Current status of EAO's JCMT

Jessica Dempsey
Deputy Director JCMT

Overview

- The dust settles on EAO handover to JCMT and the real work begins
- Large Programs initiated Dec 2015: now looking to mid-term review in February 2017
- Strong focus on creating the East Asian astronomy community - how do you make collaboration work?
- Science highlights
- Instrument program in full swing: POL-2 on telescope, FTS-2 commissioning on-going and SCUBA-2 overhaul to start in October

The JCMT and EAO

- The UK operation of JCMT in February 2015 (partnership operation with Canada and the Netherlands ceased in 2014)

- The East Asian Observatory (China, Japan, Korea and Taiwan) was incorporated in late 2014 and took over JCMT operations in March 2015

- The United Kingdom and Canada continue to participate as operational partners in the facility

- Current Canadian funding ending January 2017 - new funding verbally agreed, likewise the UK have indicated intent to continue

- EAO looks beyond JCMT in next phase…

Why JCMT for EAO?

- **Operations**: tested and efficient by design and adversity - software, systems and policies are highly transferable to other EAO projects

- **Instrumentation:** new instrument plans perfectly tap into the skills and interests of EAO regional labs - bigger, better instruments are possible

- **Science:** JCMT becomes testing ground for how best to merge and enhance regional scientific cooperation and push out past the cutting edge

JCMT Operations

- Observing time distribution: 50% Large Programs; 50% PI Proposals

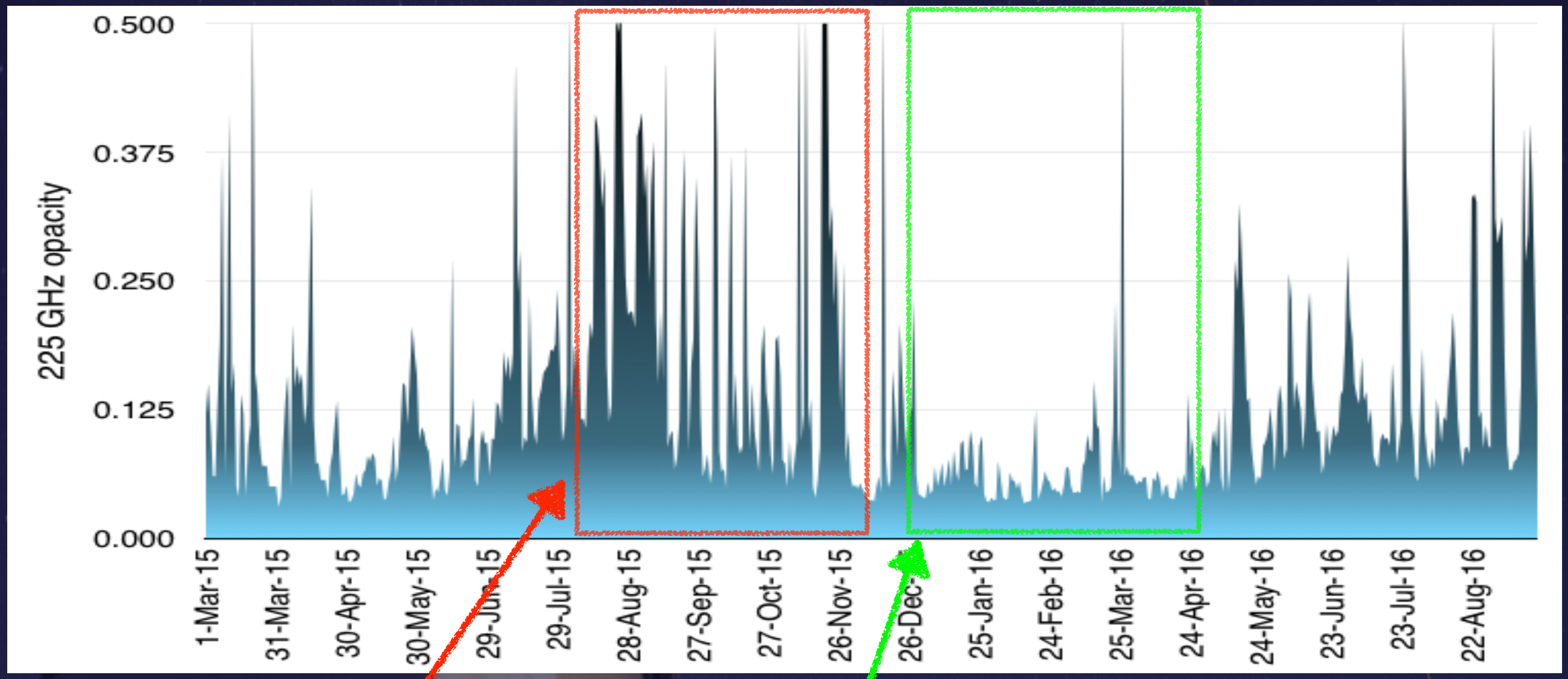
- TAC: one unified TAC process - priority on telescope by science ranking

- Observers: Scheduled Projects send Observers, observer project priority if in weather grade - **in one year we have had over 150 scientists visit to observe with us**

- Queue Mode: Flexible Schedule according to Weather

- Currently partial on-site and partial remote night observing + extended (remote) observing

Unprecedented conditions

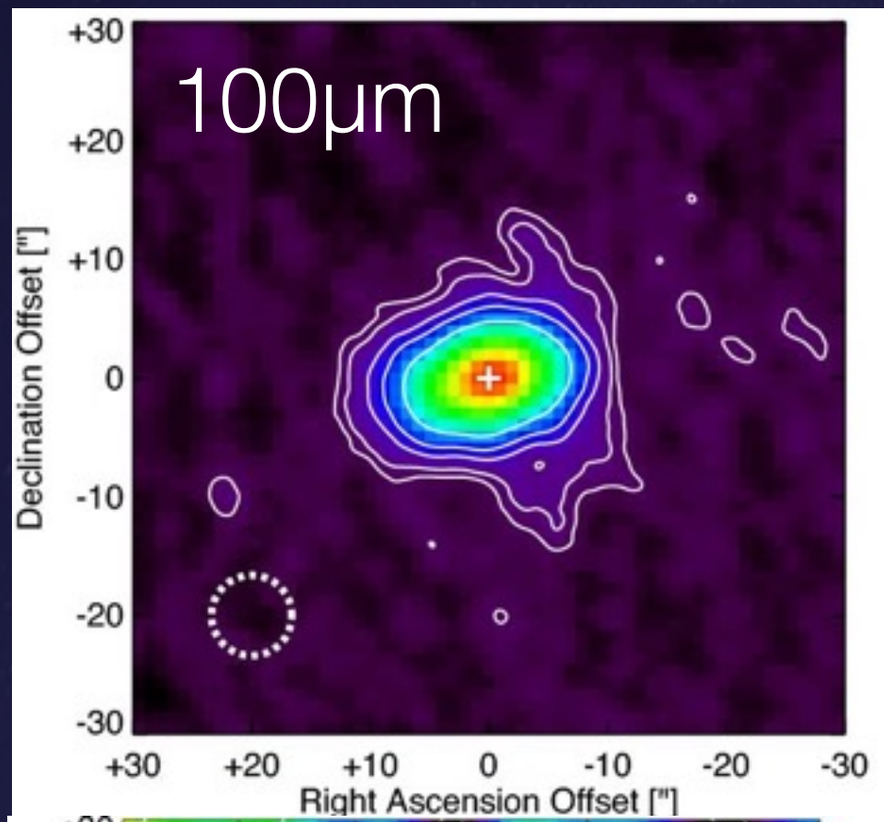


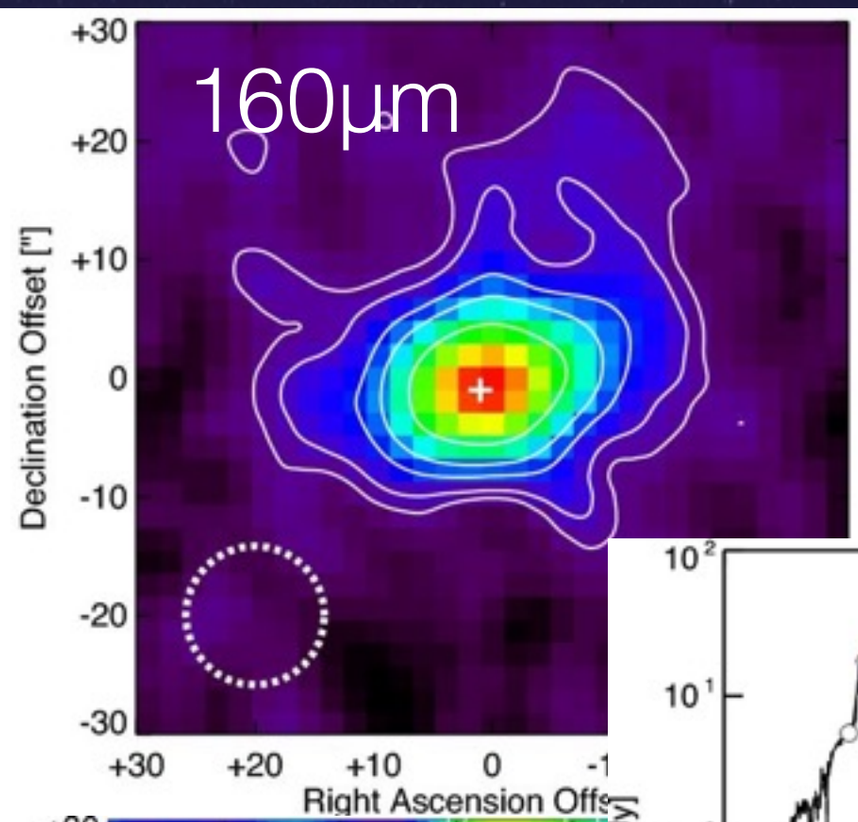
- 14 hurricanes in Aug-Oct hampers 15B semester (80% weather Grade 3 or worse)
- But unprecedented winter weather (El Nino) gives great start to Large Programs (Jan, Feb, March 75% Grade 2 or better)

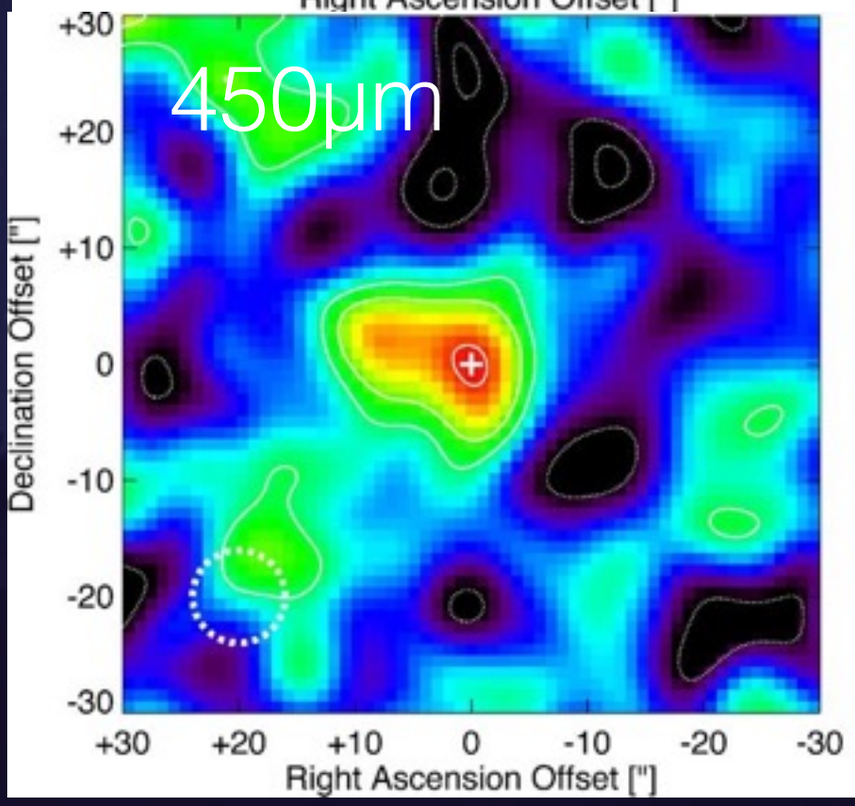
James Clerk Maxwell Telescope
East Asian Observatory

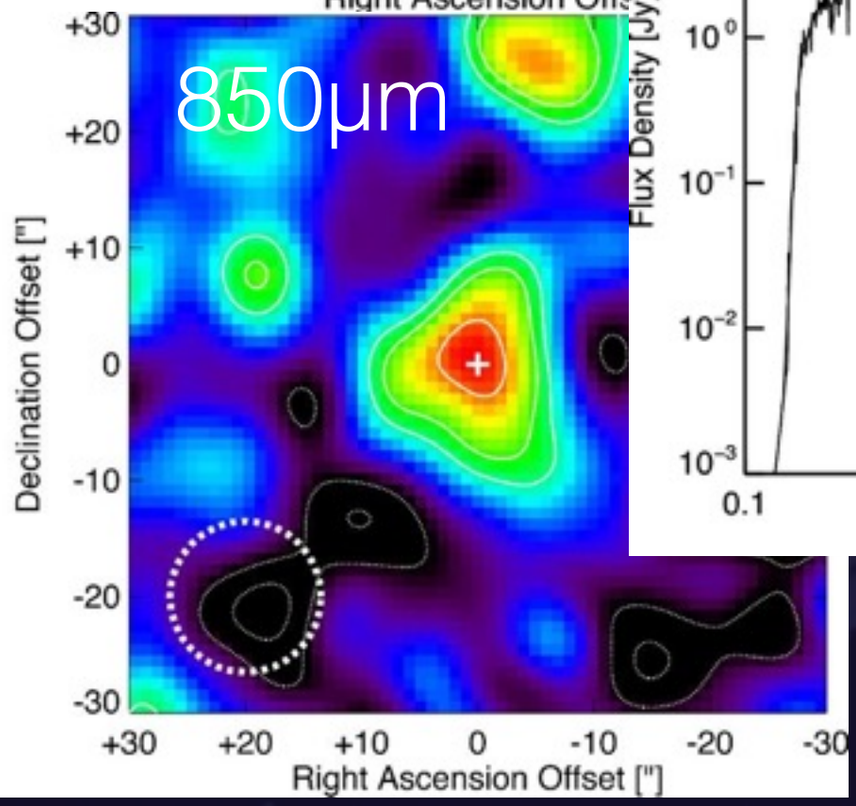
Unusual Circumstellar Disk - HD76582

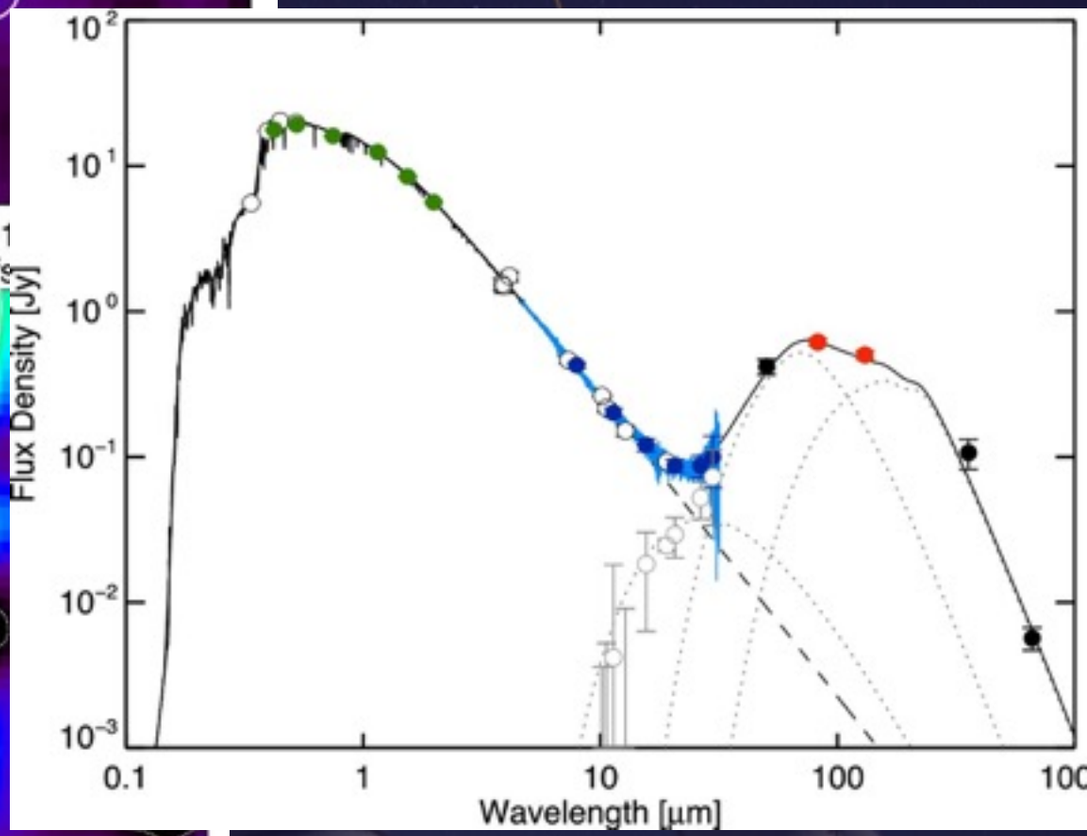
Turbulent, three-component disk in non-steady-state collisional cascade







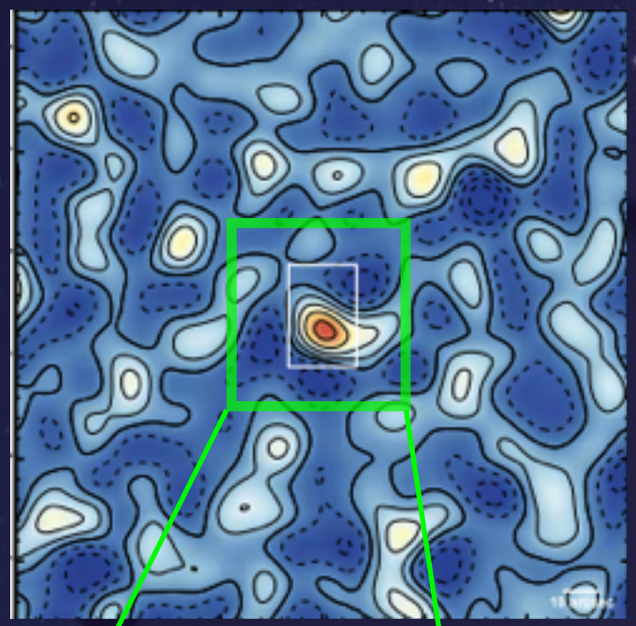




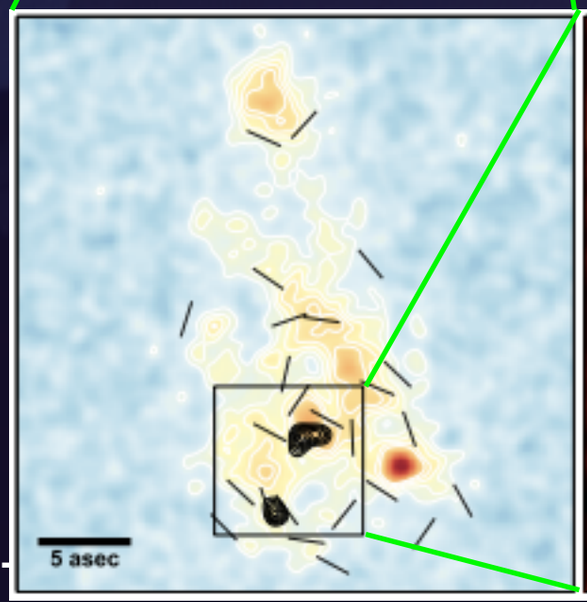
Marshall et al. MNRAS, 2016

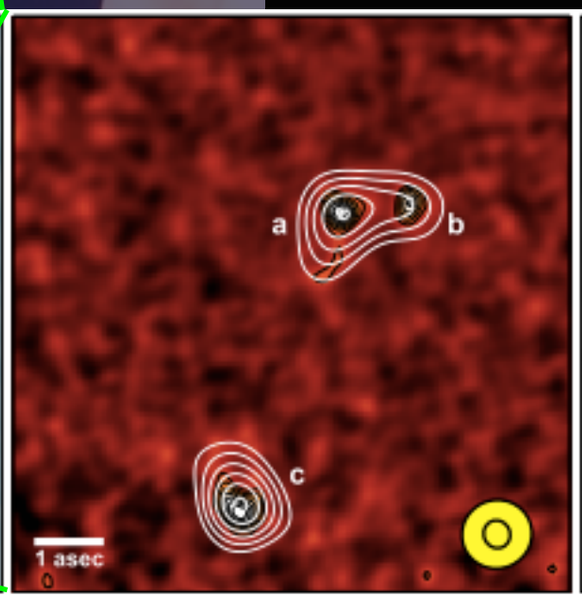
Lyman-Alpha Blobs (LABs) - SSA2-LAB1

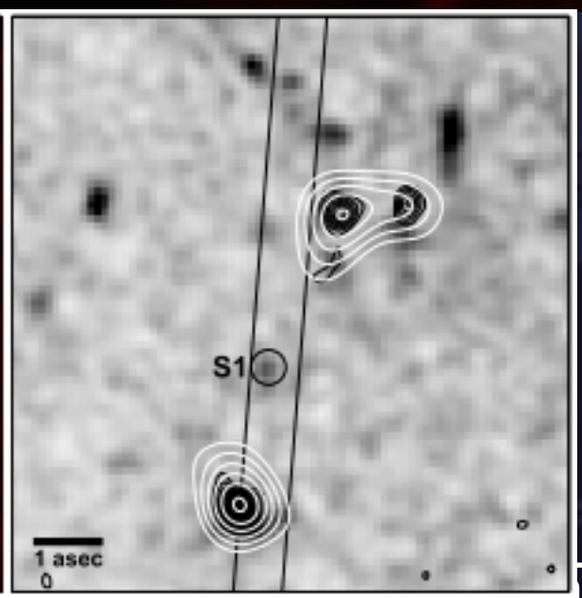
SCUBA-2:Geach et al 2014



Muse/ALMA/Keck: Geach et al 2016







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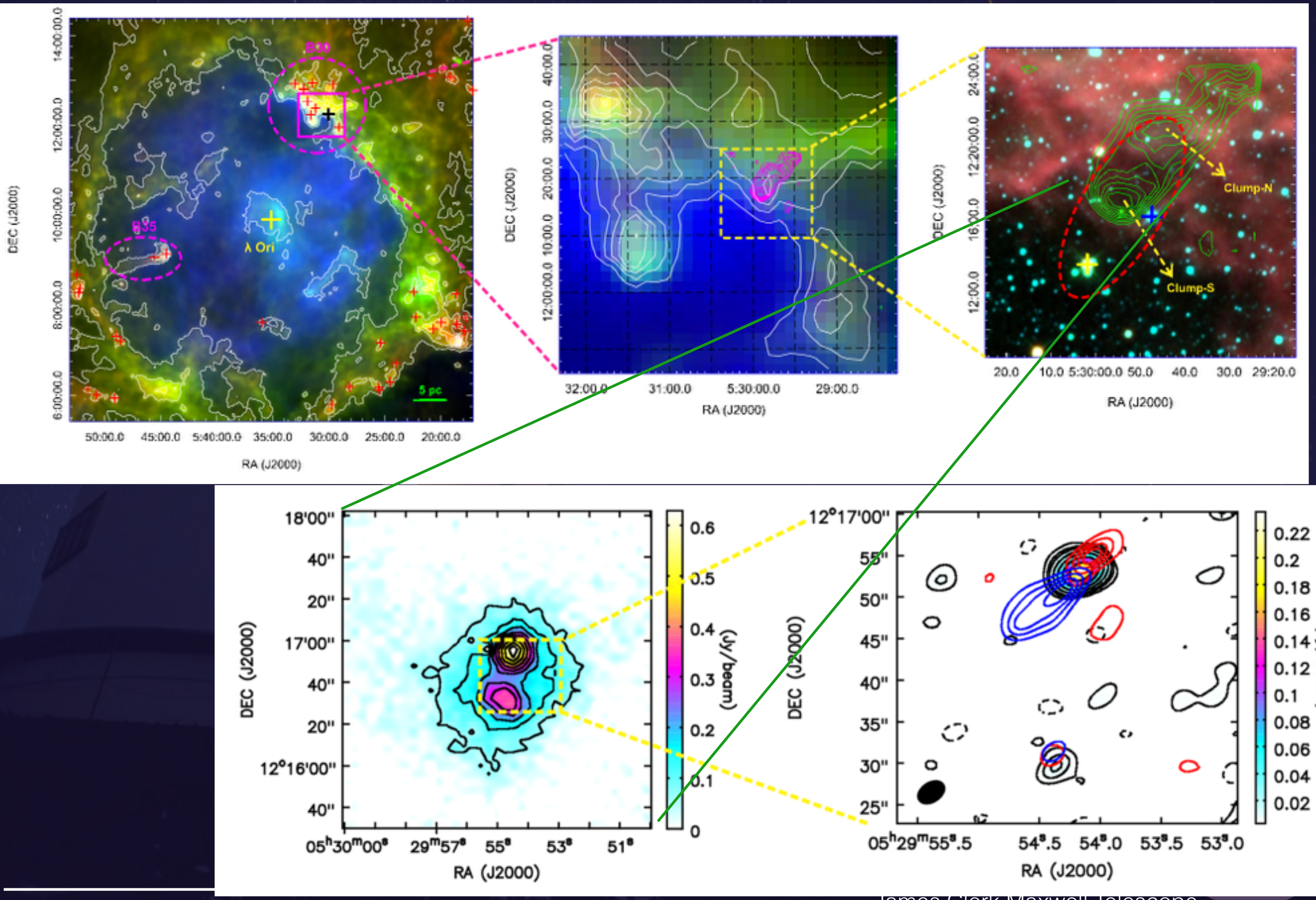
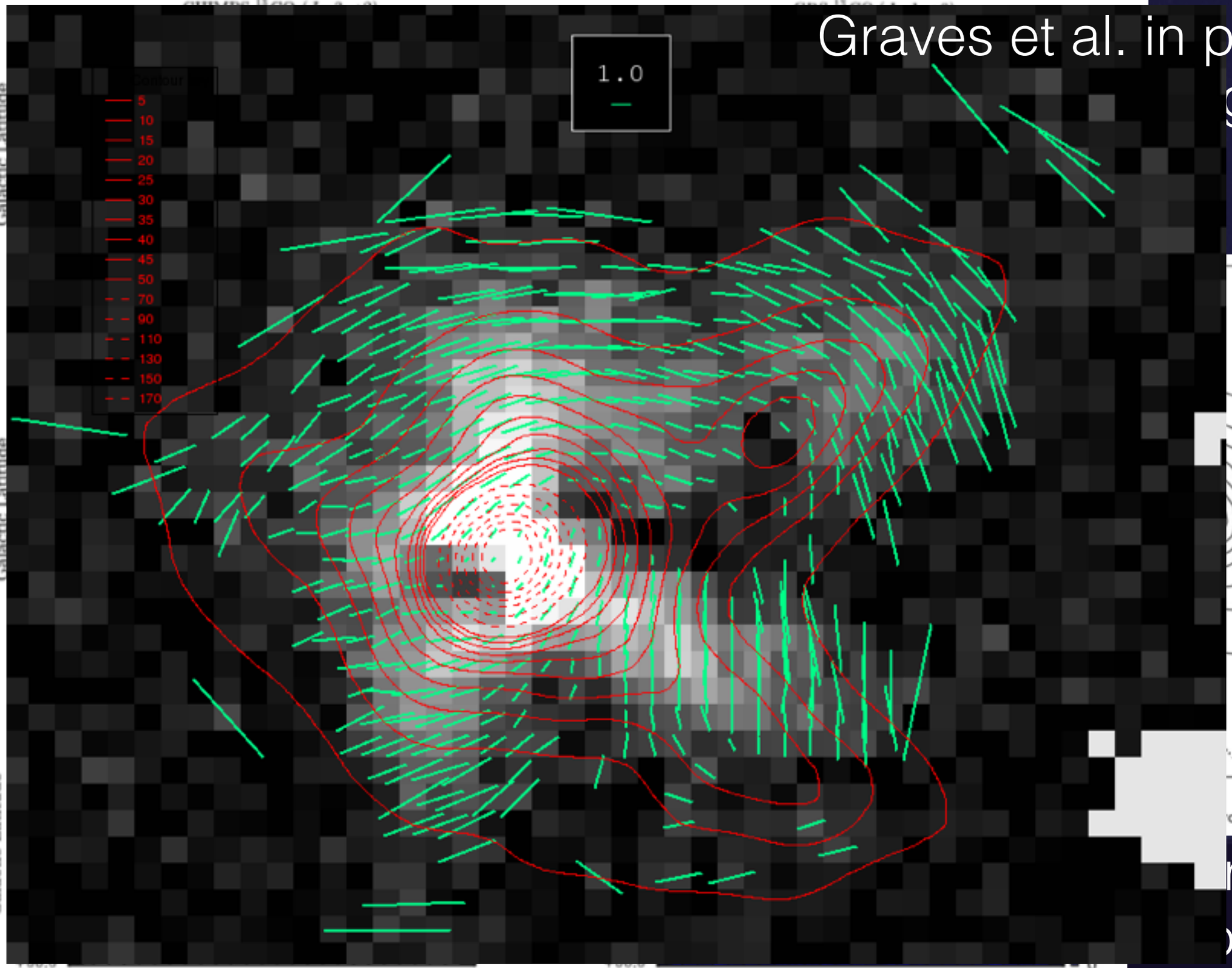
SCOPE - discoveries in Bright Rimmed Clouds

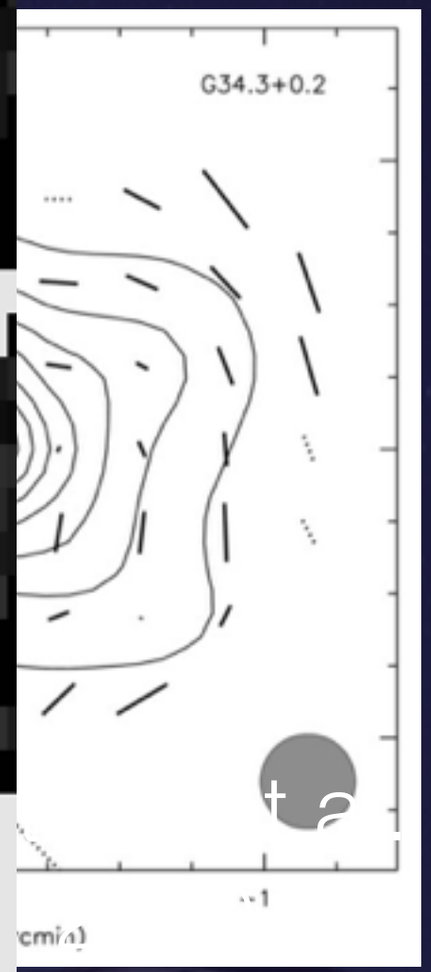


G34.3 - Massive star forming region

Graves et al. in prep

gby et al. 2016





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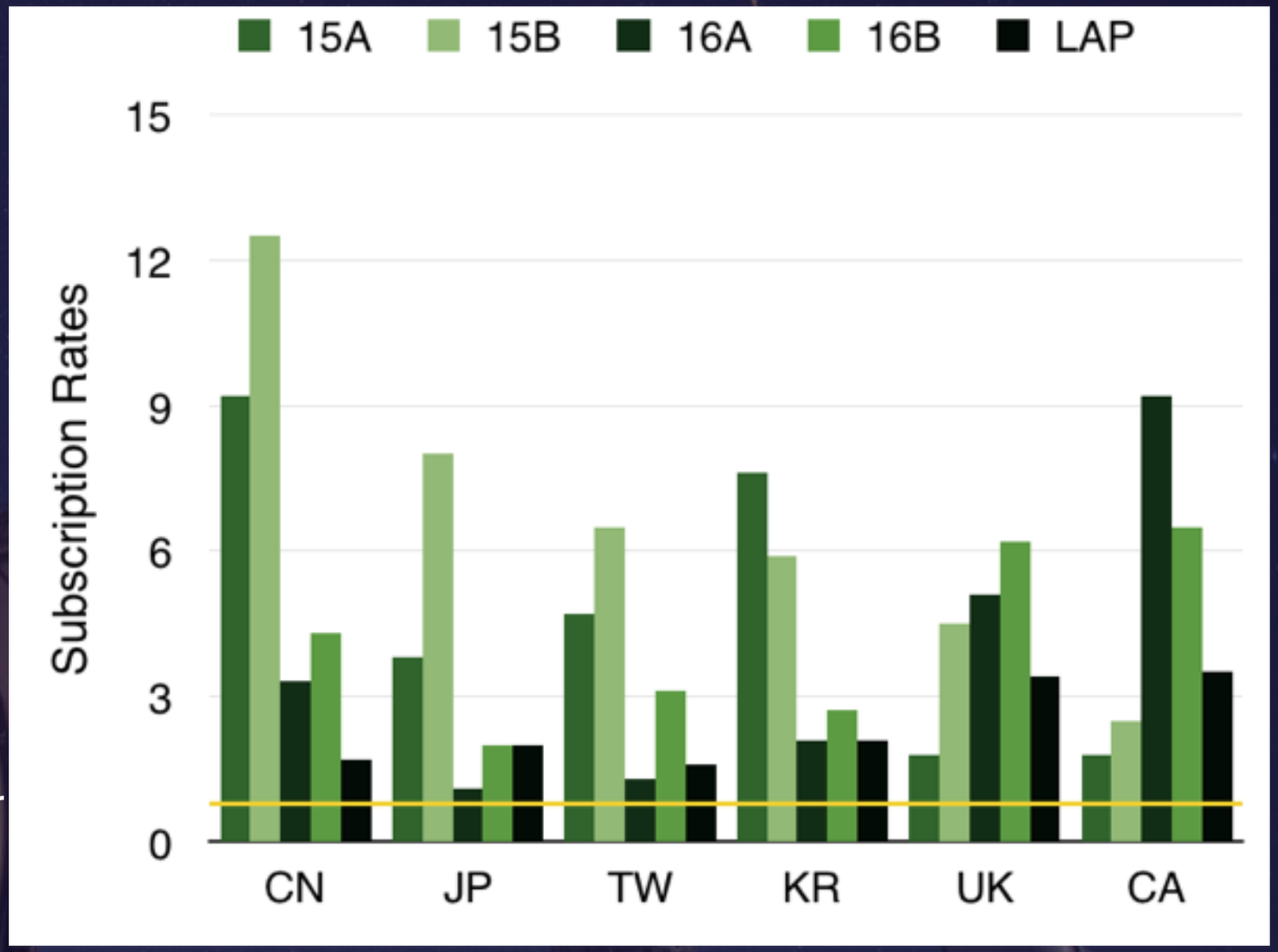
Science Calls

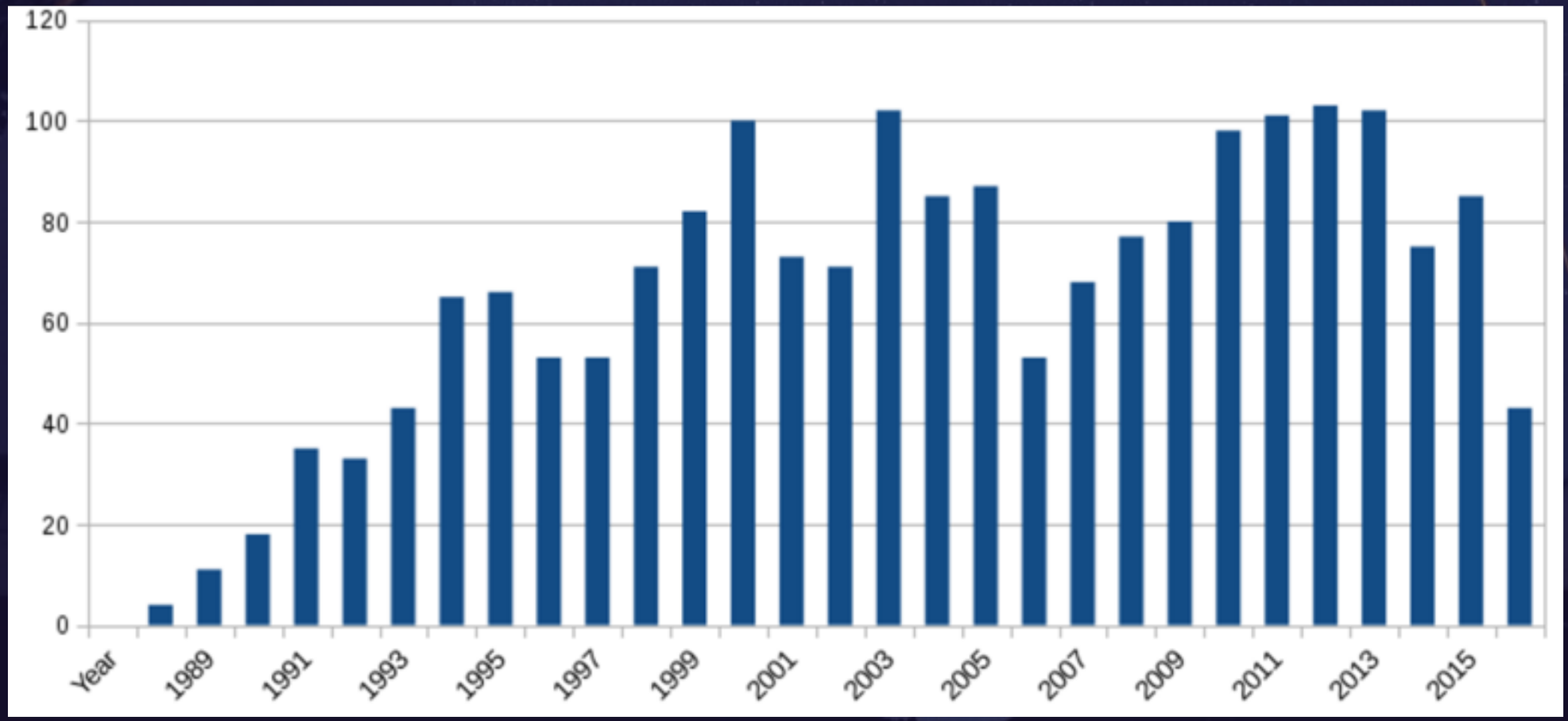
- In a year and a half at JCMT, we have had six Calls for Proposals, 24,000 hours requested, and over 1300 astronomers involved in proposals

- A key concern has been how to integrate the existing, established communities (UK, Canada) with the newer EAO regions (Japan, China, Korea and Taiwan)



Publications

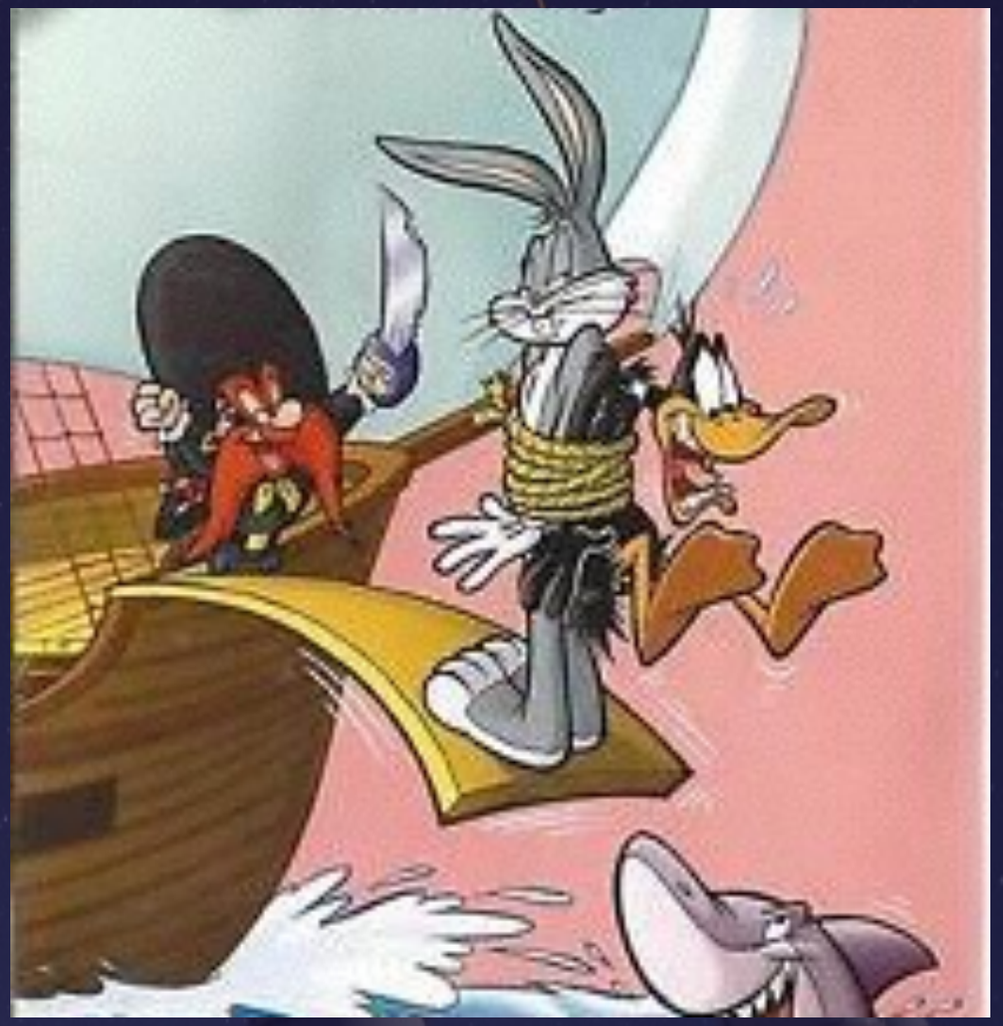
- 80+ papers expected in 2016 (current to Sept 1, 2016)
- Hoping to increase this paper production rate - the key is good, consistent DR and an accessible archive
- And **collaboration**



How to create collaboration?

Encourage (carrot)

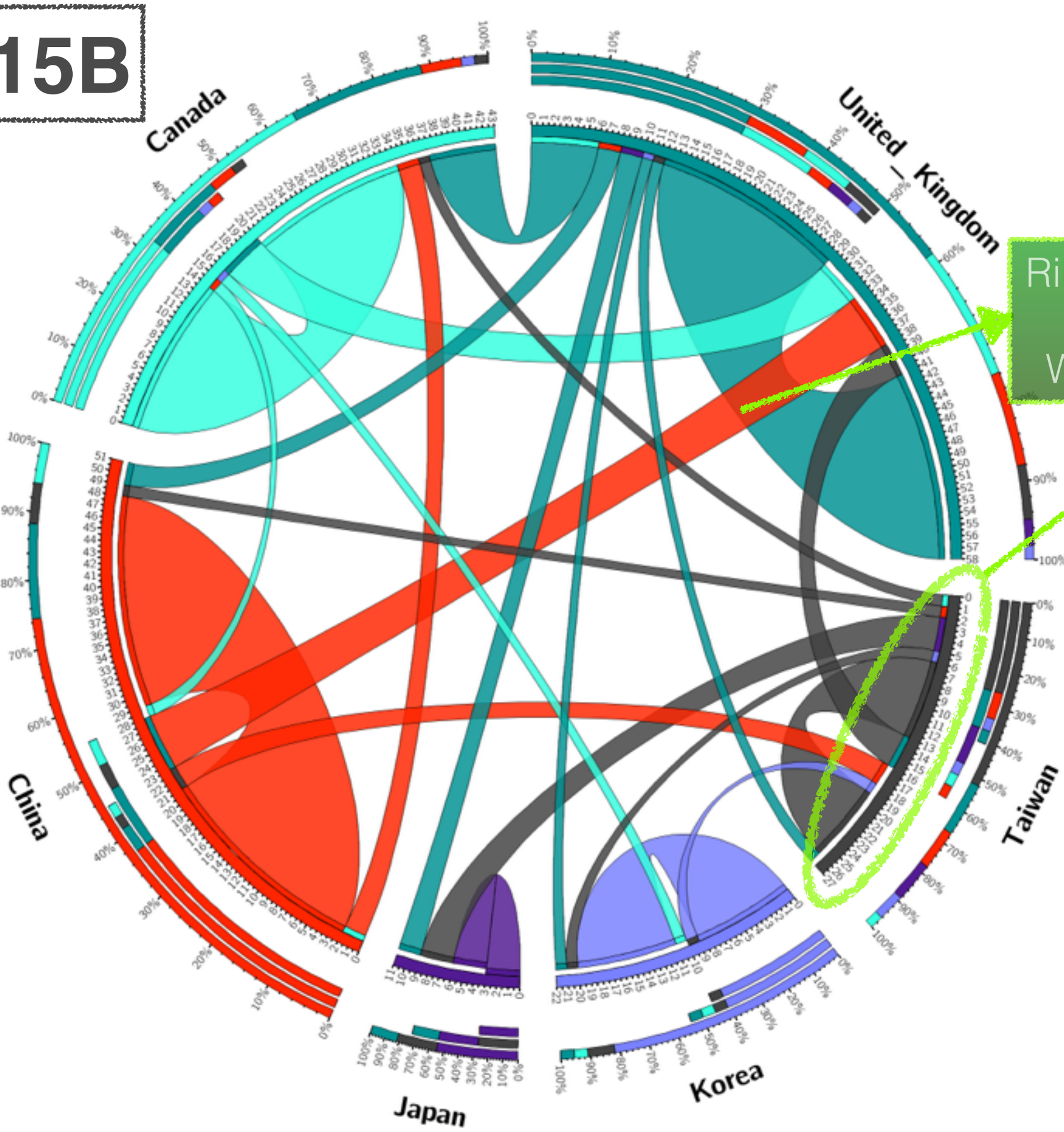
Enforce (stick)



The carrot: PI collaboration

- 50% of each semester's science time is allocated to PI science
- We have a single TAC reviewing all regional submissions
- We have a fractional allocation algorithm ***designed to encourage collaborations*** between regions with experience (but small funding contribution and thus small allocation) and less experienced regions with a lot of time to play with
- The key is to ***reward P.I.s who look to collaborate strongly between regions*** - and so we try to make that as easy as possible
- We leave a fraction (currently 10%) open to 'Best Science' and this is not debited against any regional allocation

15B



Ribbon shows collaboration

Colour = PI region

Arc length = Width = # of investigators

total # investigators

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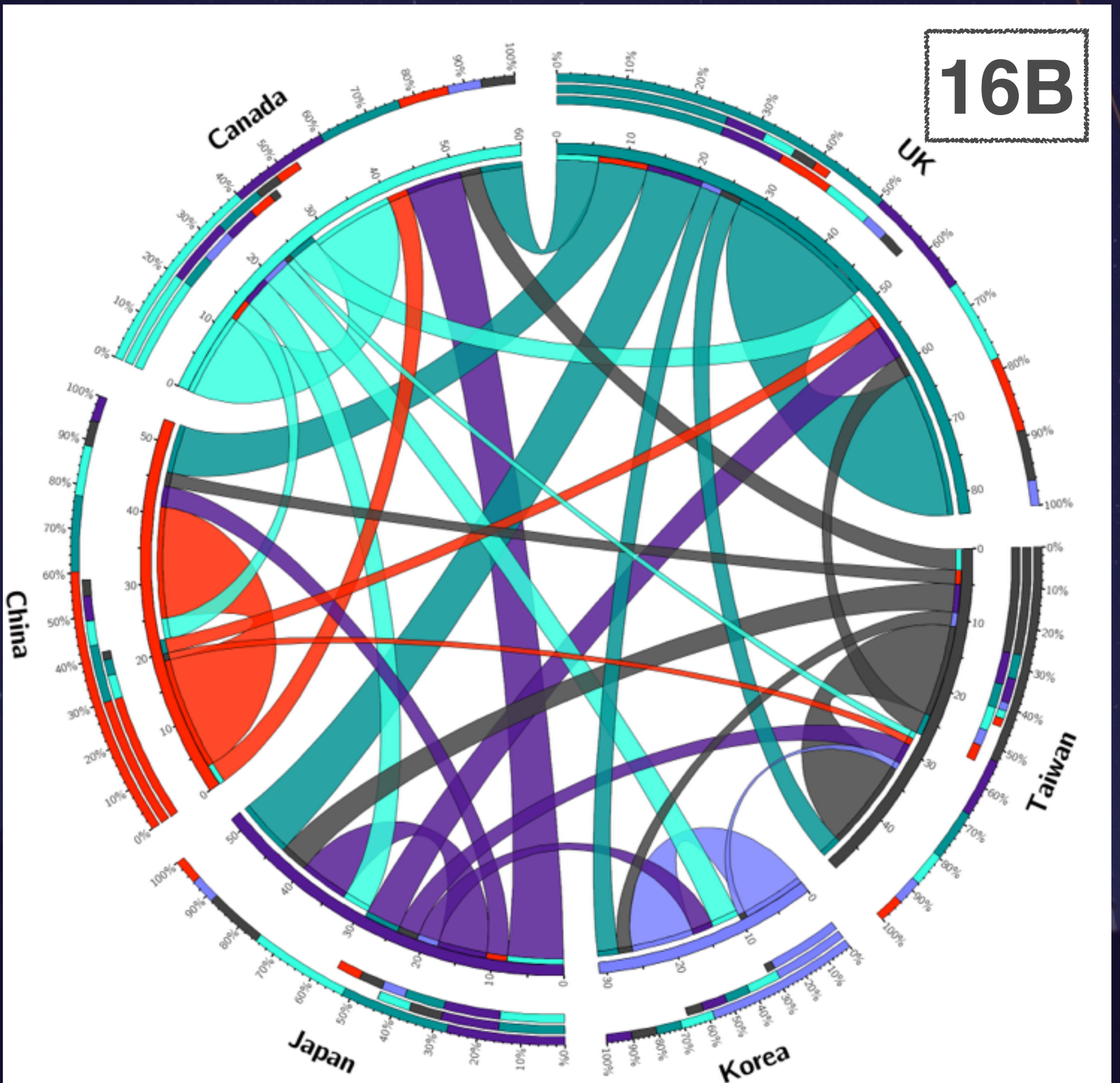
16B



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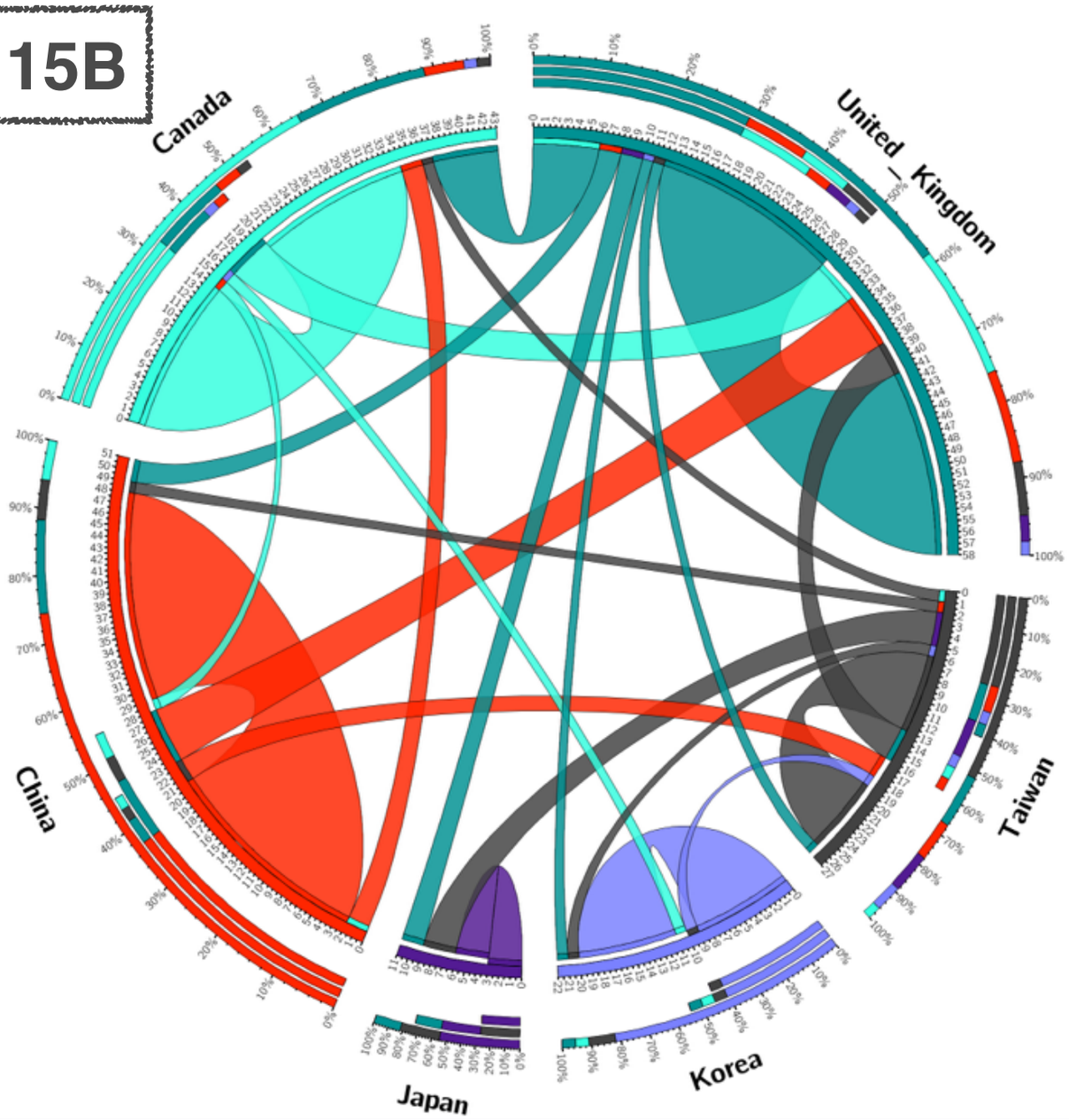

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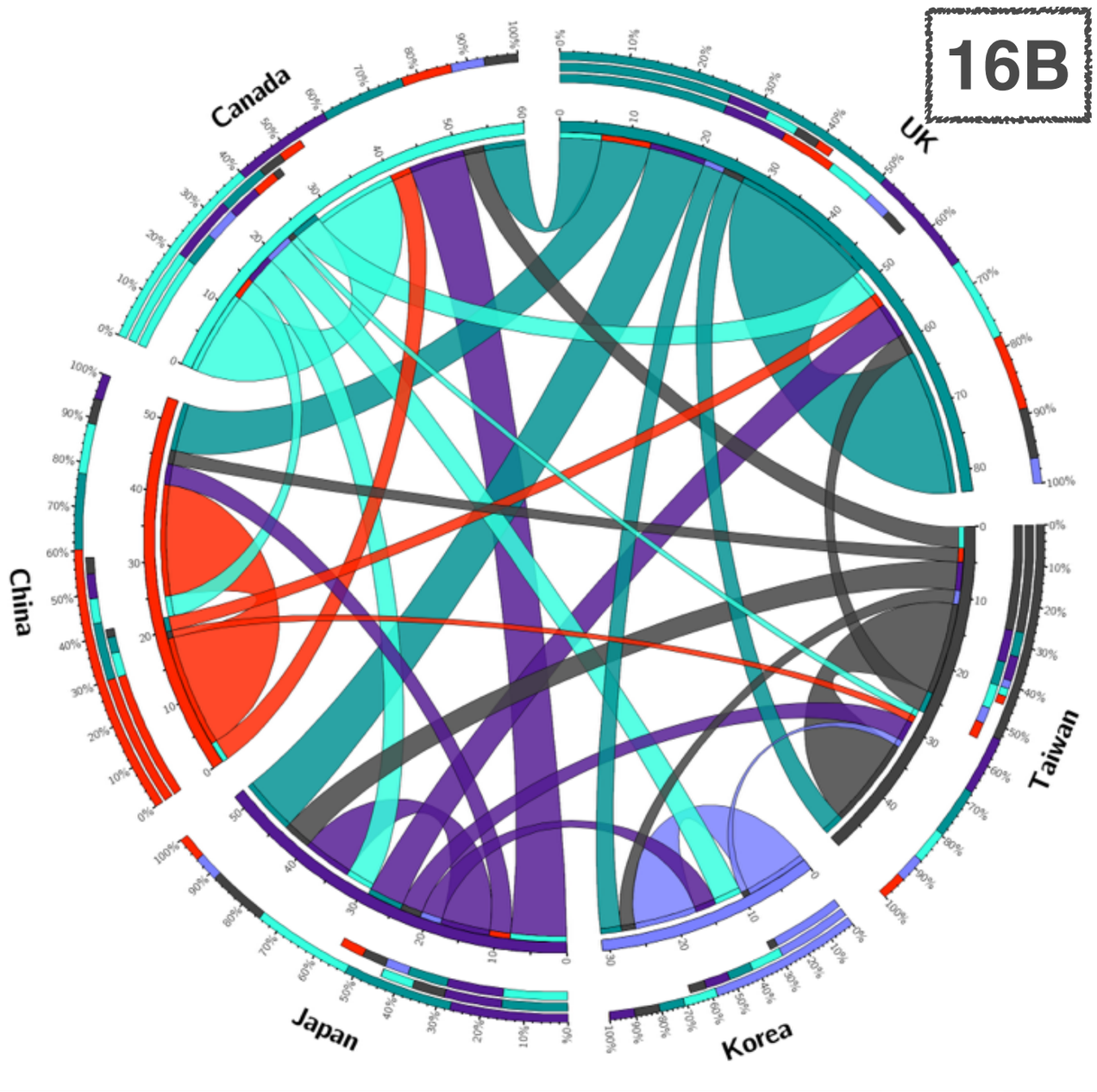

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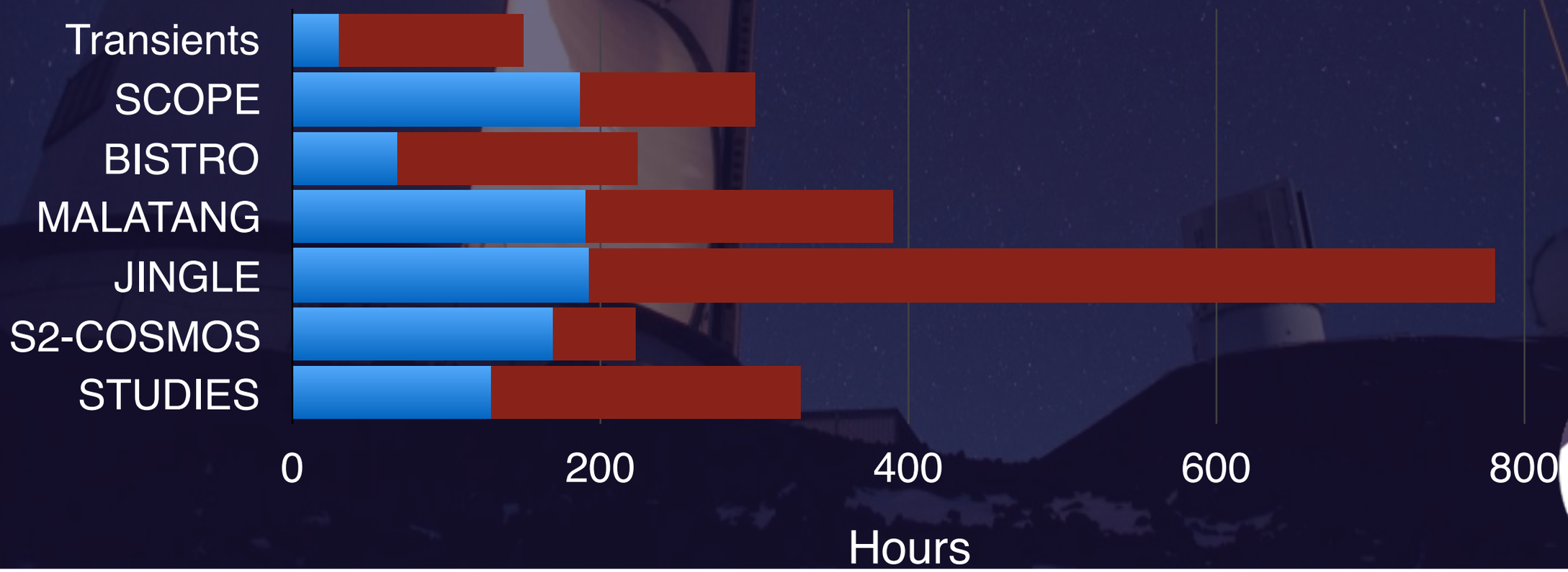
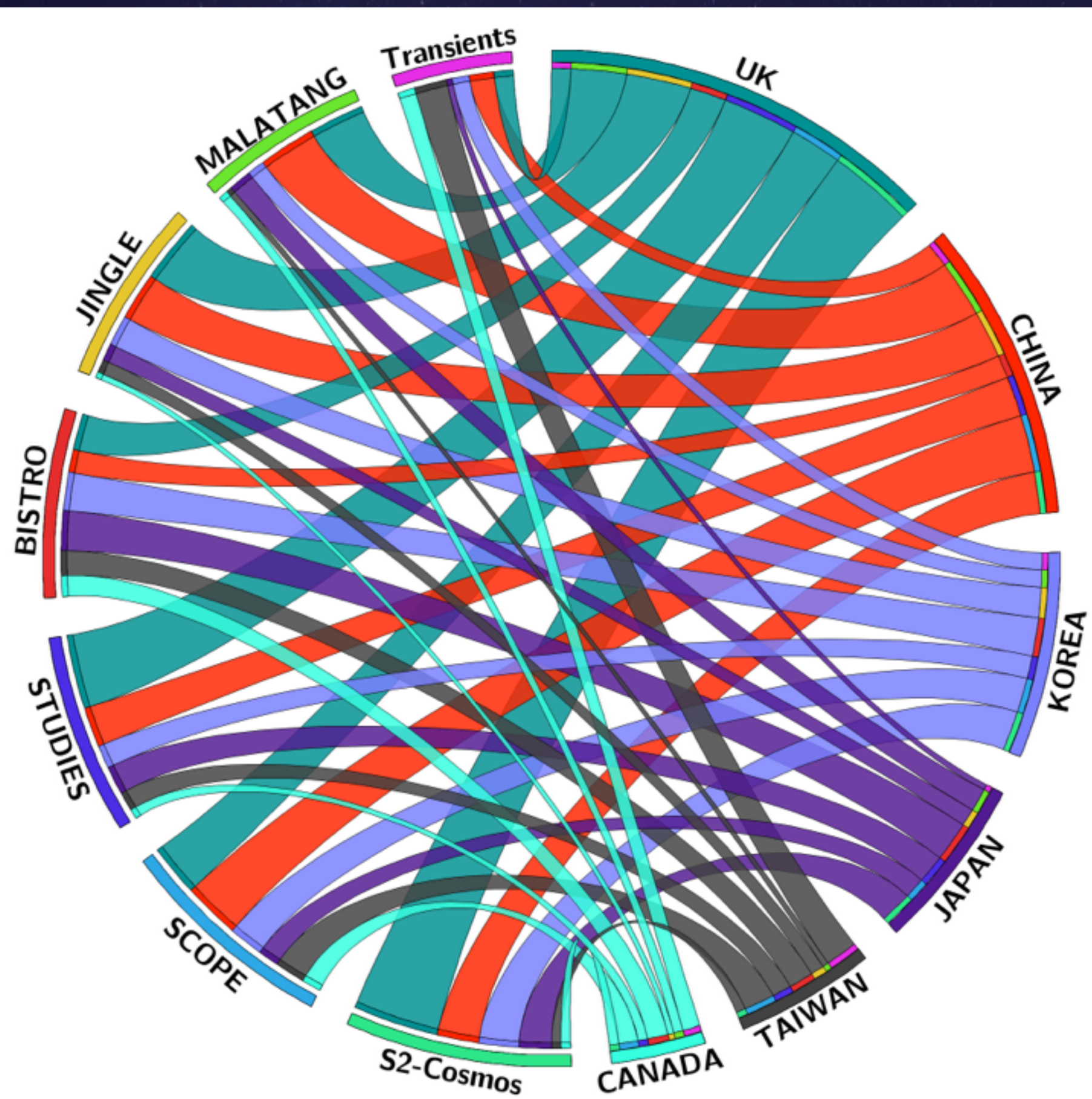
The stick: JCMT Large Programs

- Seven programs awarded 2700 hours of time over three years
- After successful programs were awarded time a period of ‘open enrollment’ allowed any EAO regional astronomer to sign up as a participant in any Large Program: over 600 scientists involved throughout six regions
- Mid-term review in 2017 will allow for further programs as well as determine if current projects are given their time





- Regional participation is roughly proportional to community size (with Canada and Taiwan punching well above their weight)
- This tells us we have projects that are of key interest to all regions

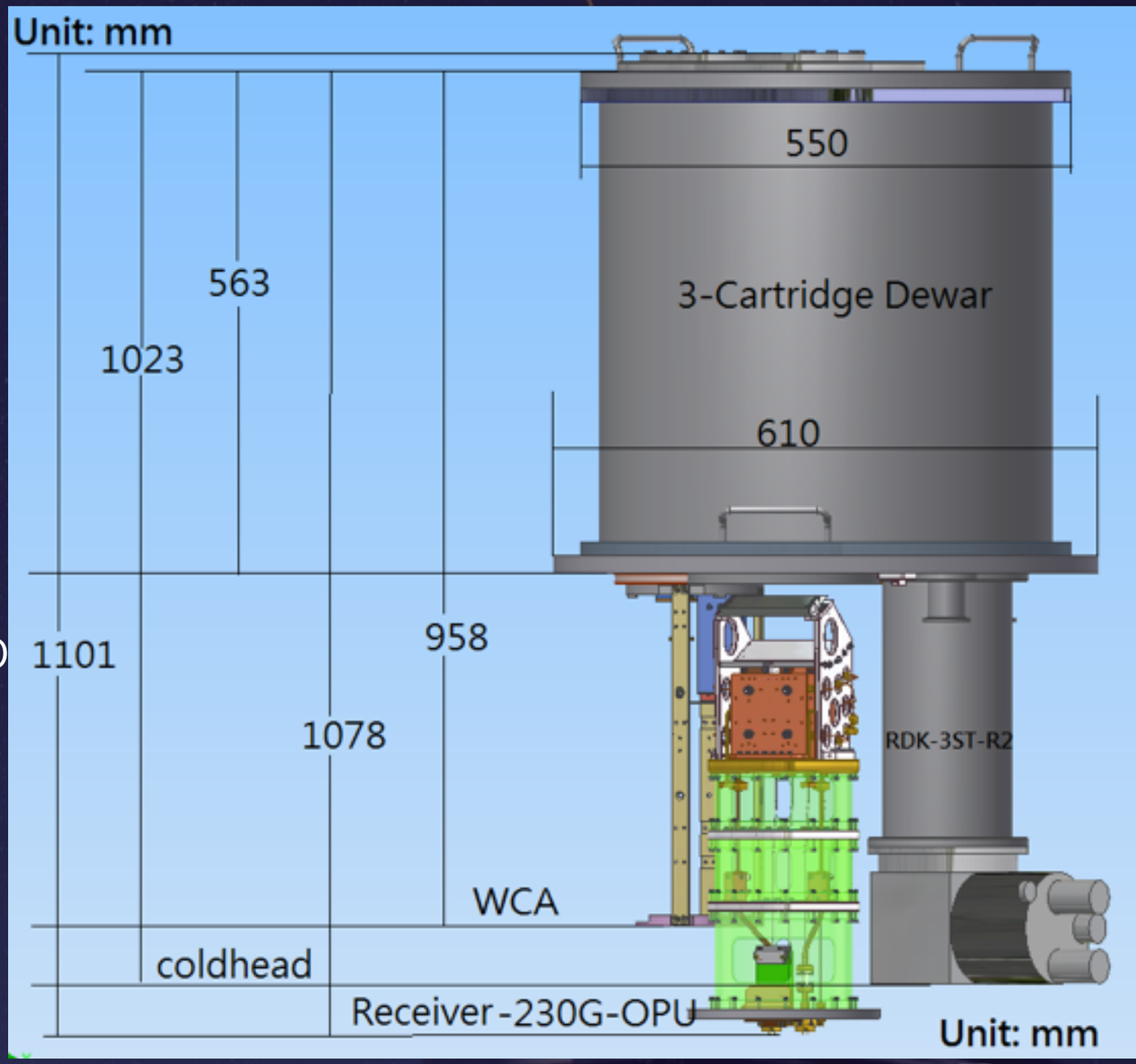
James Clerk Maxwell Telescope
East Asian Observatory

JCMT Instrument Project

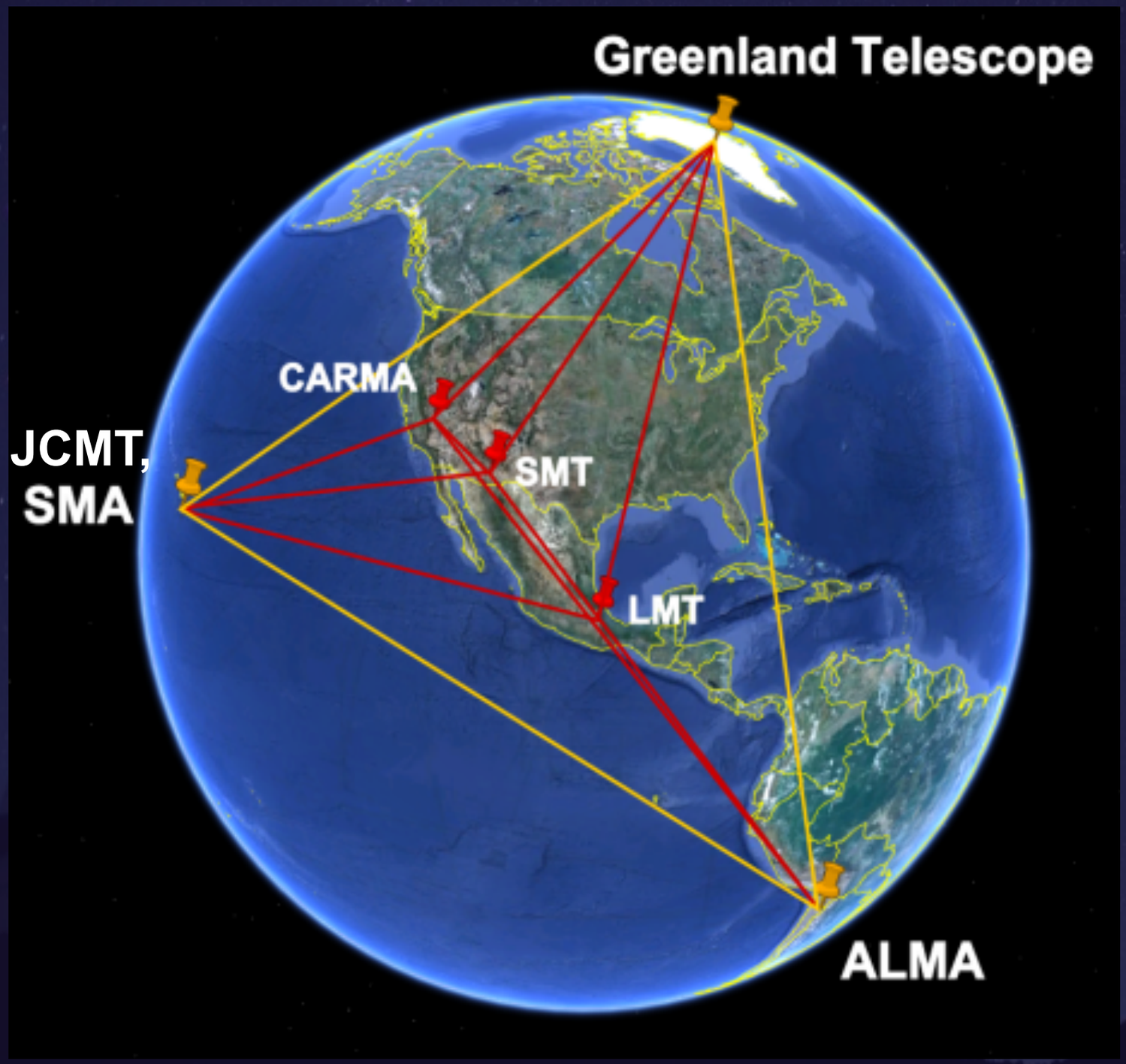
- Our 230GHz receiver is over 20 years old - and the current instrument capabilities do not meet the needs of our critical science - primarily participation in the Event Horizon Telescope VLBI
- HARP, whilst still in good operable condition, is limited in bandwidth and sensitivity
- SCUBA-2 has a higher optical loading than expected, and detector technology is now much further advanced
- JCMT is the largest submillimeter single dish in the world, and will remain so for the next decade - **increasing it's wide-field mapping capabilities brings many new science goals into focus**
- We want to capitalize on the interests and resources of the East Asian regional instrument designers and builders

Current status

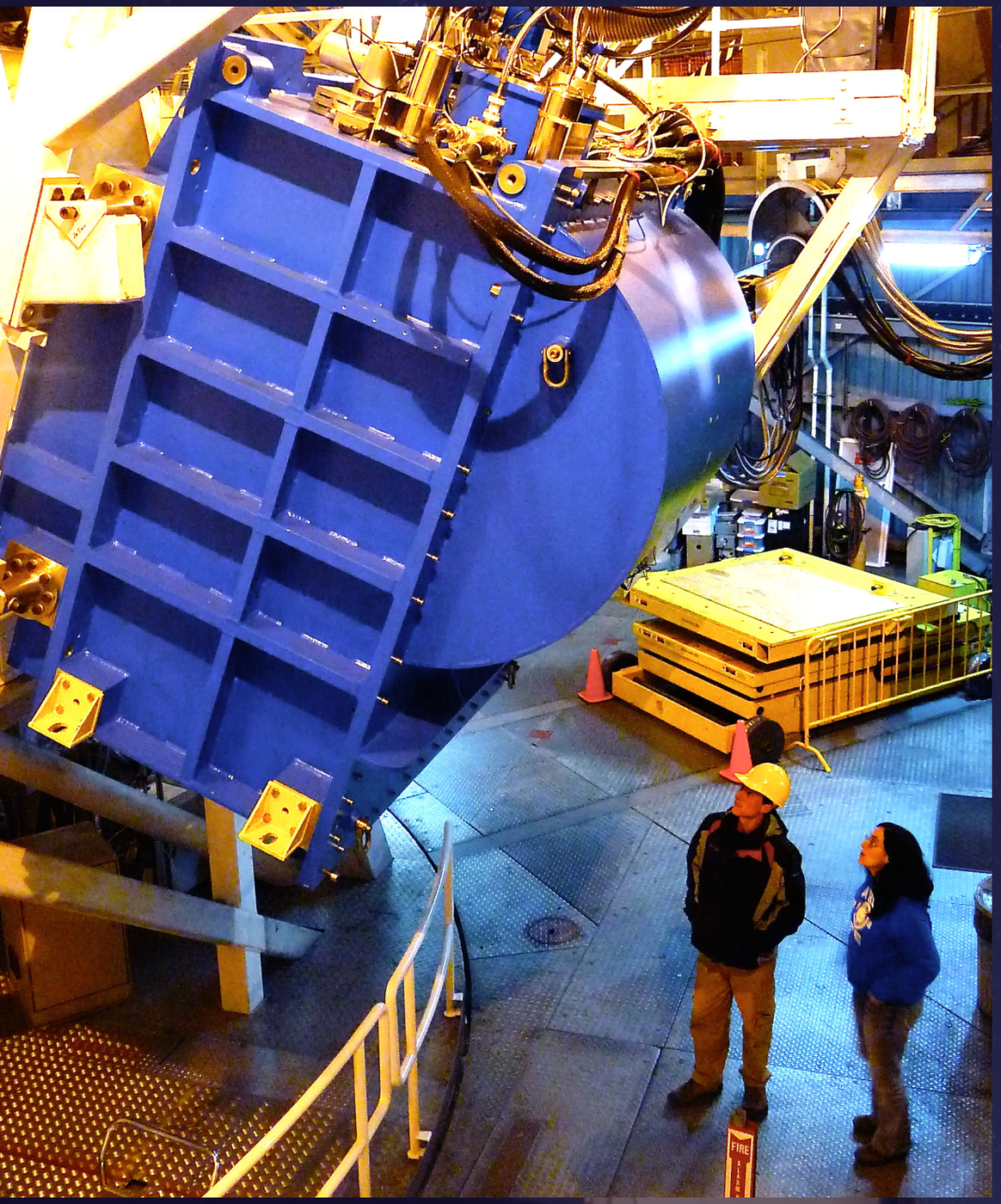
- PoI-2 operation is the most cutting edge opportunity in submillimeter single-dish to date
- New 230GHz receiver - main goals: stand-alone VLBI as well as continued participation in the Event Horizon Telescope - but also opportunities for low-frequency VLBI with East Asia
- SCUBA-2 - new filters will improve mapping speed by x2
- New heterodyne array - 100 pixels



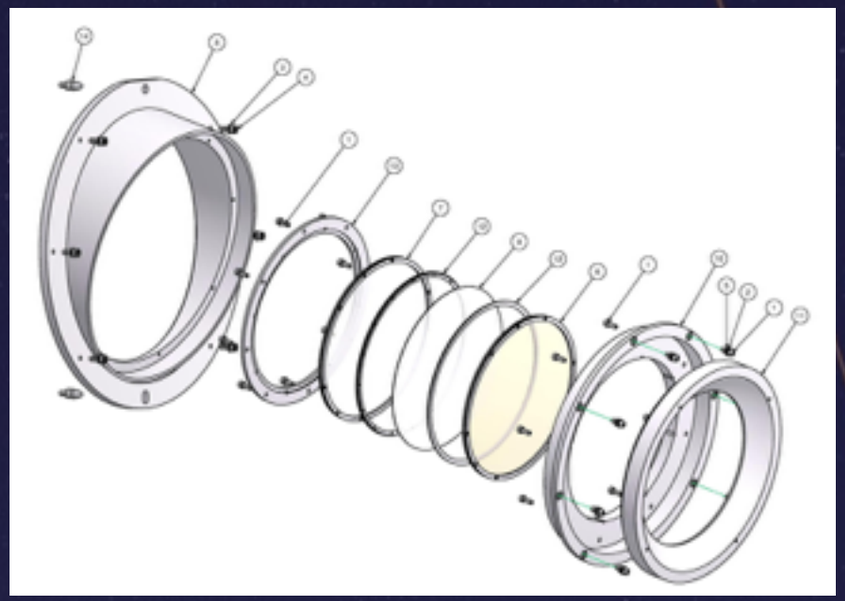
Event Horizon Telescope

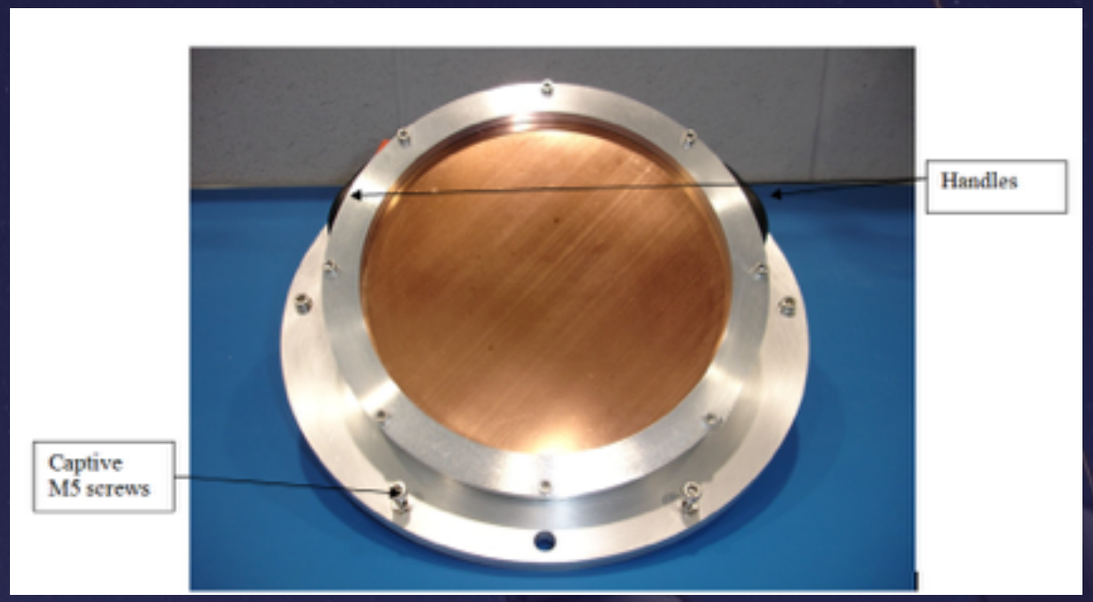


- JCMT is part of EHT
- D ~ 9000 km
- Resolution ~ 10μas
- Goal: Resolve Black Hole shadow; measure spin and mass
- Fringes with ALMA in Sept 2015



SCUBA-2 upgrades





- Filter modeling suggests possible x2 decrease in optical loading
- SCUBA-2 service (replacing PTCs and installing filters): Oct/Nov 2016

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East Asian Observatory

Instrument Project summary

Instrument	Type	Frequency	Pixels	Pols	Bandwidth	Tsys/ NEFD	F.O.V. (arcmin^2)	Map speed (x)	Timescale
RxA (230 - current)	Heterodyne	219 - 272 GHz	1	1	3 - 9 GHz	140	0.1	1.0	
New 230 receiver	Heterodyne	210 - 275 GHz	1	2	4 - 10 GHz	100	0.1	3.9	2017
HARP (345 - current)	Heterodyne	325 - 375 GHz	16	1	3 - 5 GHz	250	2.3	1.0	
New 345 receiver	Heterodyne	320 - 375 GHz	45	2	4 - 8 GHz	200	7.1	8.8	Nov. 2021
SCUBA-2	Continuum	850/450 µm	5120	-	-	93	30.1	1.0	
SCUBA-2+	Continuum	850/450 µm	6400	-	-	35	48.4	11.3	Dec 2016 / Nov 2020

EAO and JCMT meetings

Date	Location	Meeting topic
17-18 October 2016	Shanghai, China	JINGLE meeting
20 - 21 October 2016	Nanjing, China	MALATANG meeting
15 - 16 December 2016	Beijing, China	SCOPE meeting
Jan/Feb 2017	Nanjing, China	Transients meeting
13 - 15 February 2017	**Nanjing, China**	**JCMT Users' meeting**
3 - 7 July 2017	Taipei, TW	Asia Pacific Regional IAU Meeting

What EAO and JCMT needs now…

- **People! We have the work and a plan…but we need more staff to make it all happen**

- **Engineers, instrument scientists, post-docs, students, circus clowns…**

- **Please come and talk to me and Paul!**