



Cycle 4における太陽観測状況報告 およびCycle5での太陽観測モード

下条圭美

国立天文台・チリ観測所

ALMAの共同利用(観測期間)

Cycle 0 : 2011 October – 2012 August

Cycle 1 : 2013 January – 2014 May

Cycle 2 : 2014 Jun – 2015 September

Cycle 3 : 2015 October – 2016 September

Cycle 4 : 2016 October – 2017 September

アルマ望遠鏡科学観測サイクル4における新機能



Cycle 4のスケジュール

22 March 2016: Released of the ALMA Cycle 4 Call for Proposals.

22 April 2016: Proposal Deadline

9 August 2016: Result of the proposal review sent to Proposers

15 September 2016: Phase 2 Deadline

30 September 2016: Start of ALMA Cycle 4 observations

Feb. Suspension of scientific observations for maintenance (Bolivia Winter) ← 今ここ

30 September 2017: End of ALMA Cycle 4 observations

プロポーザルレビューの結果

応募プロポーザル総数: 1571プロポーザル

Grade A or B rank (優先的に観測): 475 プロポーザル (競争率 3.3倍)

- Grade Aは、観測できなかった場合次のサイクルのキャリアオーバー

Grade C rank (時間が余ったら観測): 232プロポーザル

- 太陽観測はnon-standardのためGrade C カテゴリーは無い。

地域別比較

- EA (Grade A or B / All) : 109/341 → 競争率 **3.13**倍
- EU (Grade A or B / All) : 161/657 → 競争率 4.08倍
- NA (Grade A or B / All) : 153/428 → 競争率 **2.80**倍
- Chile (Grade A or B / All) : 38/100 → 競争率 2.63倍
- Open (Grade A or B / All) : 14/45 → 競争率 3.21倍

EA: 日本・台湾・韓国, EU: ESO加盟国, NA: アメリカ・カナダ・台湾

プロポーザルレビューの結果 (太陽)

Solar Proposals: 53 / Grade-A/B: 15 [競争率 3.53倍] (69.6hrs)

- EA 4 (24 hrs) / NA 8 (29.1hrs) / EU 2 (10.5hrs) / Open 1 (6hrs)

| | Project Code | Title | PI | Exective |
|----|----------------|---|---------------------|----------|
| 1 | 2016.1.00030.S | Energy evaluation of micro- and nano-flaring heating events in solar active regions | Toshifumi Shimizu | EA |
| 2 | 2016.1.00050.S | Solar Chromospheric Heating | Bart De Pontieu | NA |
| 3 | 2016.1.00070.S | High-energy electrons in magnetic reconnection | Masumi Shimojo | EA |
| 4 | 2016.1.00156.S | Wave Heating in Solar Prominences | Joten Okamoto | EA |
| 5 | 2016.1.00166.S | Measuring the Chromospheric Thermal Structure in Active Regions on the Sun | Gregory D Fleishman | NA |
| 6 | 2016.1.00182.S | A Study of Solar Spicules at Millimeter, Optical, UV, and EUV Wavelengths | Tim Bastian | NA |
| 7 | 2016.1.00201.S | Magnetohydrodynamic mechanisms of jets in the solar chromosphere | Takaaki Yokoyama | EA |
| 8 | 2016.1.00202.S | Dynamics and energetics of the quiet-sun solar chromosphere | Stephen M White | NA |
| 9 | 2016.1.00298.S | Constraining the temperature and heating mechanisms in the solar plage chromosphere | Jorrit Leenaarts | EU |
| 10 | 2016.1.00423.S | Towards solving the Sun's chromospheric/coronal heating problem | Sven Wedemeyer | Open Sky |
| 11 | 2016.1.00572.S | A first look at the quiet Sun with ALMA | Tim Bastian | NA |
| 12 | 2016.1.00788.S | Microflares in the Chromosphere with ALMA | Adam Kobelski | NA |
| 13 | 2016.1.01129.S | Turbulence and Wave Propagation in the Solar Internetwork | Kevin Reardon | NA |
| 14 | 2016.1.01408.S | The Cool Alter Ego of the Solar Corona | Patrick Antolin | EU |
| 15 | 2016.1.01532.S | Unveiling the Nature of Small-Scale Energy Release Events in the Low Solar Atmosphere | Bin Chen | NA |

アバウトな分類

AR: 4.5 QS: 3.5 Spicule(Limb):2 (micro)Flare: 3 Prominence: 1 Non-thermal(flare): 1

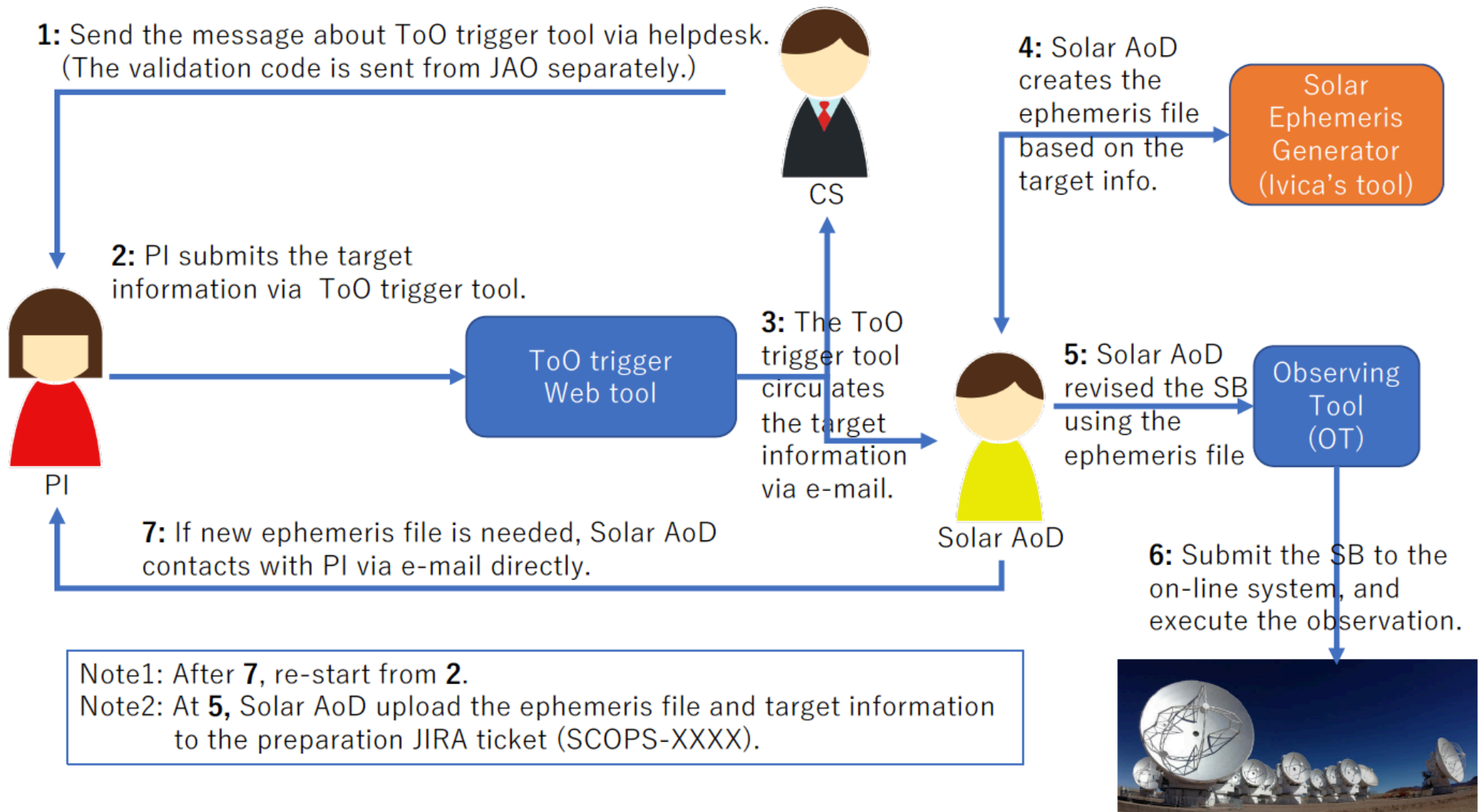
Cycle 4 (実際の) アンテナ配置スケジュール

| Start date | End date | Purpose | Approx Config. ¹ | min - max baseline (m) | beam ² (") | maximum recoverable scale ² (") | |
|------------|------------|-----------------------------|-----------------------------|------------------------|-----------------------|--|--|
| 2016-09-30 | 2016-10-15 | PI (Observing Report) | C40-6 | 15-1800 | 0.35" | 3.1" | |
| 2016-10-15 | 2016-11-13 | PI (Observing Report) | C40-5 | 17-1100 | 0.54" | 6.0" | |
| 2016-11-13 | 2016-12-08 | PI (Observing Report) | C40-4 | 15-704 | 0.93" | 8.9" | |
| 2016-12-08 | 2017-01-08 | PI (Observing Report) | C40-3 | 15-460 | 1.5" | 13.7" | |
| 2017-01-08 | 2017-02-01 | PI (Observing Report) | C40-2 | 15-273 | 2.4" | 22.1" | |
| 2017-02-01 | 2017-03-10 | February Maintenance Period | | | | | |
| 2017-03-10 | 2017-04-22 | | C40-1 | 15-155 | 3.7" | 29.0" | |
| 2017-04-22 | 2017-05-15 | | C40-3 | 15-460 | 1.5" | 13.7" | |
| 2017-05-15 | 2017-06-23 | | C40-5 | 17-1100 | 0.54" | 6.0" | |
| 2017-06-23 | 2017-07-26 | | C40-9 | 271-12600 | 0.066" | 0.78" | |
| 2017-07-26 | 2017-09-08 | | C40-8 | 168-6800 | 0.12" | 1.3" | |
| 2017-09-08 | 2017-09-30 | | C40-7 | 81-3700 | 0.21" | 1.8" | |
| | | End of Cycle 4 | | | | | |

← 12月に太陽キャンペーン開催



PIとのコミュニケーションプラン



Cycle 4 (実際の) アンテナ配置スケジュール

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← 12月に太陽キャンペーン開催



Cycle 5のスケジュール

| | |
|-------------------|---|
| 21 March 2017 | Release of the ALMA Cycle 5 Call for Proposals and Observing Tool, and opening of archive for proposal submission |
| 20 April 2017 | Proposal deadline |
| End of July 2017 | Result of the proposal review sent to Proposers |
| 15 September 2017 | Submission of Phase 2 by Proposers |
| October 2017 | Start of ALMA Cycle 5 observations |
| September 2018 | End of Cycle 5 observations |

ほぼ、Cycle4と同じスケジュール

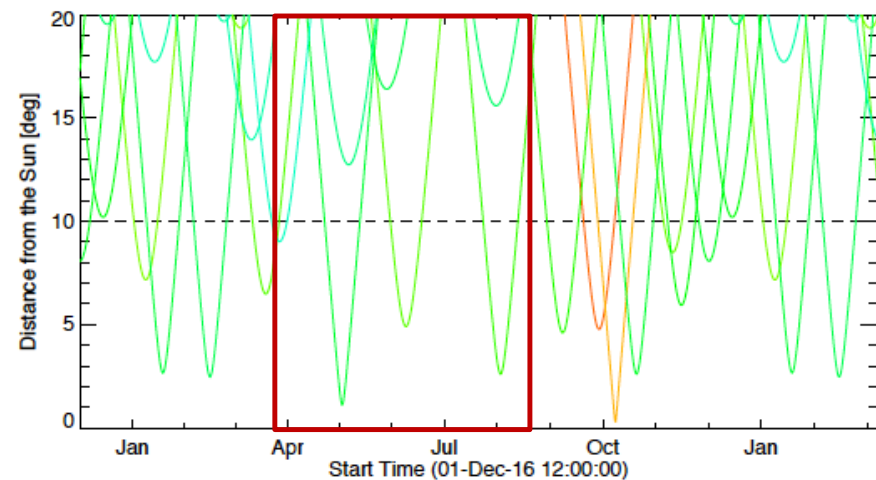
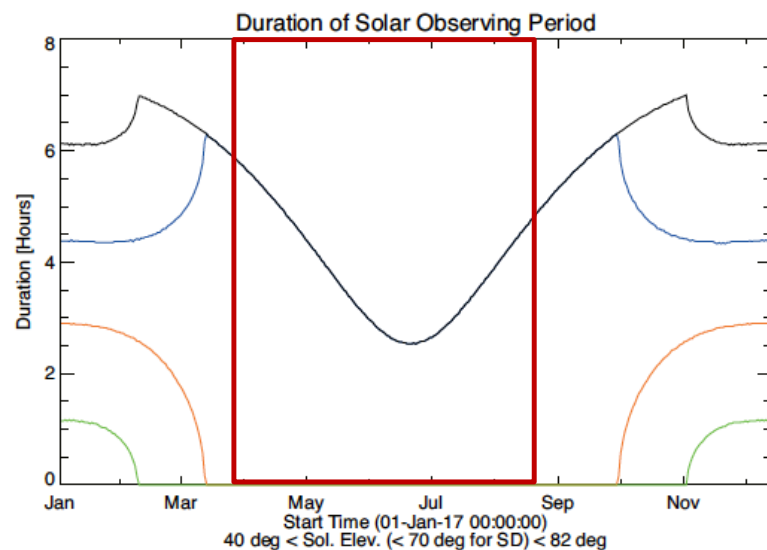
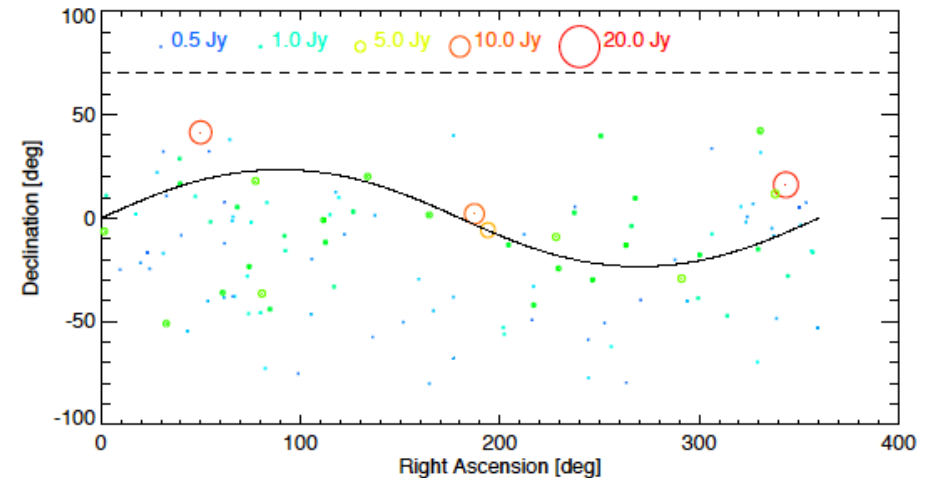
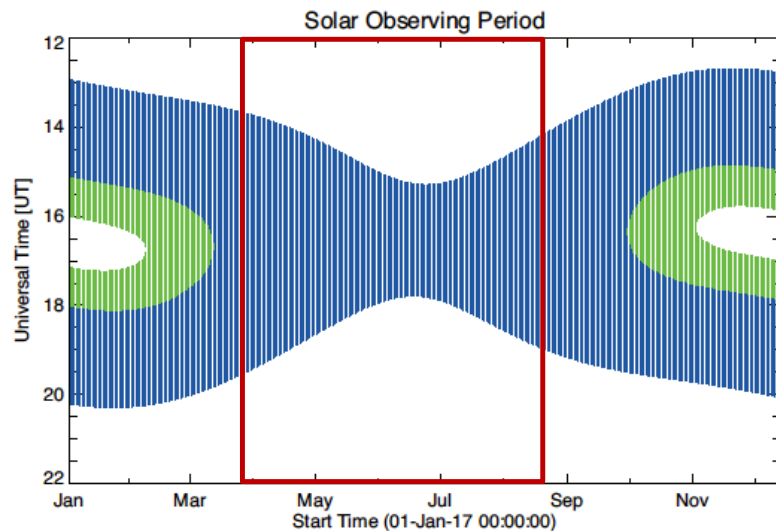
Cycle 5のアンテナ配置スケジュール(案)

Table 1: Cycle 5 Configuration Schedule

| Start date | Configuration | Longest baseline | LST for best observing conditions |
|--------------------|--|------------------|-----------------------------------|
| 2017 October 1 | C43-7 | 3.7 km | ~ 21h - 10h |
| 2017 October 5 | C43-8 | 6.8 km | ~ 22h - 11h |
| 2017 October 25 | C43-9 | 12.8 km | ~ 23h - 12h |
| 2017 November 10 | C43-10 | 16.5 km | ~ 1h - 13h |
| 2017 December 1-18 | No observations due to large antenna reconfiguration | | |
| 2017 December 19 | C43-6 | 1.8 km | ~ 4h - 15h |
| 2018 January 10 | C43-5 | 1.1 km | ~ 5h - 17h |
| 2018 February 1-28 | No observations due to February shutdown | | |
| 2018 March 1 | C43-4 | 0.7 km | ~ 8h - 21h |
| 2018 March 30 | C43-3 | 0.46 km | ~ 10h - 0h |
| 2018 May 15 | C43-2 | 0.27 km | ~ 12h - 3h |
| 2018 June 15 | C43-1 | 0.15 km | ~ 14h - 5h |
| 2018 July 15 | C43-2 | 0.27 km | ~ 17h - 7h |
| 2018 August 15 | C43-3 | 0.46 km | ~ 18h - 8h |
| 2018 August 30 | C43-4 | 0.7 km | ~ 19h - 9h |
| 2018 September 15 | C43-5 | 1.1 km | ~ 20h - 10h |



太陽観測可能な時間帯と 較正源が太陽に近くにある時期を考えると、 7月初旬は太陽観測に不向き



Cycle 5の太陽観測のモードはCycle 4と全く同じ。

The observing frequencies for solar observations are **100GHz** (3.0 mm: Band 3 receiver) and **239 GHz** (1.25mm: Band 6 Receiver).

Antenna Configuration (Spatial Resolution):

- **C43-1: 3.7" , C43-2:2.4" , C43-3:1.5"@100GHz**
- **C43-1: 1.6" , C43-2:1.0" , C43-3:0.6"@239GHz**

Field of View (for interferometric observations)

- **Single-Pointing: 60" @100GHz / 25" @239GHz**
- **MOSAIC (150 pointings): 300" x 300" @ 100GHz / 120" x 120" @239GHz**
(Rectangular FoV is available).

Time cadence of images

- Single-pointing: 2 seconds/image
- MOSAIC: one map per 1point/7sec X # of pointing + alpha

ただ、制限は増えそう(推測)。

Band3 と Band6の同日観測要求は基本却下されそう。

- Band6の観測可能気象条件が、意外に厳しい。
- 12月のキャンペーンの後半は、Band6の観測の機会がかなり無かった。
- ただ、12月は気象条件が悪い季節なので。。。

C43-1が6月15日～7月15日

- 1日あたりの太陽観測可能時間: ~3 hrs.
- 7月初旬に明るいクエーサー(較正源)が、太陽の近く(離角 $<15^\circ$)にない。

Cycle 5についてのまとめ

Call for Proposalなどのスケジュールは、Cycle 4と同じ。

太陽観測可能期間はCycle 4(12,1,3,4月)と違い4,5,6,7,8月

- ただし、7月(C43-1)には、太陽観測に対し制限が多い。

観測モード(観測パラメータ)は、Cycle4と全く同じ。



www.almaobservatory.org

The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership among Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and in Japan by the National Institutes of Natural Sciences (NINS) in cooperation with the Academia Sinica (AS) in Taiwan and the Korea Astronomy and Space Science Institute (KASI). ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI) and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.