ALMA Cycle 6: Selection Statistics

Proposal Review Process

A total of 1836 proposals were submitted in response to the ALMA Cycle 6 Call for Proposals. The proposals were reviewed during a meeting in Tokyo (Japan) on 18-23 June 2018. The review committee consisted of 146 Science Assessors grouped into 18 ALMA Review Panels (ARP) that were distributed across five scientific categories:

1. Cosmology and the high redshift universe (4 panels)
2. Galaxies and galactic nuclei (4 panels)
3. ISM, star formation and astrochemistry (4 panels)
4. Circumstellar disks, exoplanets and the solar system (4 panels)
5. Stellar evolution and the Sun (2 panels).

The Review Panels in Categories 1-4 contained eight Science Assessors each, while the Panels in Category 5 contained nine members each. Science Assessors were selected on the basis of scientific specialization while having a regional affiliation that closely matched the nominal ALMA regional shares of observing time. The full list of Science Assessors is provided in the Appendix.

The 18 Panel Chairs served on the ALMA Proposal Review Committee (APRC) together with the APRC Chair, Masao Saito. The Review Panels conducted the initial scientific reviews and recommended which Large Proposals should be further discussed by the APRC. The APRC conducted the final review to recommend which Large Programs should be scheduled.

The Joint ALMA Observatory (JAO) created an observing queue and assigned a priority grade to each proposal after considering the scientific rank determined from the review process, the share of observing time for each region, and proposal pressure for the various configurations and right ascension. Priority Grade A was assigned to the top ranked proposals up to a cumulative sum of ~1333 h of requested 12-m Array observing time. Grade B was assigned to high ranked proposals to fill the remaining time. Grade C was assigned to proposals that oversubscribed the time in a configuration by approximately 50%.

Proposal statistics

Of the 1836 proposals submitted, 100 received the highest priority of Grade A, 269 received Grade B, and 292 received Grade C. The Grade A and B proposals requested an estimated 3840 h of execution time on the 12-m Array. Together with the estimated 180 h of Cycle 4 Grade A proposals that will be carried forward to Cycle 6, this constitutes the 4000 h of 12-m Array time expected to be available for successful executions in Cycle 6.

The titles, investigators, and abstracts of the Grade A and B projects are available from the ALMA Science Portal. Tables 1 and 2 list the number and requested time for proposals grouped by region and science category, respectively. Table 3 lists the number of Grade A and B projects for different proposal types. Various metrics of the proposal data are presented in the figures.

Eighteen Large Proposals were submitted in Cycle 6. As recommended by the APRC, the following four Large Programs were scheduled :

1. *ALMA Lensing Cluster Survey* (2018.1.00035.L)
   PI: Kotaro Kohno (EA); coPIs: Franz Bauer (CL), Marc Postman (NA), Keiichi Umetsu (EA), Jean-Paul Kneib (EU), Masamune Oguri (EA), Eiichi Egami (NA), Johan Richard (EU), Masami Ouchi (EA), and Dan Coe (NA)

2. *ATOMIUM: ALMA Tracing the Origins of Molecules in dUst-forming oxygen-rich M-type stars* (2018.1.00659.L)
   PI: Leen Decin (EU); co-PI: Carl Gottlieb (NA)

3. *The Chemistry of Planet Formation* (2018.1.01055.L)
   PI: Karin Öberg (NA); coPIs: Edwin Bergin (NA), Catherine Walsh (EU), Yuri Aikawa (EA), and Viviana Guzman (CL)

4. *Fifty AU STudy of the chemistry in the disk/envelope system of Solar-like protstars (FAUST)* (2018.1.01205.L)
   PI: Satoshi Yamamoto (EA); co-PIs: Cecilia Ceccarelli (EU), Claire Chandler (NA), Claudio Codella (EU), and Nami Sakai (EA)

Collectively these four Large Programs were assigned 446 h on the 12-m Array and 46 hours on the 7-m Array.

Table 1. Distribution of proposals by region

	Chile (CL)	East Asia (EA)	Europe (EU)	North America (NA)	Open Skies	Total
Submitted Proposals						
Number of proposals	108	366	781	525	56	1836
12-m Array time (hours)	1208	4022	8344	5755	361	19690
7-m Array time (hours)	903	2127	4202	3358	325	10914
Total Power Array time (hours)	344	1976	2612	2140	54	7126
Subscription rate						
12-m Array (4000 h offered)	3	4.5	6.2	4.3	N/A	4.9
7-m Array time (3000 h offered)	3	3.2	4.1	3.3	N/A	3.6
Total Power Array (3000 h offered)	1.1	2.9	2.6	2.1	N/A	2.4
Grade A & B projects						
Number of proposals	36	74	125	129	5	369
12-m Array time (hours)	393	845	1275	1298	30	3840
7-m Array time (hours)	135	449	587	750	147	2067
Total Power Array time (hours)	15	370	397	458	3	1243
Grade C projects						
Number of proposals	21	50	125	88	9	292
12-m Array time (hours)	188	521	1008	818	47	2582
7-m Array time (hours)	198	250	961	458	33	1899
Total Power Array time (hours)	0	124	526	301	25	976

Table 2. Distribution of proposals by scientific category

	Category 1	Category 2	Category 3	Category 4	Category 5	Total
Submitted Proposals						
Number of proposals	434	415	436	391	160	1836
12-m Array time (hours)	6086	4569	3959	3761	1315	19690
7-m Array time (hours)	1112	2605	5830	811	556	10914
Total Power Array time (hours)	14	1468	5431	76	137	7126
Grade A & B projects						
Number of proposals	85	84	93	75	32	369
12-m Array time (hours)	995	954	808	748	334	3840
7-m Array time (hours)	408	383	1094	108	75	2067
Total Power Array time (hours)	0	366	795	31	51	1243
Grade C projects						
Number of proposals	63	68	82	56	23	292
12-m Array time (hours)	822	555	544	444	217	2582
7-m Array time (hours)	108	540	993	127	130	1899
Total Power Array time (hours)	0	273	699	0	4	976

Table 3. Number of proposals and Grade A & B projects by proposal type

Proposal Type	Number Submitted	Number Grade A & B	Acceptance Rate (%)
All	1836	369	20
ACA	407	77	19
ACA Standalone	111	27	24
Large Programs	18	4	22
Polarization (ex. VLBI)	123	41	33
Solar	32	9	28
Solar System	54	11	20
Target of Opportunity	22	16	73
VLBI	20	8	40

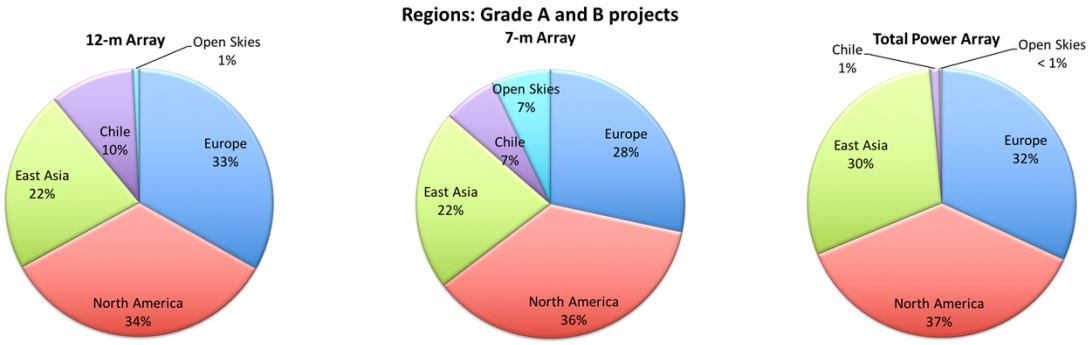

Figure 1. Distribution of the estimated execution time for Grade A and B projects by region for the 12-m (left), 7-m (center), and Total Power (right) arrays. The results for the 7-m and Total Power arrays include both ACA standalone proposals and proposals requesting the 12-m Array + ACA.

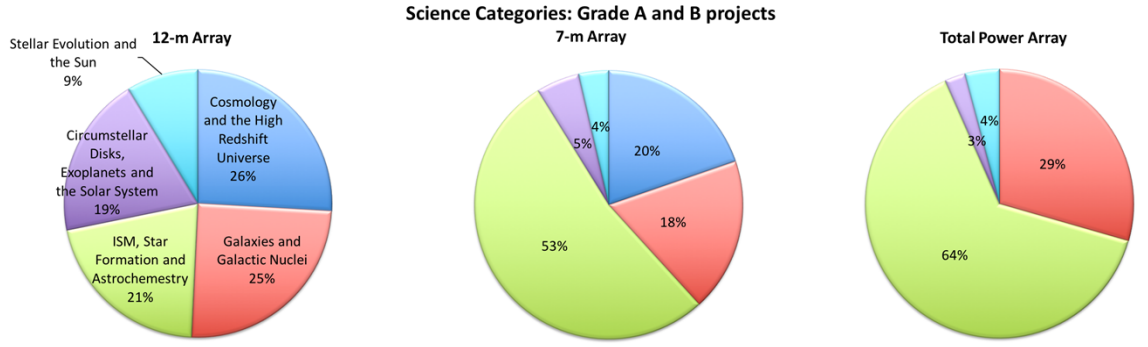

Figure 2. Distribution of the estimated execution time for Grade A and B projects by science category for the 12-m (left), 7-m (center), and Total Power (right) arrays. The results for the 7-m and Total Power arrays include both ACA standalone proposals and proposals requesting the 12-m Array + ACA.

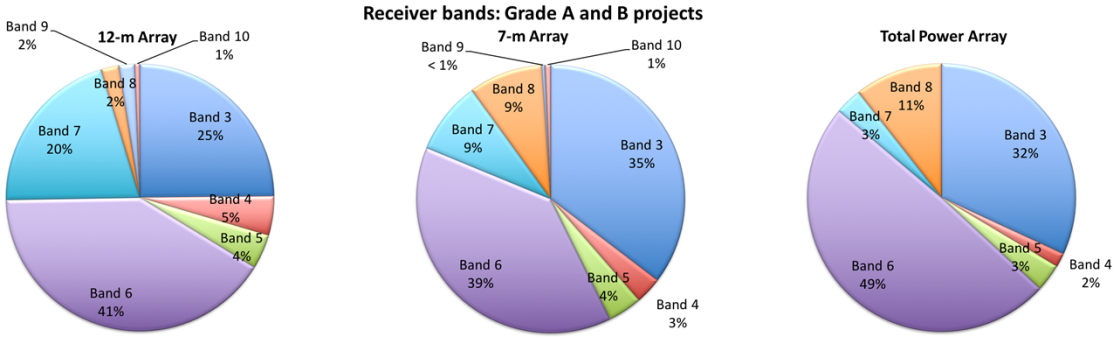

Figure 3. Distribution of the scheduled execution time for Grade A and B projects by receiver band for the 12-m (left), 7-m Array (center), and Total Power (right) arrays. The results for the 7-m and Total Power arrays include both ACA standalone proposals and proposals requesting the 12-m Array + ACA.

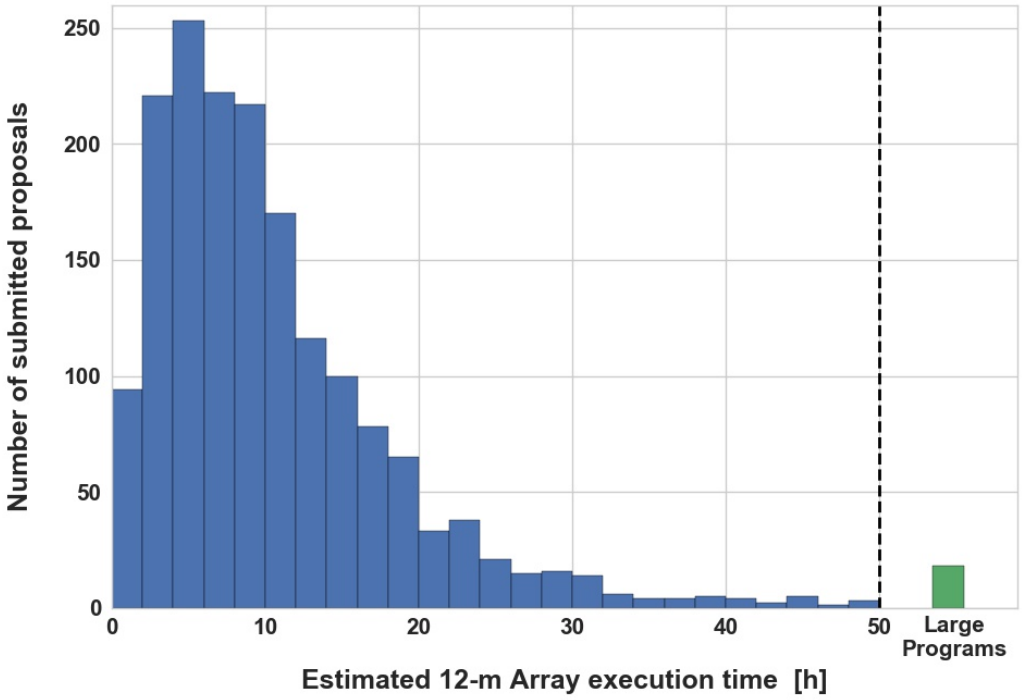

Figure 4. Number of proposals submitted as a function of the estimated 12-m Array execution time.

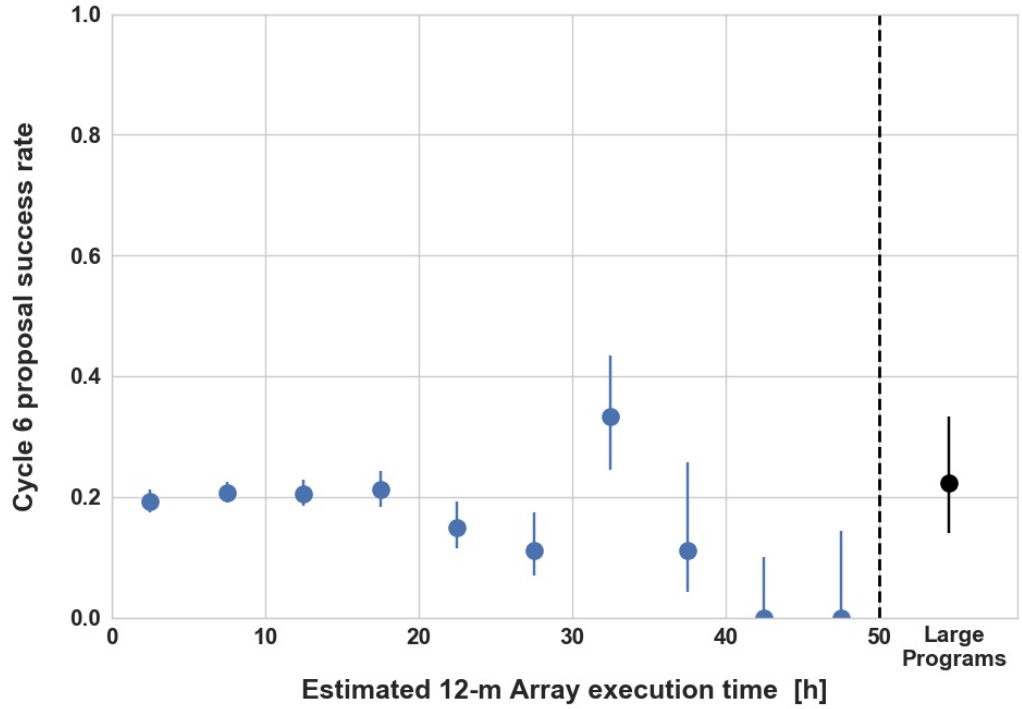

Figure 5. The fraction of proposals (with 1σ confidence intervals) that are assigned priority Grade A and B as a function of the estimated 12-m Array execution time.

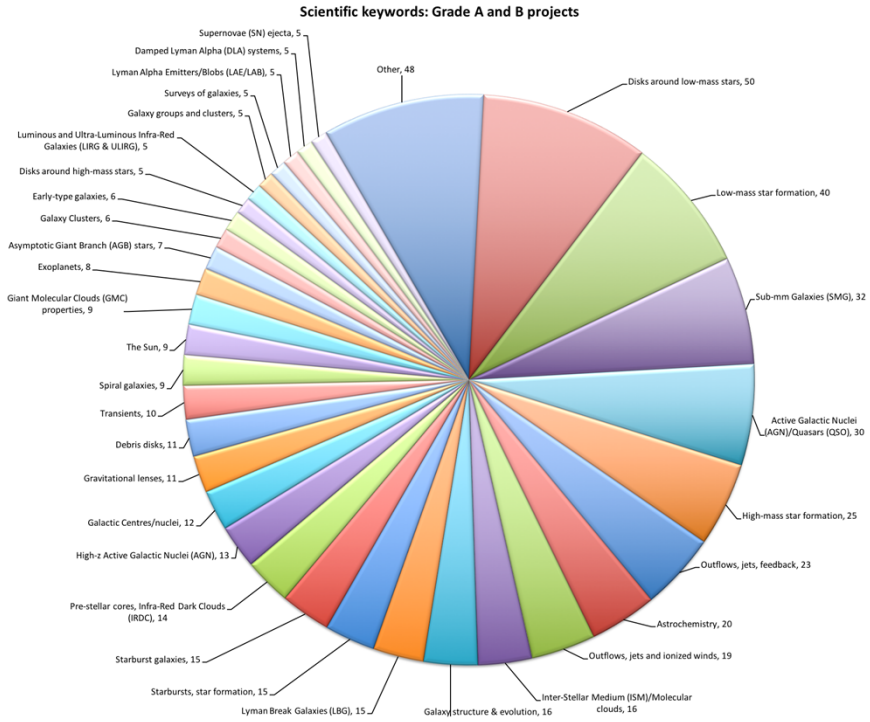

Figure 6. Breakdown of the Grade A and B projects by scientific keyword, across all ALMA scientific categories. For each science keyword, the number of proposals in which it is selected is indicated.

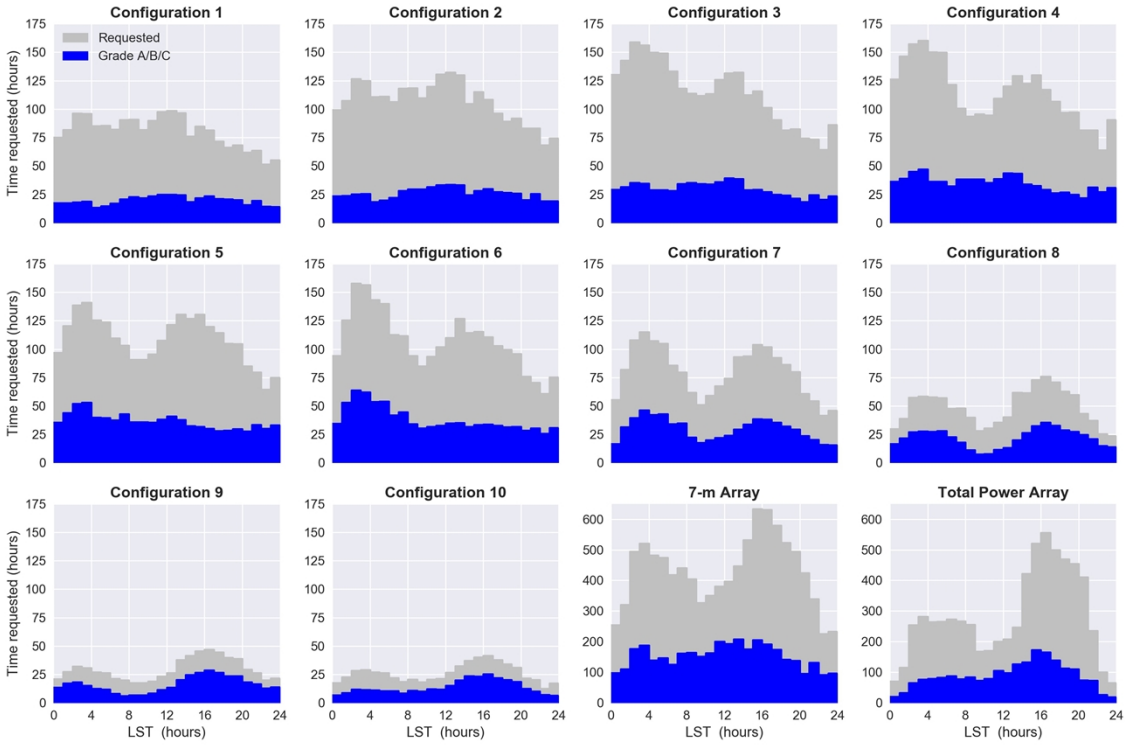

Figure 7. Distribution of estimated execution time for all Cycle 6 proposals (gray) and proposals assigned Grade A, B, or C (blue).

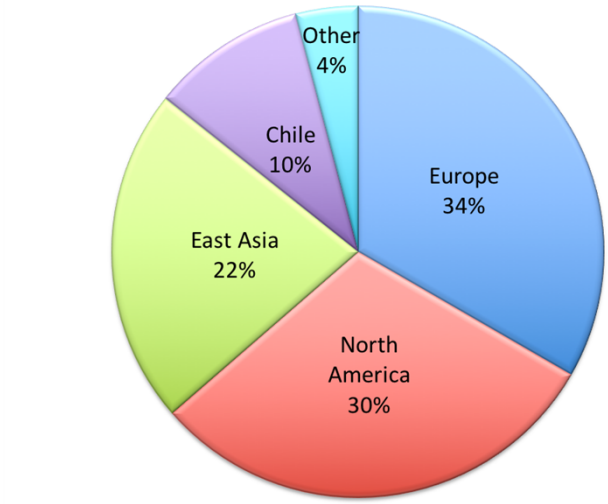

Figure 8. Regional distribution of the Cycle 6 APRC and ARP members

Appendix: Cycle 6 APRC and ARP members

APRC chair:

Masao Saito	National Astronomical Observatory of Japan (Japan)

APRC and ARP members:

Felipe Alves	Max-Planck-Institute for Extraterrestrial Physics (Germany)
Sean Andrews	Harvard-Smithsonian Center for Astrophysics (USA)
Manuel Aravena	Universidad Diego Portales (Chile)
Roberto Assef	Universidad Diego Portales (Chile)
Henrik Beuther	Max-Planck-Institute for Astronomy (Germany)
Rachel Bezanson	University of Pittsburgh (USA)
Geoffrey Blake	California Institute of Technology (USA)
Yann Boehler	Rice University (USA)
Hans Boehringer	Max-Planck-Institute for Extraterrestrial Physics (Germany)
Frederic Boone	Toulouse Observatory (France)
Médéric Boquien	University of Antofagasta (Chile)
Martha Boyer	Space Telescope Science Institute (USA)
Marcella Brusa	University of Bologna (Italy)
Claudio Caceres	University of Andres Bello (Chile)
Caitlin Casey	University of Texas at Austin (USA)
Gael Chauvin	Institut de Recherche en Astrophysique et Planétologie (France)
Aeree Chung	Yonsei University (South Korea)
Lucas Cieza	Universidad Diego Portales (Chile)
L. Ilsedore Cleeves	Harvard-Smithsonian Center for Astrophysics (USA)
Luis Colina	Centro de astrobiología (INTA-CSIC) (Spain)
Martin Cordiner	National Aeronautics and Space Administration (USA)
Diane Cormier	CEA Saclay (France)
Elisabete da Cunha	Australia National University (Australia)

Imke de Pater	University of California Berkeley (USA)
Tanio Diaz-Santos	Universidad Diego Portales (Chile)
Mark Dickinson	National Optical Astronomy Observatory (USA)
Michael Dunham	State University of New York at Fredonia (USA)
Loretta Dunne	University of Edinburgh (United Kingdom)
Ken Ebisawa	Japan Aerospace Exploration Agency (Japan)
Fumi Egusa	The University of Tokyo (Japan)
Cristobal Espinoza	Universidad de Santiago de Chile (Chile)
Davide Fedele	INAF (Italy)
David Fisher	Swinburne University of Technology (Australia)
Gregory Fleishman	New Jersey Institute of Technology (USA)
Jan Forbrich	University of Hertfordshire (United Kingdom)
David Frayer	Green Bank Observatory (USA)
Roberto Galvan-Madrid	National Autonomous University of Mexico (Mexico)
Dale Gary	New Jersey Institute of Technology (USA)
Jorge González López	Universidad Diego Portales (Chile)
Jane Greaves	Cardiff University (United Kingdom)
Antoine Gusdorf	ENS, Paris (France)
Graham Harper	University of Colorado at Boulder (USA)
Bunyo Hatsukade	The University of Tokyo (Japan)
Mark Heyer	University of Massachusetts at Amherst (USA)
James Higdon	Georgia Southern University (USA)
Aya Higuchi	RIKEN (Japan)
Talvikki Hovatta	University of Turku (Finland)
Annie Hughes	Institut de Recherche en Astrophysique et Planétologie (France)
Charles Hull	National Astronomical Observatory of Japan (Japan)
Edo Ibar	University of Valparaiso (Chile)
Masatoshi Imanishi	National Astronomical Observatory of Japan (Japan)
Akio Inoue	Osaka Sangyo University (Japan)
Pascale Jablonka	Technical Federal School Lausanne (EPFL) (Switzerland)
Knud Jahnke	Max-Planck-Institute for Astronomy (Germany)
Eric Jensen	Swarthmore College (USA)
Izaskun Jimenez-Serra	University of London Queen Mary (United Kingdom)
Kay Justtanont	Chalmers University of Technology (Sweden)
Jouni Kainulainen	Chalmers University of Technology (Sweden)
Paul Kalas	University of California Berkeley (USA)
Inga Kamp	University of Groningen (Netherlands)
Akimasa Kataoka	National Astronomical Observatory of Japan (Japan)
Yukio Katsukawa	National Astronomical Observatory of Japan (Japan)
Hyosun Kim	Korea Astronomy and Space Science Institute (South Korea)
Tetsu Kitayama	Toho University (Japan)
Pamela Klaassen	UK ATC (United Kingdom)
Jin Koda	State University of New York at Stony Brook (USA)
Shinya Komugi	Kogakuin University (Japan)

Agnes Kospal	Max-Planck-Institute for Astronomy (Germany)
Stefan Kraus	University of Exeter (United Kingdom)
Therese Kucera	National Aeronautics and Space Administration (USA)
Claudia Lagos	International Centre for Radio Astronomy Research (Australia)
Shih-Ping Lai	National Tsing-Hua University (Taiwan)
Luisa Lara	Astrophysical Institute of Andalucia (Spain)
Emmanuel Lellouch	Paris Observatory (France)
Lihwai Lin	Academia Sinica (Taiwan)
Maria Loukitcheva	Bay Area Environmental Research Institute (USA)
Fabien Louvet	University of Chile (Chile)
Hiroyuki Maezawa	Osaka Prefecture University (Japan)
Mikako Matsuura	Cardiff University (United Kingdom)
Karin Menendez-Delmestre	Federal University of Rio de Janeiro (Brazil)
Eileen Meyer	University of Maryland Baltimore County (USA)
Stefanie Milam	National Aeronautics and Space Administration (USA)
Elisabeth Mills	Boston University (USA)
Munetake Momose	Ibaraki University (Japan)
Kentaro Motohara	University of Tokyo (Japan)
Lee Mundy	University of Maryland (USA)
Tohru Nagao	Ehime University (Japan)
Neil Nagar	University of Concepcion (Chile)
Naomasa Nakai	Kansai Gakuin University (Japan)
Jun-ichi Nakashima	Ural Federal University (Russia)
Marcel Neeleman	Max-Planck-Institute for Astronomy (Germany)
Nicole Nesvadba	Paris-Sud University (France)
Kristina Nyland	National Radio Astronomy Observatory (USA)
Joten Okamoto	National Astronomical Observatory of Japan (Japan)
Monica Orienti	INAF (Italy)
Masami Ouchi	The University of Tokyo (Japan)
Deborah Padgett	California Institute of Technology (USA)
Laura Pentericci	INAF (Italy)
Sebastian Perez	University of Chile (Chile)
Rene Plume	University of Calgary (Canada)
Linda Podio	INAF (Italy)
Paola Popesso	Excellence Cluster Universe (Germany)
Bettina Posselt	Pennsylvania State University (USA)
Jose Prieto	Universidad Diego Portales (Chile)
Huub Rottgering	Leiden University (Netherlands)
Monica Rubio	University of Chile (Chile)
Sarah Sadavoy	Harvard-Smithsonian Center for Astrophysics (USA)
Hideo Sagawa	Kyoto Sangyo University (Japan)
Raghvendra Sahai	California Institute of Technology (USA)
Nami Sakai	RIKEN (Japan)
Colette Salyk	Vassar College (USA)

Karin Sandstrom	University of California at San Diego (USA)
Hidetoshi Sano	Nagoya University (Japan)
Matthias Schreiber	University of Valparaiso (Chile)
Marta Sewilo	National Aeronautics and Space Administration (USA)
Hsien Shang	Academia Sinica (Taiwan)
Hiroshi Shibai	Osaka University (Japan)
Takashi Shimonishi	Tohoku University (Japan)
Renske Smit	University of Cambridge (United Kingdom)
Gordon Stacey	Cornell University (USA)
Thaisa Storchi-Bergmann	Federal University of Rio Grande do Sul (Brazil)
Lisa Storrie-Lombardi	California Institute of Technology (USA)
Eckhard Sturm	Max-Planck-Institute for Extraterrestrial Physics (Germany)
Carmen Sánchez Contreras	Centro de astrobiología (INTA-CSIC) (Spain)
Kengo Tachihara	Nagoya University (Japan)
Mario Tafalla	National Astronomical Observatory (Spain)
Shigehisa Takakuwa	Kagoshima University (Japan)
Nial Tanvir	University of Leicester (United Kingdom)
Susan Terebey	California State University, Los Angeles (USA)
Tomoka Tosaki	Joetsu University of Education (Japan)
Junko Ueda	National Astronomical Observatory of Japan (Japan)
Bram Venemans	Max-Planck-Institute for Astronomy (Germany)
Joaquin Vieira	University of Illinois at Urbana-Champaign (USA)
Serena Viti	University of London (United Kingdom)
Catherine Walsh	The University of Leeds (United Kingdom)
Ann Wehrle	Space Science Institute (USA)
Jonathan Williams	University of Hawaii at Manoa (USA)
Chris Willott	National Research Council of Canada (Canada)
Tony Wong	University of Illinois at Urbana-Champaign (USA)
Mark Wyatt	University of Cambridge (United Kingdom)
Satoshi Yamamoto	The University of Tokyo (Japan)
Luis Zapata	National Autonomous University of Mexico (Mexico)
Maria Rosa Zapatero Osorio	Centro de astrobiología (INTA-CSIC) (Spain)
Laura Zschaechner	Helsinki University (Finland)