 hrs	Go to fault summary
Time lost to weather	0.00 hrs	
Other Time	0.00 hrs	
Extended Time	0.00 hrs	
Calibrations	2.70 hrs	
MJLSC02	2.65 hrs	
MJLSJ02	6.30 hrs	
MJLSN07	2.15 hrs	
Total	13.95 hrs	
Total time spent on projects	11.10 hrs	
Clear time lost to faults	1.08%	
Clear time lost to technical faults	1.08%	

Data Quality Analysis

Tau for 20140617



FAULT TRACKING

- Fast fault-resolution, resource for training, links to faults for affected projects

JCMT Faults: View Faults

90 faults returned matching your query

Find faults responded to filed with any activity

by user (ID)

between dates (YYYYMMDD) and HST

in the last days

in the last calendar month

System Type Status

Return time-losing faults only Show affected projects

Return chronic faults only

Organize by system/type

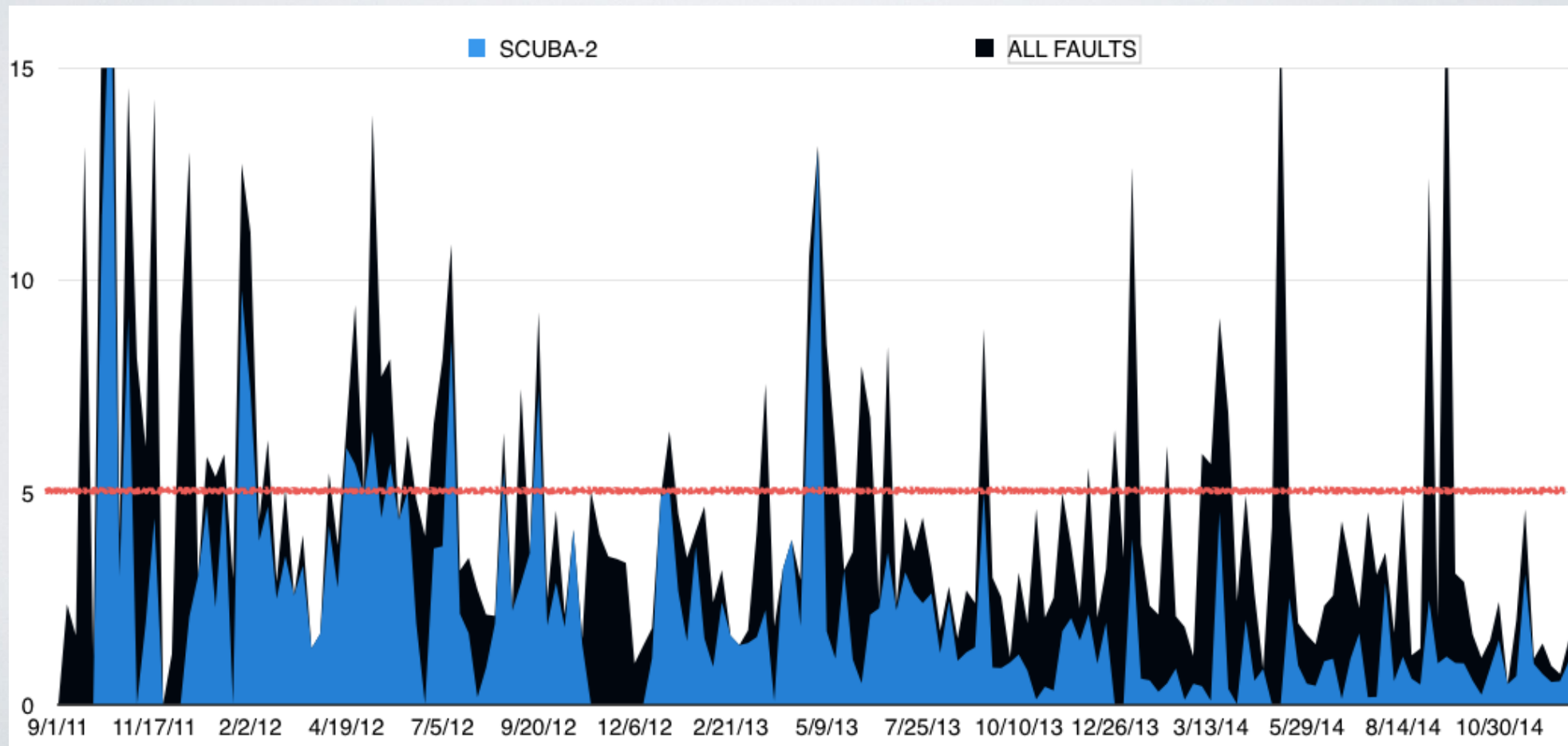
Or display

Total time lost: 8.4 hours

[Show oldest/lowest first](#) | Showing most recent/highest first
[Sort by file date](#) | [Sort by fault time](#) | [Sort by date of last response](#) | Sorted by time lost

ID	Subject	Filed by	System	Type	Status	Loss	Replies	
20140227.003	False CRANE NOT PARKED INTERLOCK Prevents Start Up of Carousel Drive Motors	William Montgomerie	Telescope	Electronic	Duplicate	2.00 hrs	0	[View/Respond]
20140205.005	LN2 not filled causing many faults	Callie Matulonis	Front End - RxA	Human	Open	1.75 hrs	3	[View/Respond]
20140215.002	Failed Calibrations/Apparent DCM Faults (x15)	Callie Matulonis	Back End - ACSIS	Software	Duplicate	0.35 hrs	0	[View/Respond]
20140228.006	"Abort Observation" Button for SCUBA2 (AND ACSIS) Causes Miscellaneous Disasters	William Montgomerie	Computer	Software	Duplicate	0.30 hrs	0	[View/Respond]
20140210.001	Monitor on task SCUBA2 disconnected	William Montgomerie	SCUBA-2	Software	Duplicate	0.30 hrs	0	[View/Respond]
20140205.001	Failed Calibrations/Apparent DCM Faults	Callie Matulonis	Back End - ACSIS	Software	Duplicate	0.30 hrs	0	[View/Respond]
20140222.001	rts/smu wtag errors (wTag:7 eTag: 14 if-micro died)	Jim Hoge	Back End - ACSIS	Software	Duplicate	0.25 hrs	0	[View/Respond]

- Aiming for $< 5\%$ fault rate per night (less than a half hour of lost time)
- In past six months, fault rate has averaged less than 1% per night

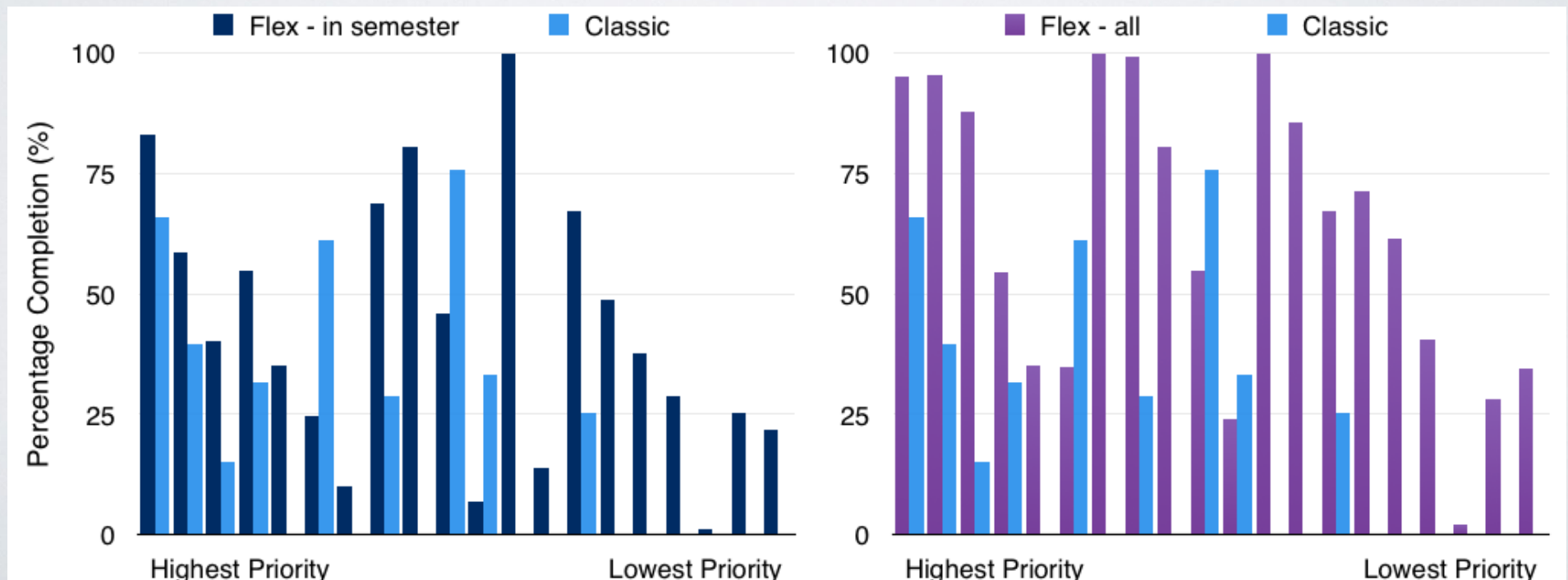


DOES FLEXIBLE SCHEDULING WORK?

- To be sure you must compare flexible and classical scheduling
- Re-allocated an entire year (2007) of projects in a classical mode based on original project rankings and partner shares
- Knowing weather and fault statistics for the nights allocated, available time was credited to a classical project if:
 - Full time if $\text{Grade} \leq \text{Grade required}$
 - Half time if $\text{Grade} = \text{Grade required} + 1$
 - No time if $\text{Grade} = \text{Grade required} + 2$

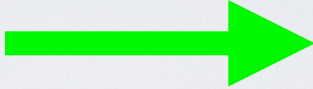
FLEX VS CLASSIC

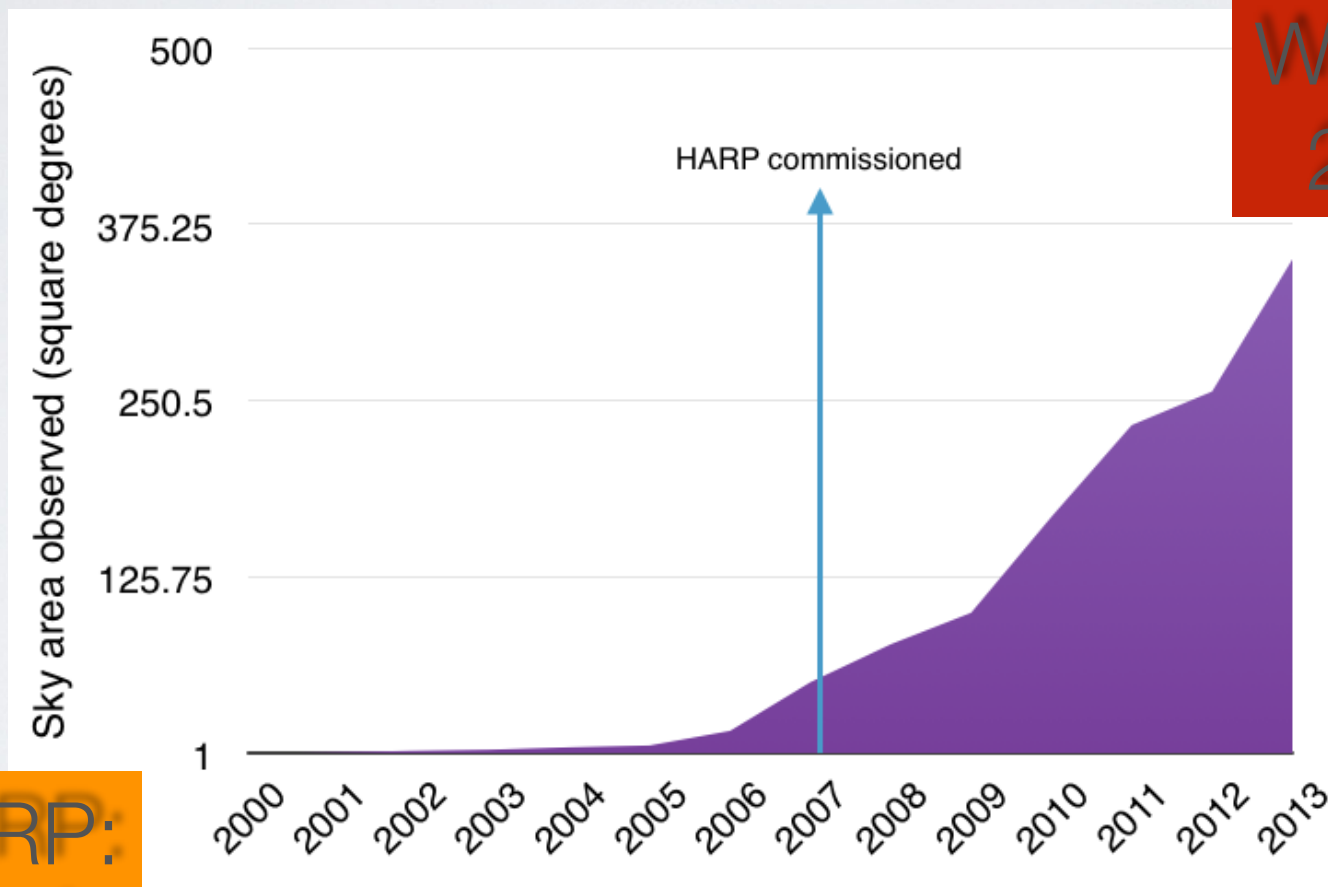
- ✦ With flex: More project time and more completion
- ✦ With flex: Small, targeted projects (< 1 night)
- ✦ No 'wasted' photons - projects get the weather they need
- ✦ Flexing into following semester increases completion



ARRAYS ARE THE THING...

Heterodyne history at JCMT

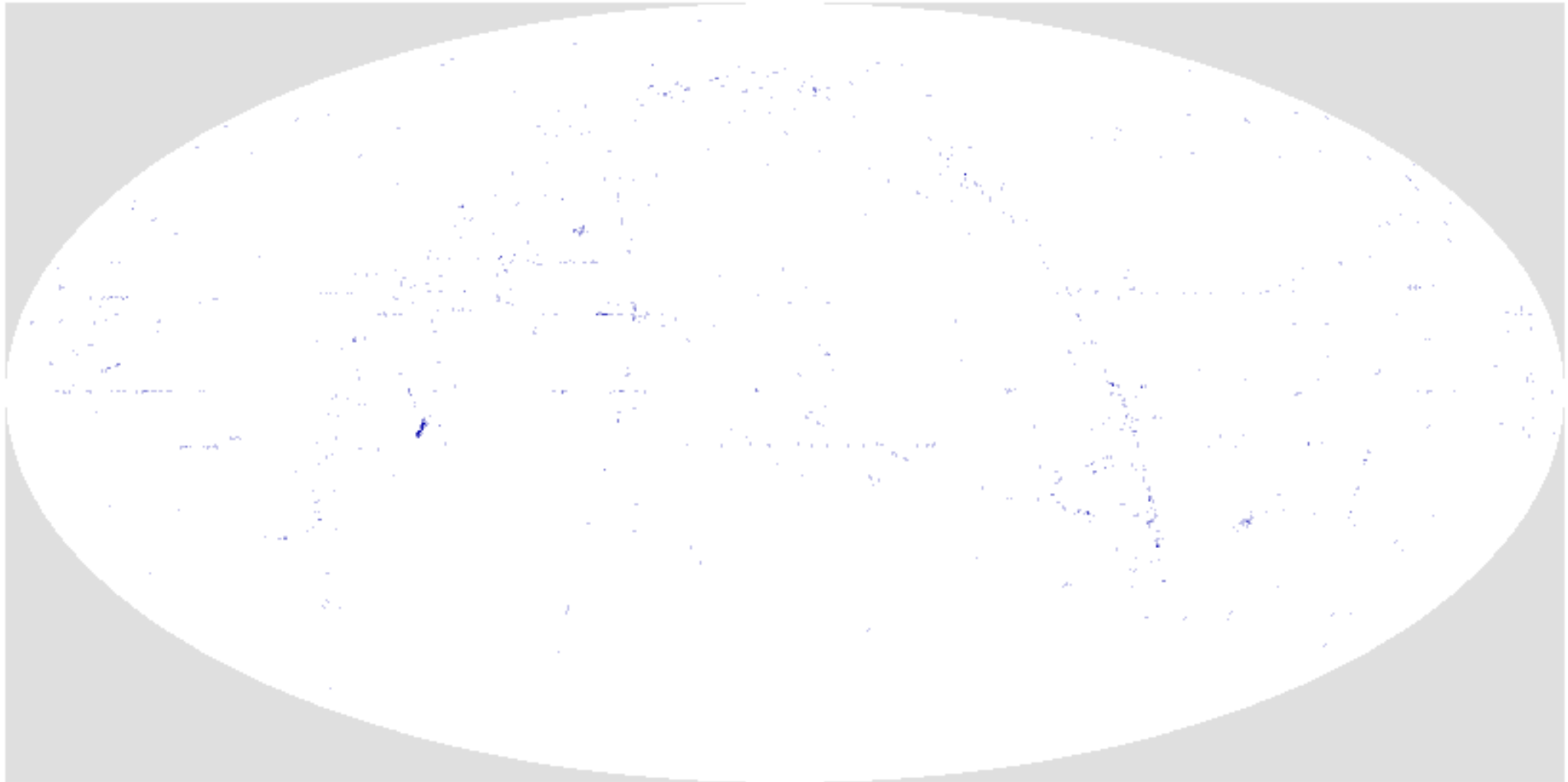
RxB (1)  HARP (16)



With HARP:
250 deg²

Pre-HARP:
9.2 deg²

HETERODYNE 1996a

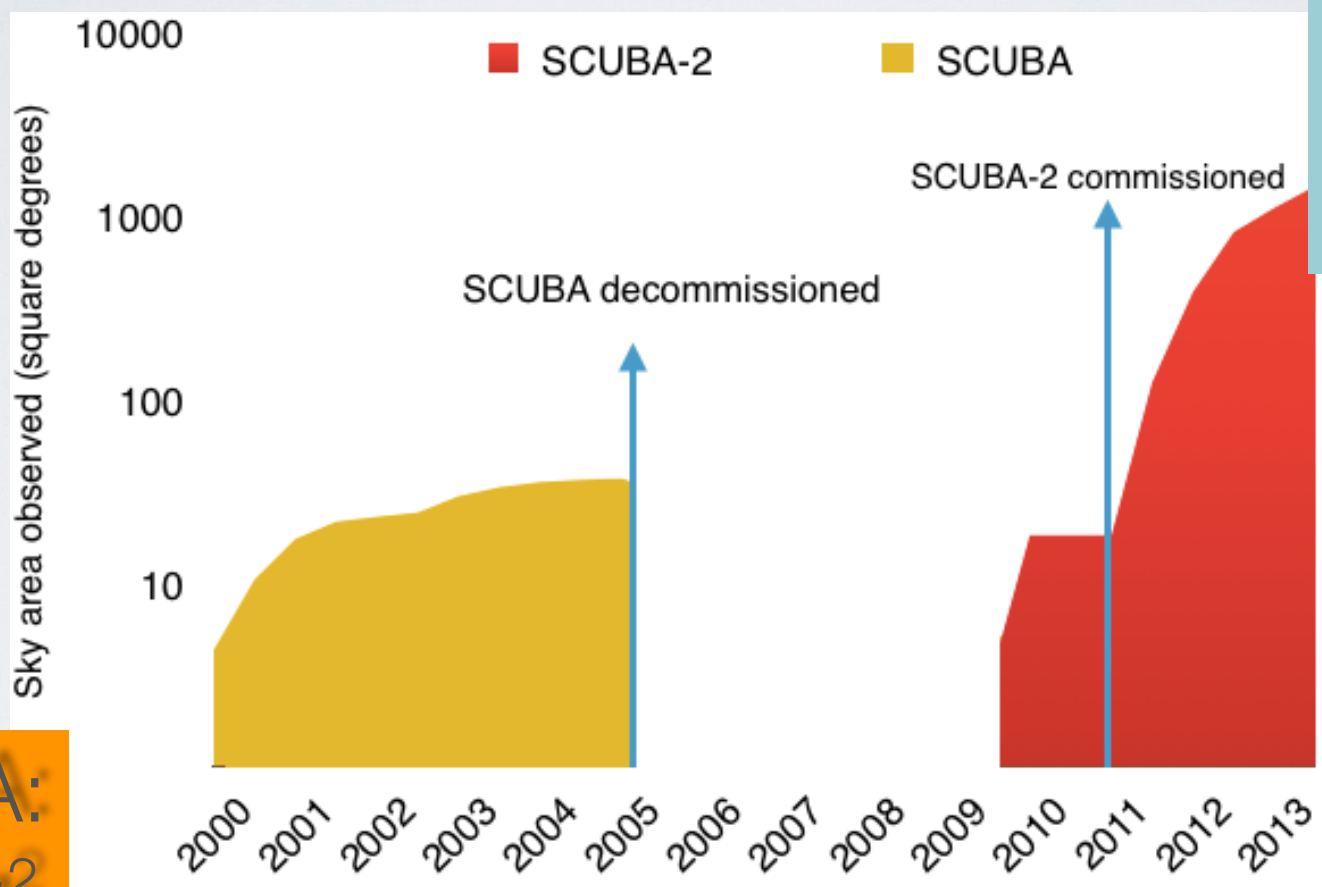


1.5 square degrees

ARRAYS ARE THE THING...

Continuum history at JCMT:

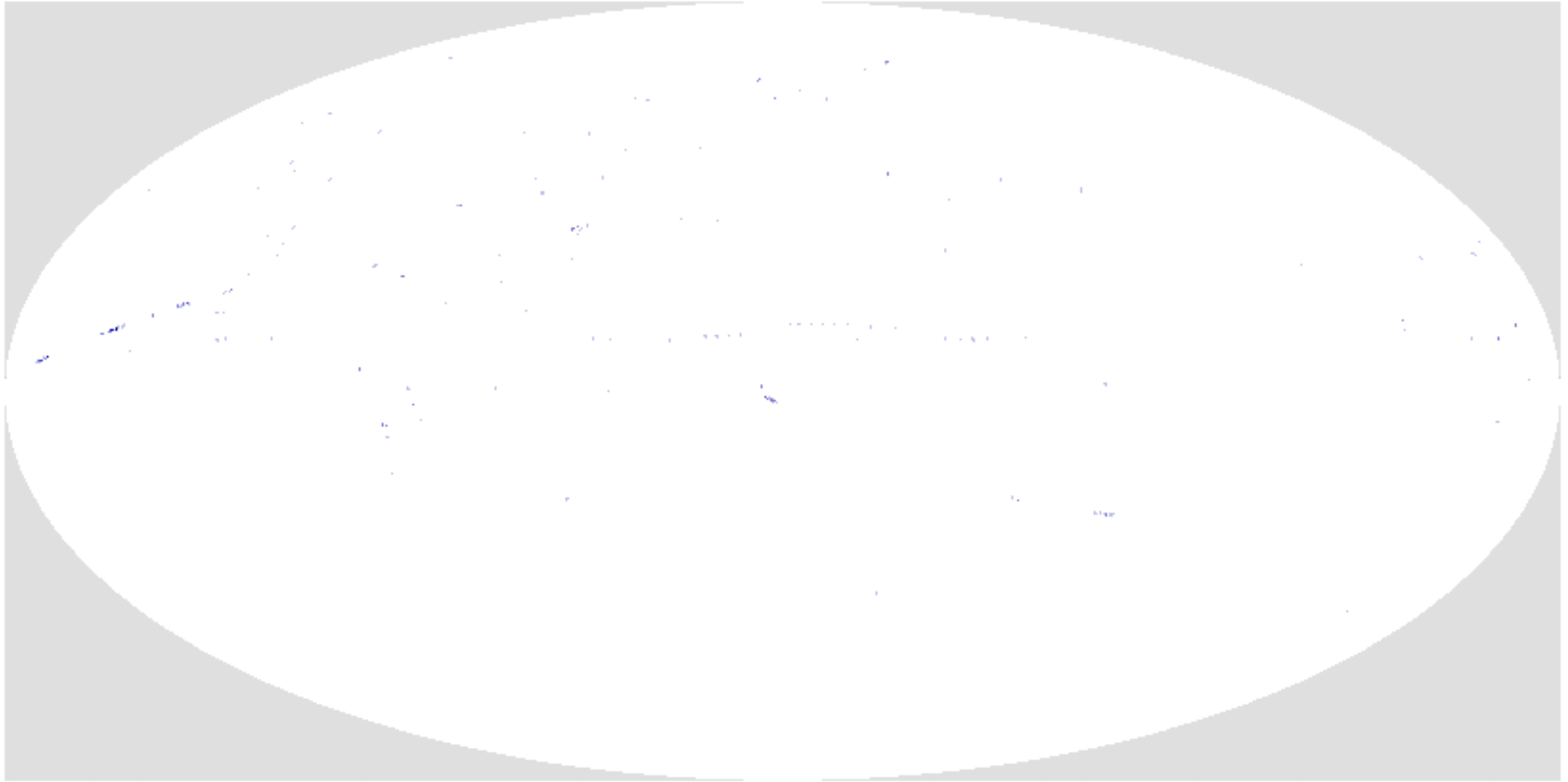
UKT-14 (1) → SCUBA (128) → SCUBA-2 (10000)



SCUBA-2:
>1500 deg²
2.5 years

SCUBA:
49 deg²
7 years

SCUBA 1996b



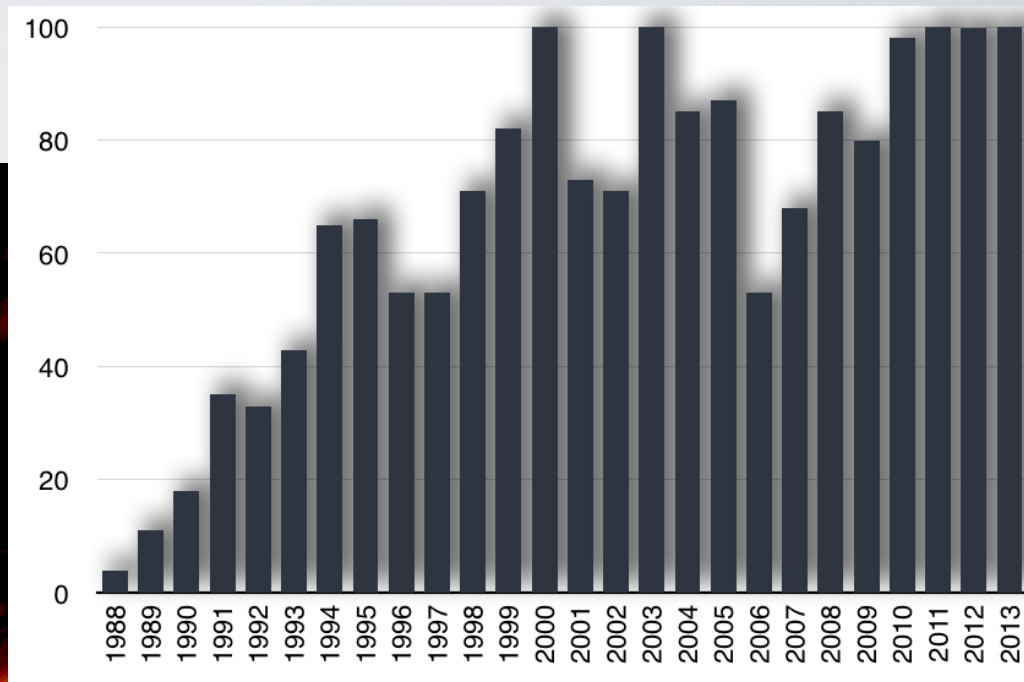
0.5 square degrees

EXTENDED OBSERVING

- JCMT implemented 'extended' remote observing in 2013
- 2.5 - 4.5 hours of additional observing in early morning from Hilo
- Average 10 - 15 hours additional science time a week

JCMT SCIENCE ARCHIVE

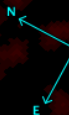
- Photons collected are not useful unless they are being used...
- JSA archive of advanced data products accounts for more than half of JCMT publications
- JCMT legacy will only increase with time



<http://www.cadc-ccda.hia-ihp.nrc-cnrc.gc.ca/en/jcmt/>

SCUBA

• SCUBA-2



EAO IMPORTANT DATES

- First Call for Proposals: March 1st, 2015 - deadline, May 15th, 2015
- EAO Pilot Science program: March 1st - June 30th, 2015
- First Semester start: July 1st, 2015

EAO PILOT SCIENCE 2015

- EAO partners are offered 60% of available time in ES2015 - 860 hours of observing time (12 hour nights, March 1st - June 30th), 20% UK, 3% Canada, 10% POL-2/FTS-2 commissioning
- Open for science programs of < 30 hours each
- 230GHz, 345GHz (array) heterodyne instruments and SCUBA-2 are available
- Ideal for P.I.s to investigate JCMT capabilities, pathfind for larger proposals and programs, complement existing datasets, initiate collaborations
- Technical assessment and assistance from JCMT staff - no formal adjudication
- Programs to be submitted to Northstar proposal system

EAO CALL FOR PROPOSALS

- Open for submissions March 1st 2015
- Long submission period (deadline May 15th 2015) is to allow time for P.I.s to obtain and assess path-finder data in the Early Science period
- Allocation will be 50% surveys (Programs $>$ 100 hours) and 50% P.I. programs (Programs $<$ 100 hours)
- A single TAC will assess all the proposals (survey and PI)
- Semester starts July 1st - December 31st

JCMT: A FIRST CLASS SCIENCE SERVICE

- In order to ensure they gain the maximum scientific value for their time, the JCMT aims to provide every assistance to our observers
- Support/Instrument Scientists available to help observers with:
 - Calculating integration time for proposals (and maintaining online calculators for this purpose), preparing observations for queue execution supporting visits to the observatory, archival retrieval of data and data reduction, troubleshooting data issues
- Scientific computing supports by
 - configuring and improving our data pipelines, developing software tools and support of installation and maintenance of reduction software

SUMMARY

- The key to JCMT efficiency is the constant willingness of its dedicated staff to adapt and improve
- I know you are all here because you have ideas for exciting new science
- So, how can we help?

www.eaobservatory.org/jcmt/



helpdesk@eaobservatory.org

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