What's New in ALMA Cycle 7?

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Atacama Large Millimeter/submillimeter Array
Karl G. Jansky Very Large Array
Very Long Baseline Array

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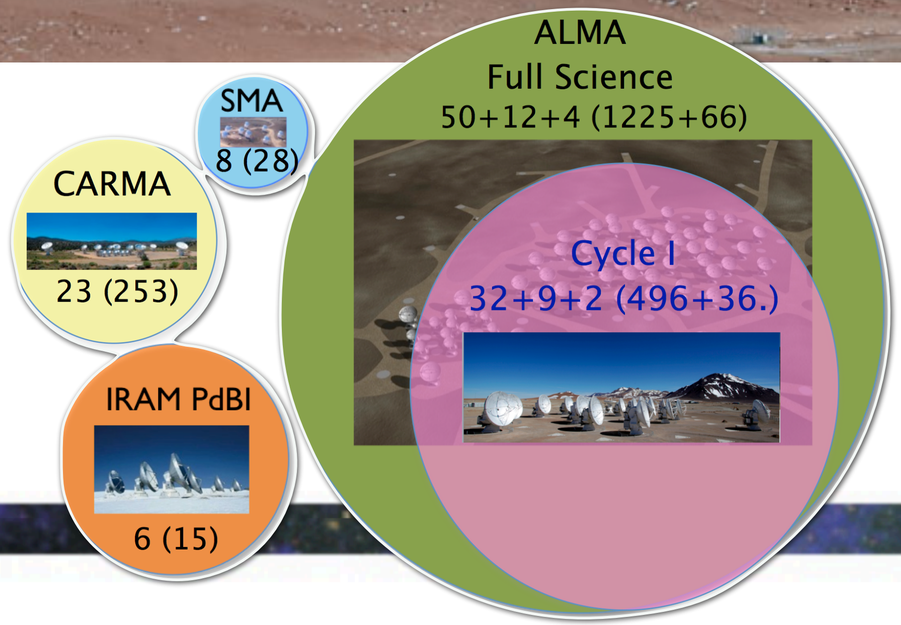
Outline

- ✔ Overview of ALMA capabilities
- ✔ New capabilities in Cycle 7
- ✔ Observing strategies for Cycle 7
- ✔ Sources of support

ALMA: The Atacama Large (sub-)Millimeter Array

66 reconfigurable, high-precision 12m antennas
Array configurations of 150m – 16km baselines
10 observing bands at 0.32mm – 8.5mm
Site at 16,500ft elevation, -23° latitude
Imaging + spectroscopy



10–100x higher sensitivity & resolution

- *Collecting area* → *sensitivity*
- *Longest baseline* → *resolution*
- *No. of baselines* → *image fidelity*

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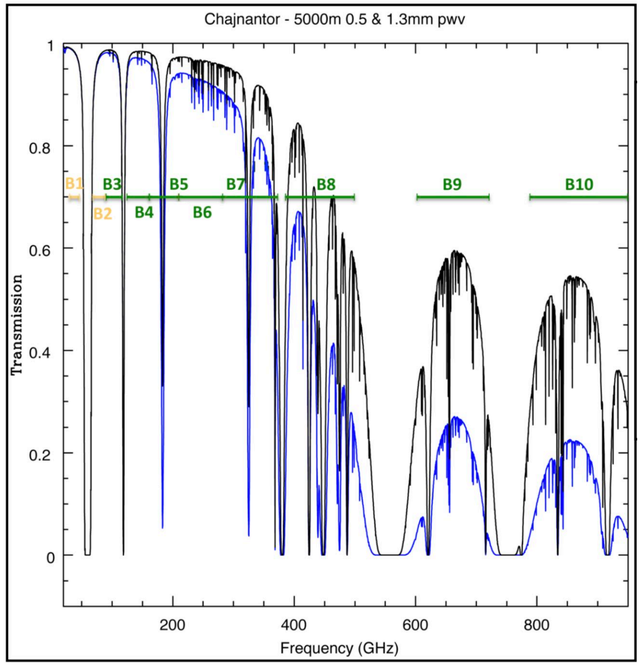
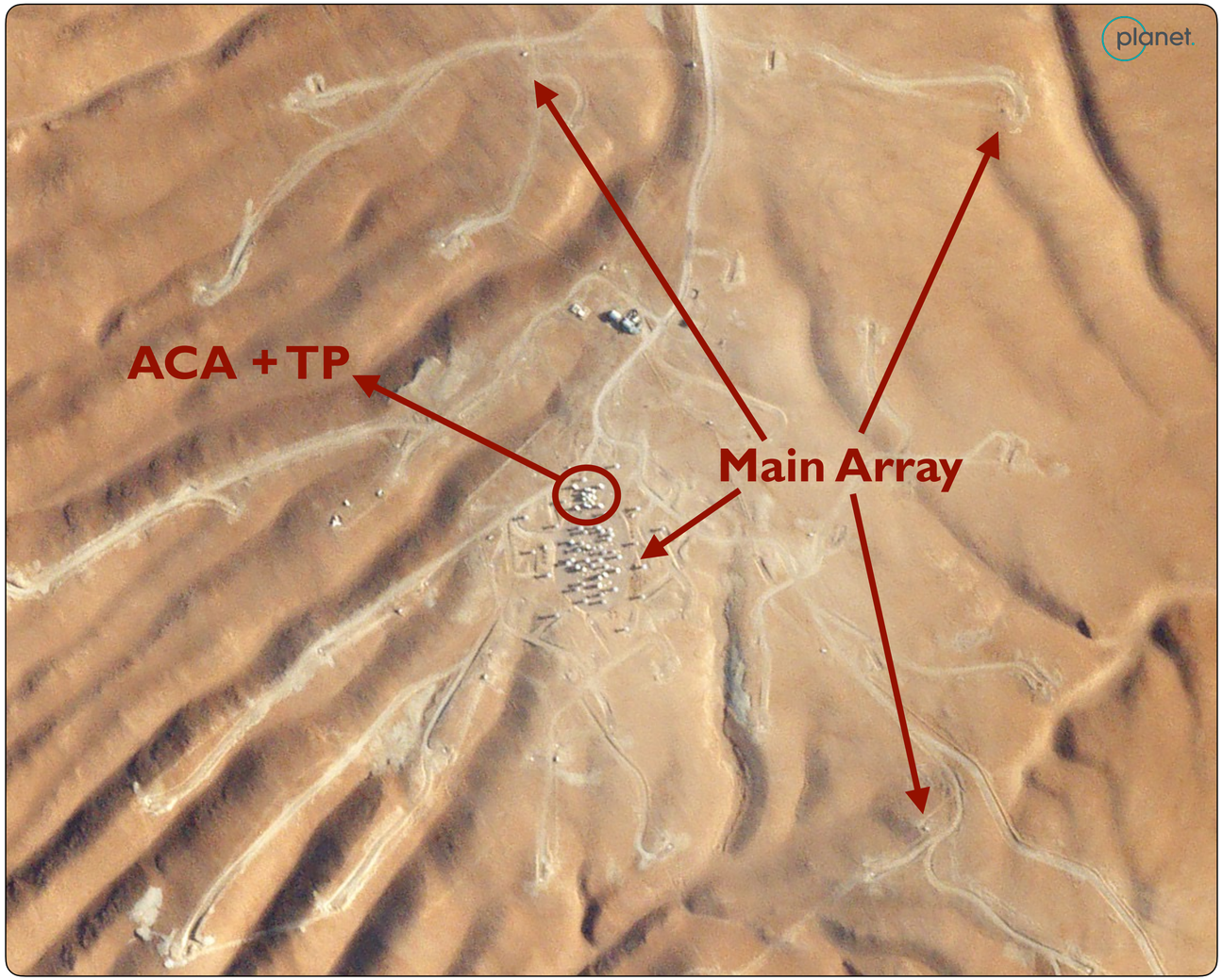
ALMA: Main Array, Compact Array, Total Power Array

ALMA Main Array: *50x12m antennas <=16 km apart*

Compact Array (ACA): *12x7m antennas, closely spaced*

Total Power (TP) Array: *4x12m antennas, acting as one*





ALMA Cycle 7 Capabilities

[see Appendix A of ALMA Proposers' Guide: https://almascience.nrao.edu/documents-and-tools]

	Main Array	ACA	TP
Number of Antennas	43(50)	10(12)	3(4)
Available time (hours)	4300*	3750**	3750

*includes DDT, Cycle 6 carry-over/resubmissions

**750 hr available in supplemental call

Band	3	4	5	6	7	8	9	10
Wavelength (mm)	3.1	2.1	1.6	1.3	0.87	0.74	0.44	0.35
Frequency (GHz)	100	150	183	230	345	460	650	870
Max. Baseline (km)	16	16	16	16	16	3.6	3.6	3.6
Max. Resolution (")	0.042	0.028	0.021	0.018	0.028	0.046	0.033	0.024

ALMA has been since Cycle 5 in "steady state" operations

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ALMA Cycle 7 Capabilities

[see Appendix A of ALMA Proposers' Guide: https://almascience.nrao.edu/documents-and-tools]

Continuum: Main Array + ACA for all bands

Spectral Lines: Main Array + ACA for all bands, TP for bands 3–8

Single-field: Main Array + ACA for all bands

Mosaics: Main Array + ACA for bands 3–9

Polarization: Single-pointing, on-axis, full polarization for continuum & spectroscopy for Main Array for bands 3–7 (min. circular polarization = 1.8% of peak flux)

New in Cycle 7

Long Baselines*: Now available in Band 7 as standard mode (if phase calibrator < 5°)

Spectral Scan Mode: Now 25% faster and considered "standard" observing mode

Solar Observations: Band 7 continuum available in compact configurations

Data Rates: largely relaxed from previous cycles

***No long baselines in Cycle 8! Request them now in Cycle 7, or wait until Cycle 9 and beyond**

Standard vs. Non-Standard Modes

What does "non-standard" mean?

No guarantee that observations can be reduced with the standard pipeline (but still possible / testing)
~20% of time in Cycle 7 will go to non-standard modes (requires additional observatory resources)

What is considered non-standard in Cycle 7?

- *Band 7 observations with baselines > 5 km if calibrator > 5° from science target (OT will tell you)*
- *Band 9 & 10 observations (difficult to calibrate)*
- *All polarization observations*
- *Bandwidth switching projects*
- *Solar observations (only Bands 3, 6, 7)*
- *Astrometric observations (requires special calibrators)*

Timeline for ALMA Cycle 7

Date	Milestone
19 March 2019 (15:00 UT)	Release of Cycle 7 Call for Proposals, Observing Tool (OT), support documents
17 April 2019 (15:00 UT)	Proposal submission deadline **8AM PST, no exceptions for late submissions!**
End of July 2019	Announcement of the outcome of the Proposal Review Process **No science re-reviews / re-grades!**
05 September 2019	Deadline for submission of Phase 2 by PIs **Late P2s are automatically downgraded!**
October 2019	Start of ALMA Cycle 7 Science Observations
September 2020	End of ALMA Cycle 7

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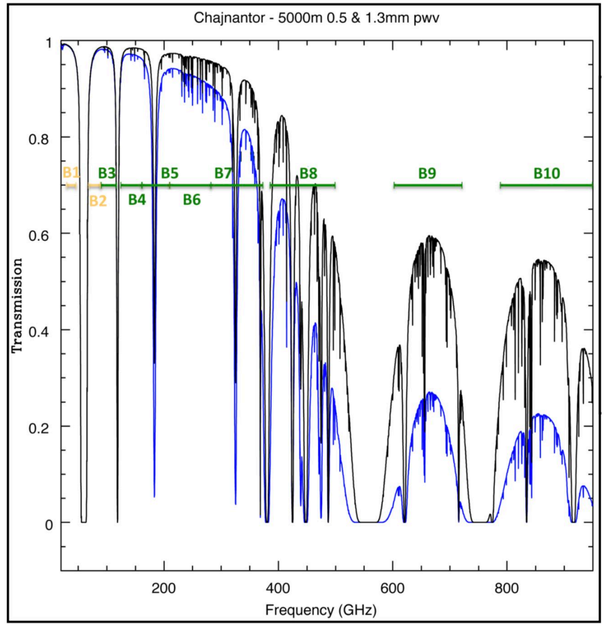
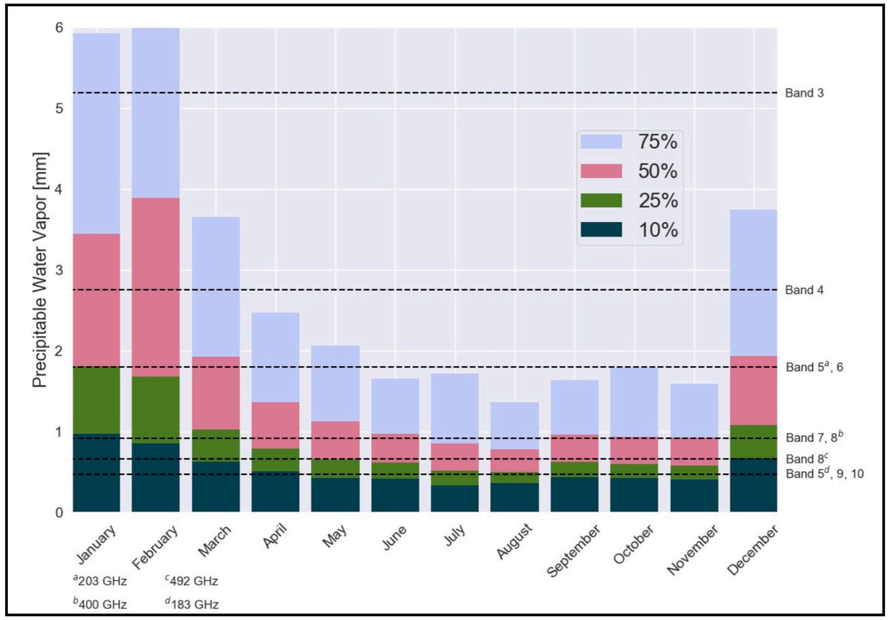
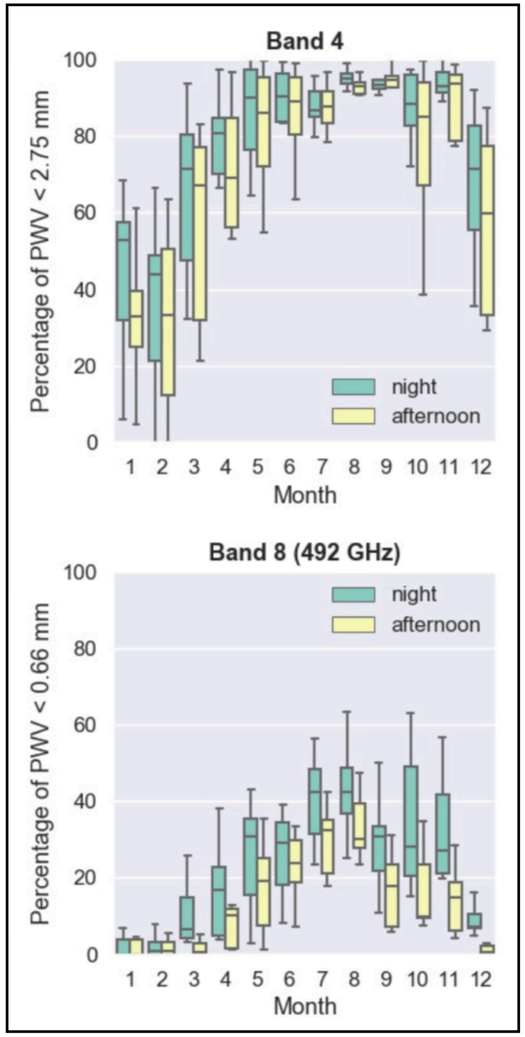
Available Observing Time in Cycle 7

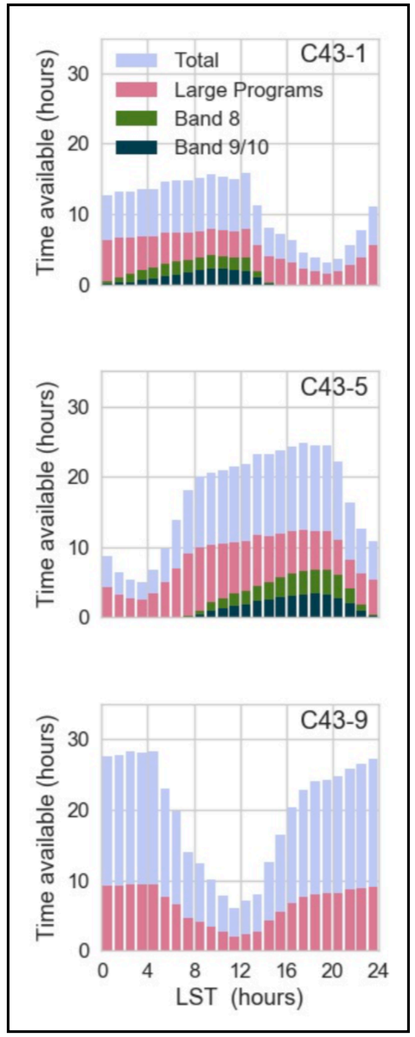
Factors affecting scheduling your observations:

- *Weather (due to yearly / daily cycles)*
- *Requested angular resolution (due to array configuration schedule)*
- *Requested frequency (due to dependence of atmosphere on freq.)*









Available Observing Time in Cycle 7

Some combinations of LST + configurations unavailable for night-time observing

Start date	Configuration	Longest baseline	LST for best observing conditions
2019 October 1	C43-4	0.78 km	~ 22—10 h
2019 October 20	C43-3	0.50 km	~ 23—11 h
2019 November 10	C43-2	0.31 km	~ 1—13 h
2019 November 30	C43-1	0.16 km	~ 2—14 h
2019 December 20	C43-2	0.31 km	~ 4—15 h
2020 January 10	C43-3	0.50 km	~ 5—17 h
2020 February 1	No observations due to maintenance		
2020 March 1	C43-4	0.78 km	~ 8—21 h
2020 March 20	C43-5	1.4 km	~ 9—23 h
2020 April 20	C43-6	2.5 km	~ 11—1 h
2020 May 20	C43-7	3.6 km	~ 13—3 h
2020 June 20	C43-8	8.5 km	~ 15—5 h
2020 July 11	C43-9	13.9 km	~16—6 h
2020 July 30	C43-10	16.2 km	~17—7 h
2020 August 20	C43-9	13.9 km	~19—8 h
2020 September 10	C43-8	8.5 km	~20—9 h

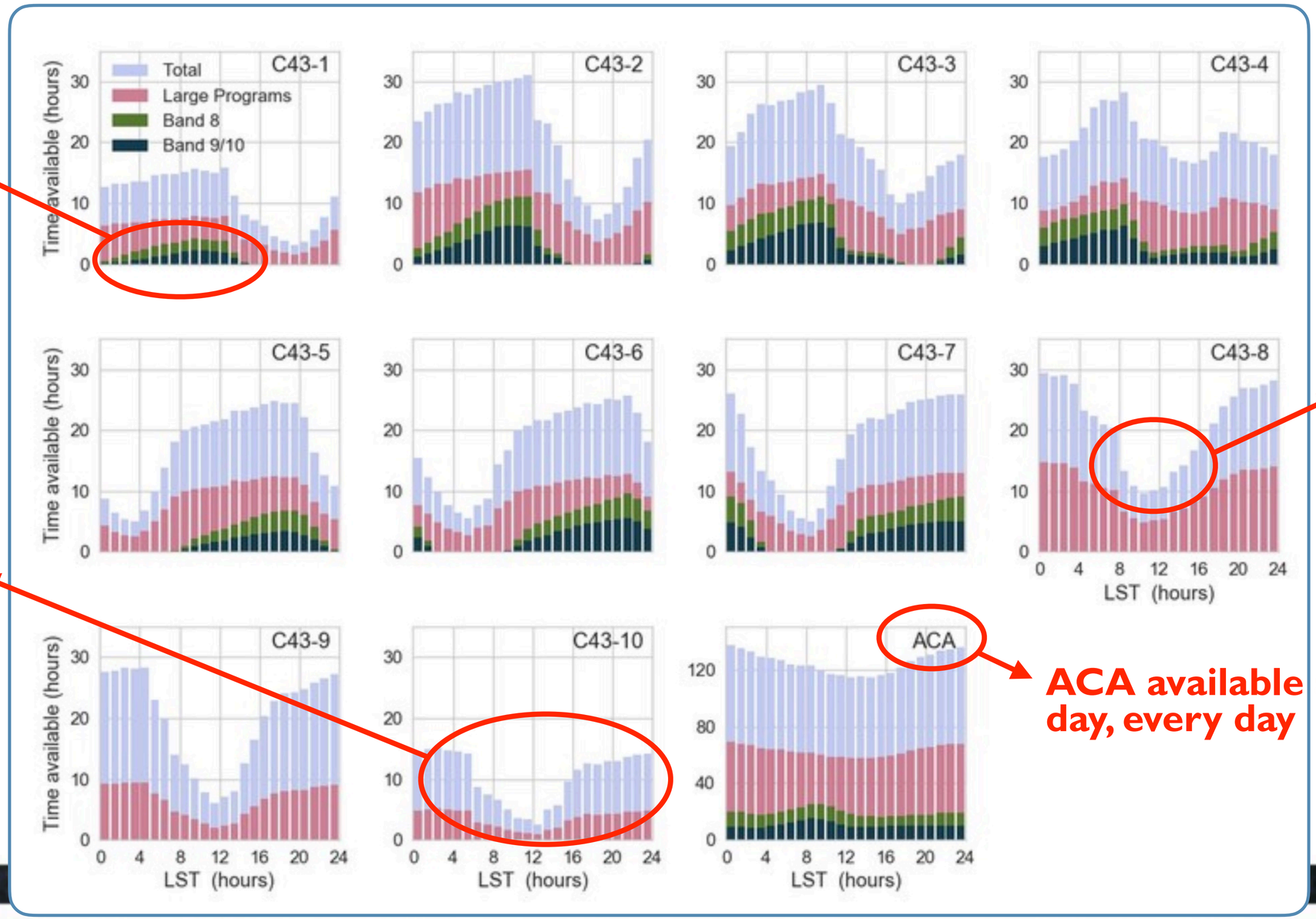
atmosphere stable (2 hrs after sunset; 4 hr after sunrise); B9+B10 priority

proposals outside LST range greatly reduce chances of observation! [excl. Band 3]

bad weather in Feb. used for maintenance

long baselines scheduled during good weather this cycle [no long baselines in Cycle 8!]

Available Observing Time in Cycle 7



High frequency weather is rare

…so are long baselines

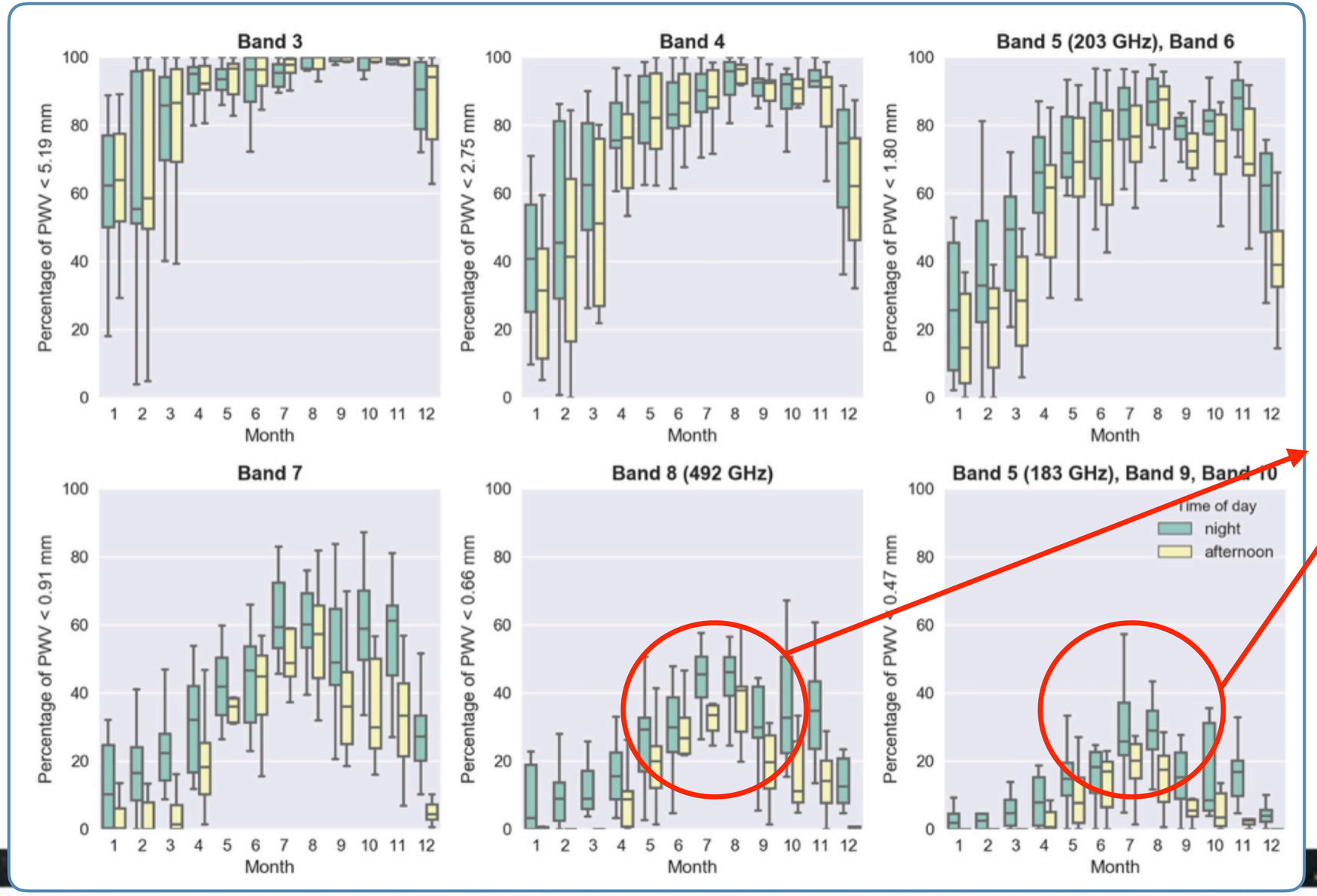
dips in daytime due to weather

ACA available all day, every day

probability of observation depends on available time for given LST + configuration

Available Observing Time in Cycle 7

Band 3 & 4 are easy all year round

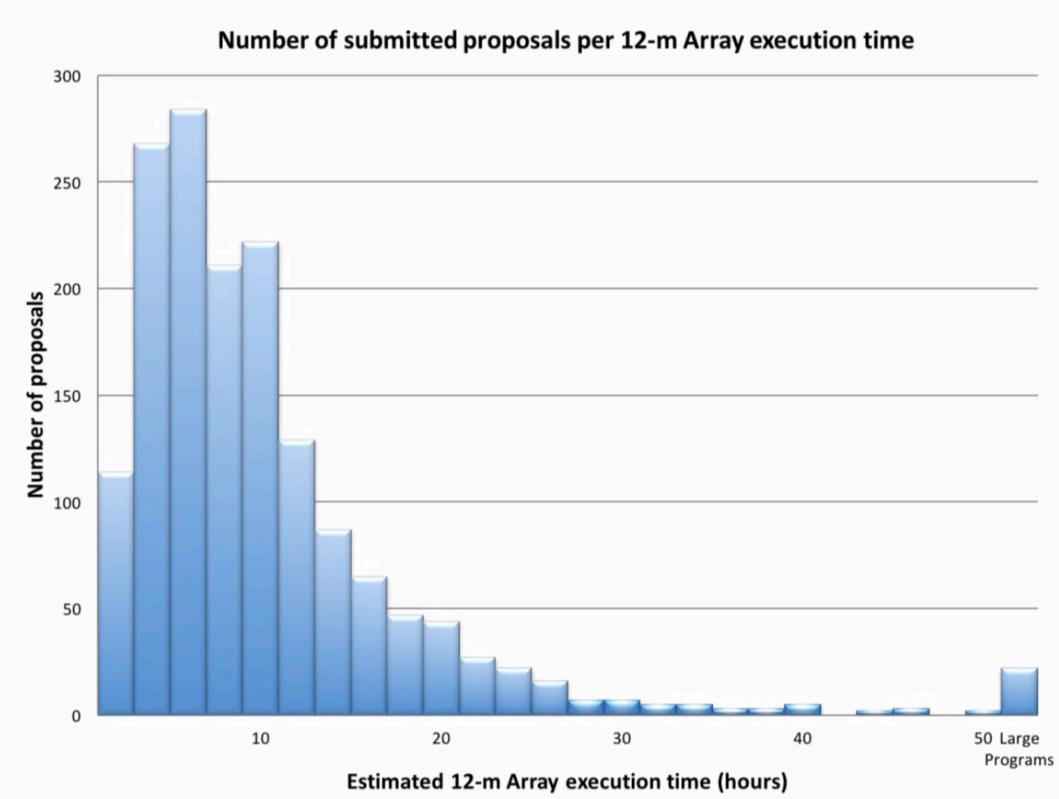


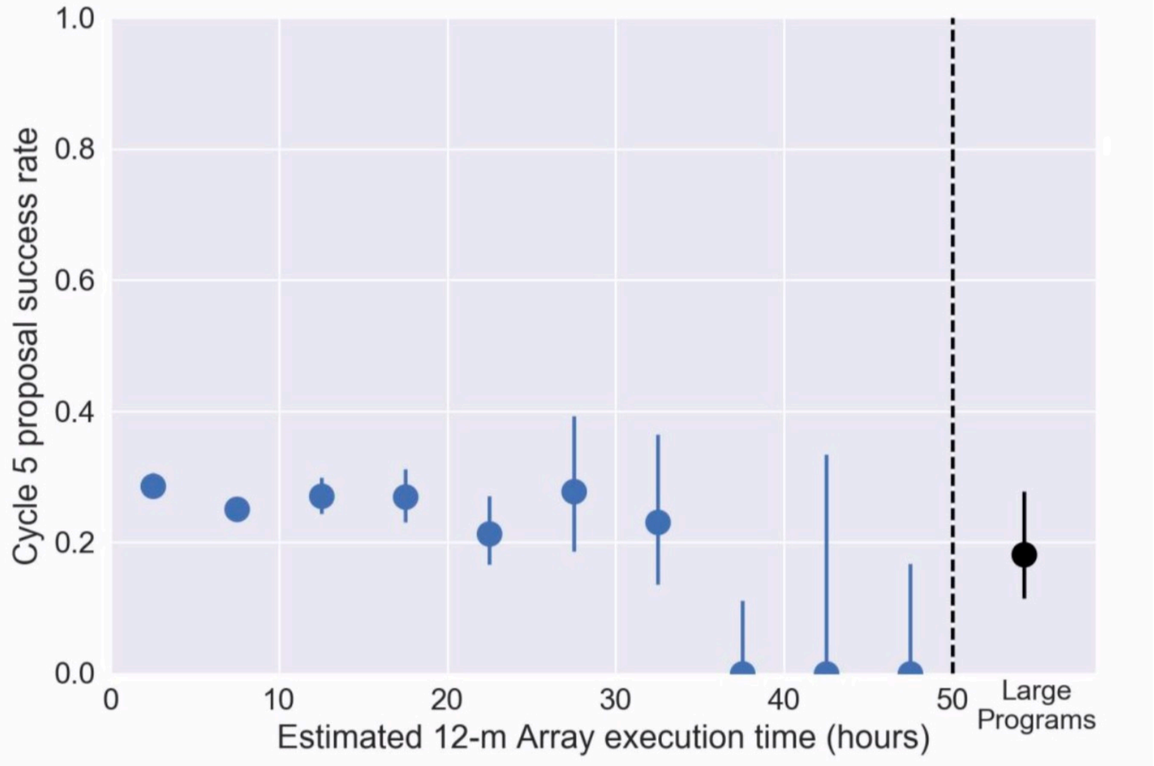
high freq. best in May-Nov.

percentage of time that atmosphere is dry enough to obtain good observations in given band

Proposal Science Case

Acceptance rate does NOT depend on time request (out to ~30 hours)





ACA Supplemental Call

[https://almascience.nrao.edu/proposing/7m-array-supplemental-call]

What: stand-alone ACA call for 750 hours (standard modes only; no time constraints)

When: ~5 months after main call (see next slide for details)

Why: maximize science output of ACA by allowing more timely science

Where: all accepted supplemental proposals will be given "C" priority

ACA Supplemental Call proposals will be peer reviewed through a "distributed review system"

Timeline for ALMA Cycle 7 Supplemental Call

Date	Milestone
03 September 2019	Call for Proposals and Supplemental Call submission server opened
01 October 2019	Deadline to submit Supplemental Call proposals
15 October 2019	Proposals released to reviewers
22 October 2019	Deadline for reviewer to report conflicts of interest on proposal review assignments
12 November 2019	Deadline to submit reviews and ranks
Early December 2020	Notification emails sent to PIs
January 2020	Successful Supplemental Call proposals enter the observing queue

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Resources During Cycle 7 Proposal Process

ALMA Help Desk 24/7 support week leading up to proposal deadline
[https://help.almascience.org/]

Documentation ALMA Primer, Proposer's Guide, Technical Handbook
[https://almascience.nrao.edu/documents-and-tools]

ALMA Ambassador Contact me: ansdell@berkeley.edu