ALMA Cycle 4: Selection Statistics

Proposal Review Process

In response to the Call for Proposals for Cycle 4, ALMA received 1571 proposals by the 21 April 2016 submission deadline. The proposals were reviewed during a meeting in Vienna (Austria) on June 19–24. The review committee consisted of 18 ALMA Review Panels (ARPs), each comprising eight Science Assessors. The panels 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).

Science Assessors were selected on the basis of scientific specialization while having the regional affiliation of the ARP members closely match the nominal ALMA regional shares of observing time. The 18 ARP Chairs served on the ALMA Proposal Review Committee (APRC), together with the APRC Chair, Anneila Sargent. The full list of Cycle 4 Science Assessors is given in the Appendix.

The proposal review process was carried out as described in the ALMA Cycle 4 Proposer's Guide. The Joint ALMA Observatory (JAO) created an observing queue and assigned a priority grade to each proposal after considering the scientific rank from the APRC, the share of observing time for each region, and scheduling feasibility to avoid oversubscribing configurations and LST ranges.

Proposal statistics

Of the 1571 proposals submitted, 135 received the highest priority of Grade A, 340 received Grade B, and 232 received Grade C. Grades A and B were assigned such that the observing time on the 12m Array for each region corresponds to the regional share based on the 3000 h offered in Cycle 4. 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 all proposals grouped by region and science category, respectively. Various metrics of the proposal data are presented in the figures.

In Cycle 4, Large Proposals and VLBI proposals were accepted for the first time. Six proposals for 1mm VLBI and three for 3mm VLBI were accepted by both ALMA and the respective VLBI network. Two Large Proposals were accepted: *ASPECS: The ALMA Spectral Line Survey in the UDF* (P.I.: Fabian Walter) and *Small-scale Substructures in Protoplanetary Disks* (P.I.: Sean Andrews). Table 3 lists the number of Grade A and B projects for different proposal types.

Table 1. Distribution of Cycle 4 proposals by region

	Chile (CL)	East Asia (EA)	Europe (EU)	North America (NA)	Open Skies	Total
Submitted Proposals						
Number of Proposals	100	341	657	428	45	1571
12m Array time (hours)	919	2573	4919	3594	282	12286
7m Array time (hours)	397	1201	1539	1534	59	4730
Total Power Array time (hours)	337	1385	1214	1249	62	4247
Subscription rate						
12m Array (3000 h offered)	3.1	3.8	4.9	3.5	-	4.1
7m Array (1800 h offered)	2.2	3.0	2.5	2.5	-	2.6
Total Power Array (1800 h offered)	1.9	3.4	2.0	2.1	-	2.4
Grade A and B Projects						
Number of projects	38	109	161	153	14	475
12m Array time (hours)	294	696	1000	1011	79	3080
7m Array time (hours)	70	259	171	304	6	811
Total Power Array time (hours)	67	190	76	111	6	450
Grade C Projects						
Number of projects	17	40	123	47	5	232
12m Array time (hours)	101	267	681	290	31	1369
7m Array time (hours)	69	114	342	62	16	604
Total Power Array time (hours)	8	146	212	0	28	395

Table 2. Distribution of Cycle 4 proposals by scientific category

	Category 1	Category 2	Category 3	Category 4	Category 5	Total
Submitted Proposals						
Number of Proposals	355	380	351	317	168	1571
12m Array time (hours)	3766	3328	2175	2011	1007	12286
7m Array time (hours)	199	1503	2404	233	391	4730
Total Power Array time (hours)	0	1500	2375	46	325	4247
Grade A and B Projects						
Number of projects	100	109	116	100	50	475
12m Array time (hours)	898	783	610	559	230	3080
7m Array time (hours)	141	127	390	71	82	811
Total Power Array time (hours)	0	108	221	44	77	450
Grade C Projects						
Number of projects	56	55	65	37	19	232
12m Array time (hours)	460	371	301	151	85	1369
7m Array time (hours)	21	54	430	70	28	604
Total Power Array time (hours)	0	21	333	0	40	395

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

Proposal Type	Number Submitted	Number Grade A & B	
All	1571	475	(30%)
ACA	315	79	(25%)
ACA Standalone	30	5	(17%)
Large Programs	27	2	(7%)
Polarization	90	45	(50%)
Solar	53	15	(28%)
Target of Opportunity	21	13	(62%)
VLBI	22	9	(41%)

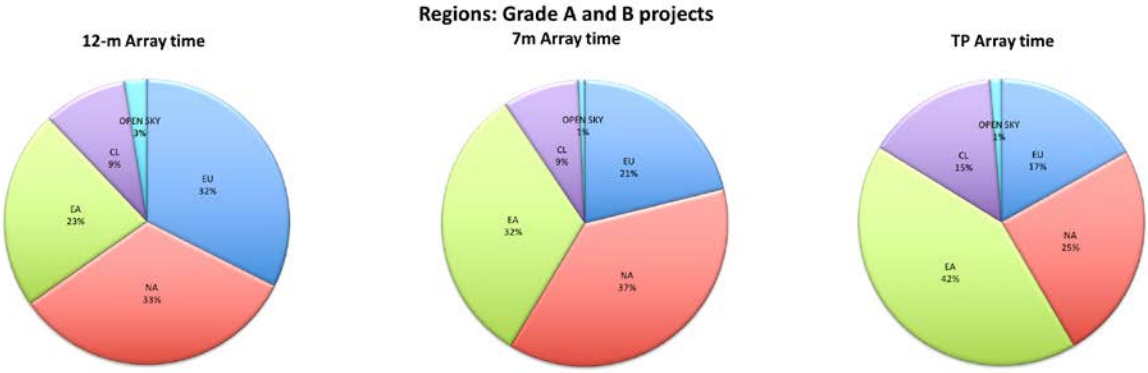

Figure 1. Distribution of execution time for Grade A and B projects by region for the 12-m (left), the 7-m (center), and the Total Power (right) arrays.

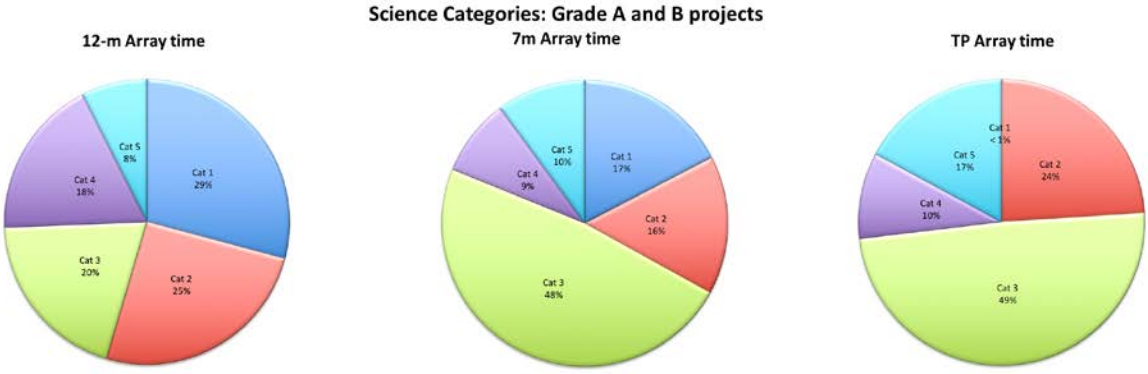

Figure 2. Distribution of execution time for Grade A and B projects by science category for the 12-m (left), the 7-m (center), and the Total Power (right) arrays. The definitions of the categories are provided in the text.

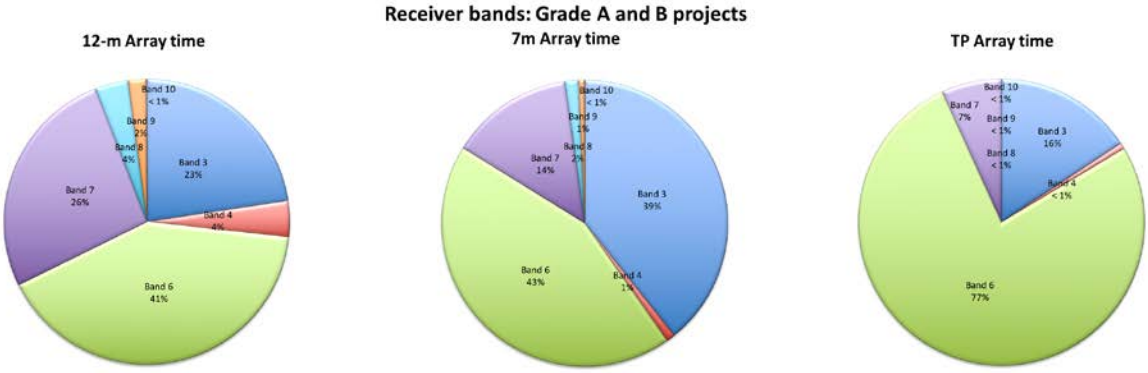

Figure 3. Distribution of execution time for Grade A and B projects by receiver band for the 12-m (left), 7-m Array (center), and Total Power (right) arrays.

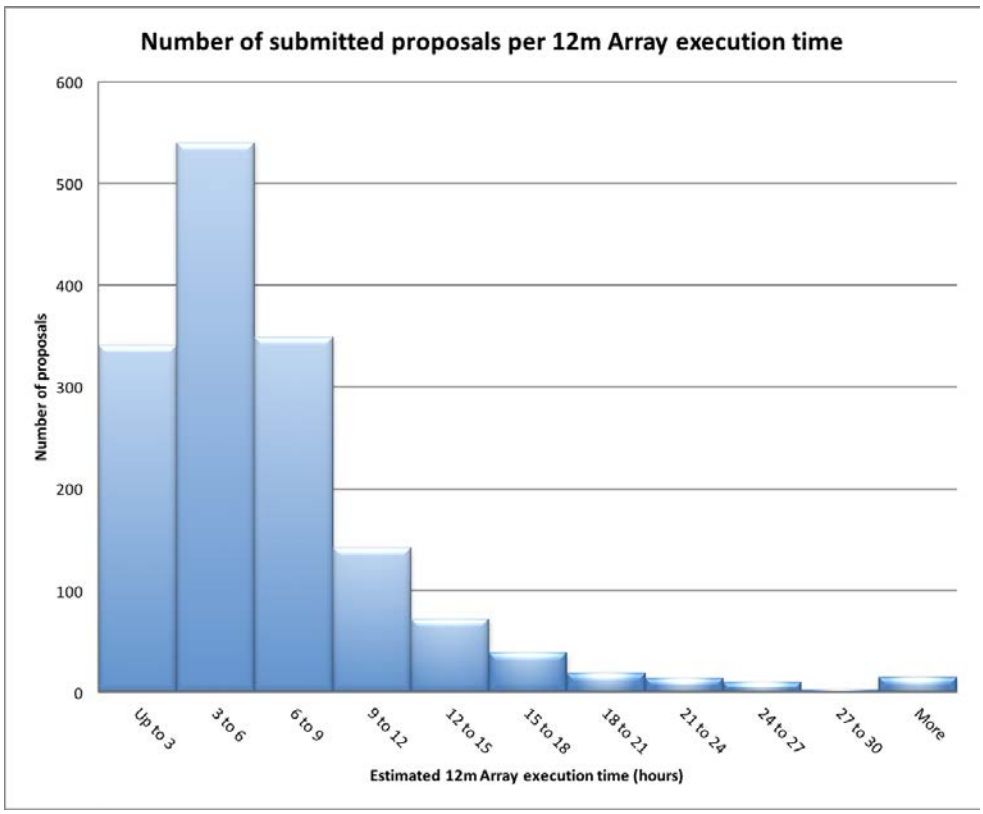

Figure 4. Number of proposals submitted as a function of the 12-m Array execution time, excluding Large Proposals. The median requested 12m time per proposal is 5.5 h, which is a 17% increase over Cycle 3.

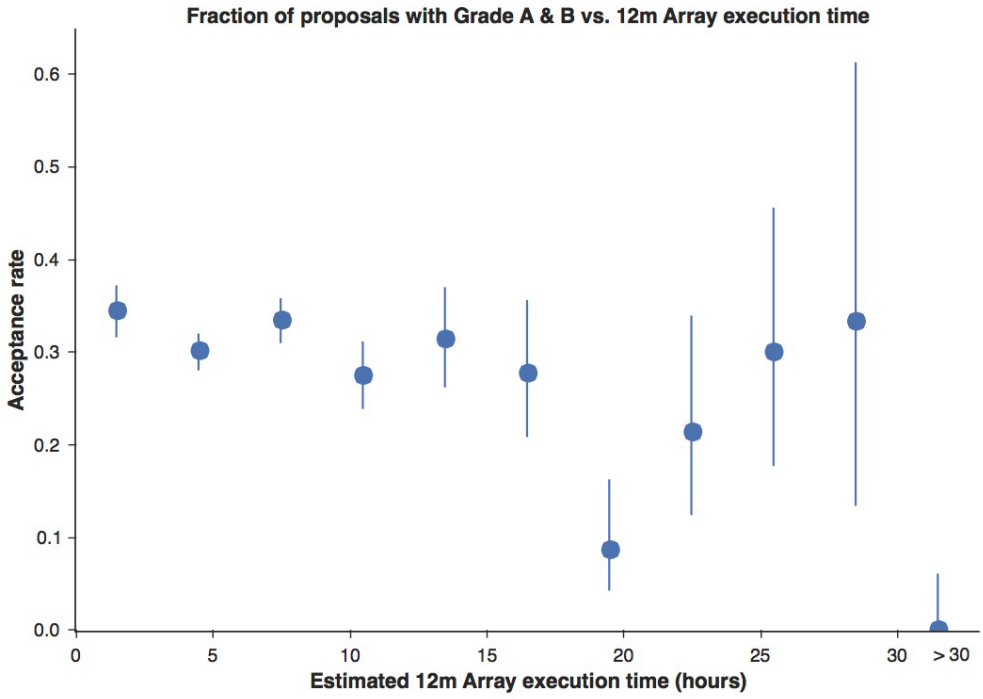

Figure 5. The fraction of proposals assigned priority Grade A and B as a function of the estimated 12m Array time. Uncertainties represent 68% (1σ) confidence intervals for a binomial proportion.

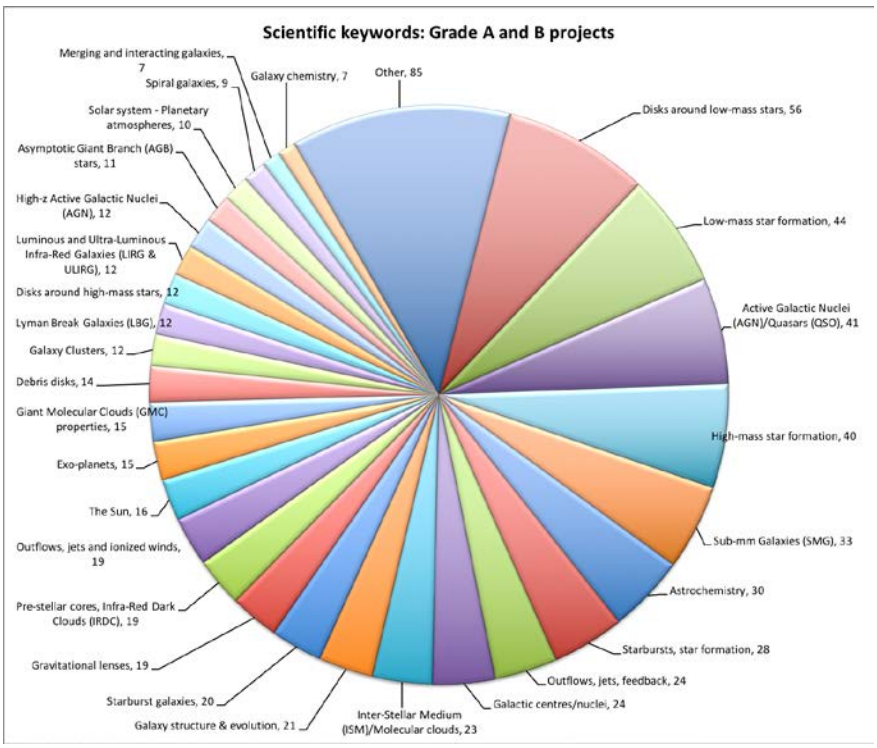

Figure 6. Breakdown of the Grade A and B projects by scientific keyword, across all ALMA scientific categories. For each science keyword, the number of proposals in which it is selected is indicated.

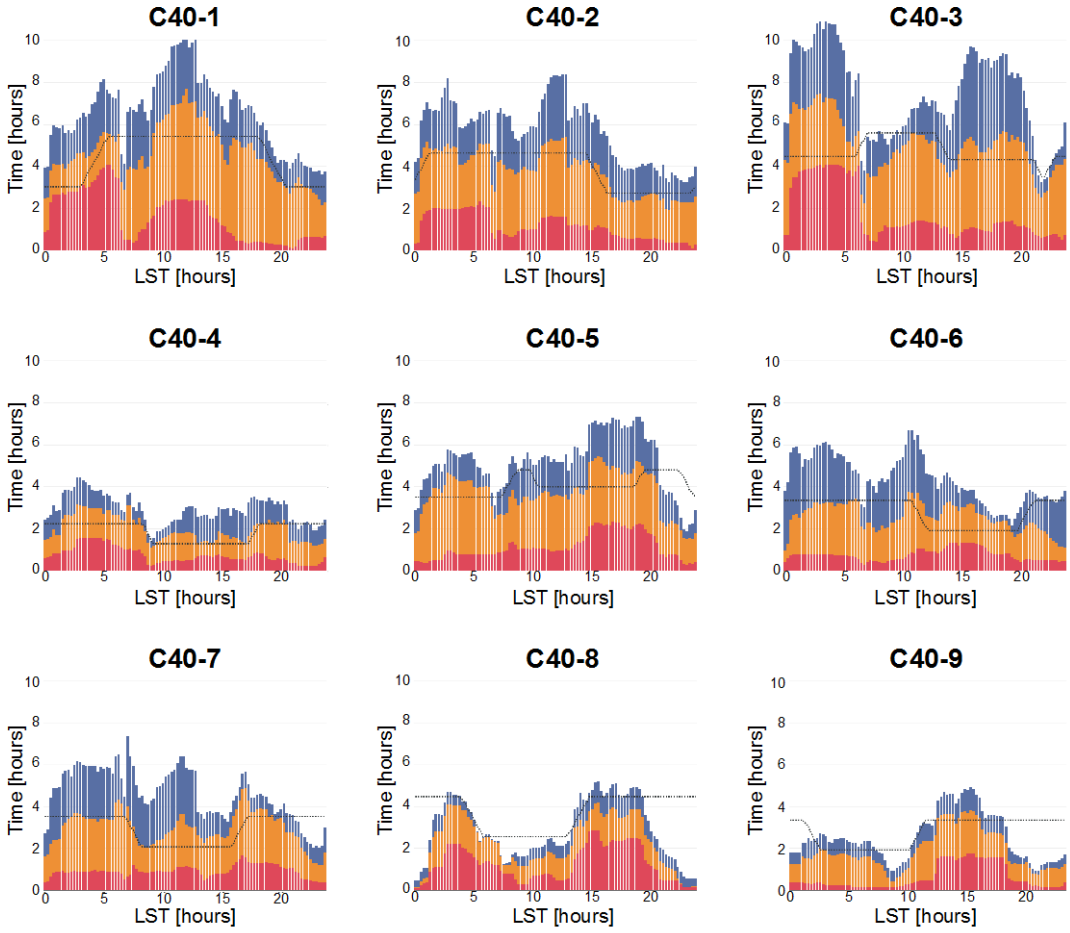

Figure 7. Distribution of the amount of 12-m Array time per LST as a function of LST for the array configurations offered in Cycle 4. The red, orange, and blue histograms indicate Grade A, B, and C projects, respectively. The dotted line in each panel shows the expected amount of observing time available for the configuration.

Appendix: Cycle 4 APRC and ARP members

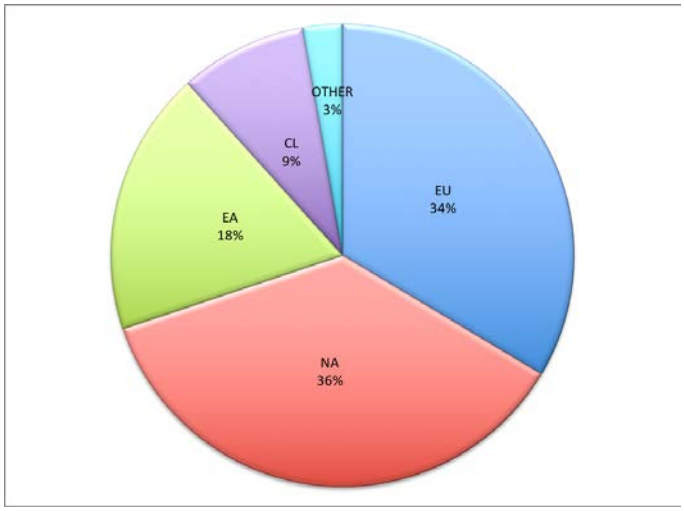

Figure 8. Regional distribution of the Cycle 4 APRC and ARP members

APRC chair:

Anneila Sargent	California Institute of Technology (USA)

APRC and ARP members:

Jose Afonso	Instituto de Astrofísica e Ciências do Espaço (Portugal)
Manuel Aravena	Universidad Diego Portales (Chile)
Roberto Assef	Universidad Diego Portales (Chile)
Maarten Baes	Ghent University (Belgium)
Franz Bauer	Catolica of Chile, Pontifica University (Chile)
Amelia Bayo	Valparaiso, University of (Chile)
Tracy Beck	Space Telescope Science Institute (USA)
Rachel Bezanson	Arizona, University of (USA)
Hans Boehringer	Max-Planck-Institute for Extraterrestrial Physics (Germany)
Frederic Boone	Toulouse Observatory (France)
Marusa Bradac	California, Davis, University of (USA)
Elias Brinks	Hertfordshire, University of (United Kingdom)
Marcella Brusa	Bologna, University of (Italy)
Daniela Calzetti	Massachusetts at Amherst, University of (USA)
Simon Casassus	Chile, University of (Chile)
Caitlin Casey	University of Texas at Austin, Department of Astronomy (USA)
Tzu-Ching Chang	Academia Sinica (Taiwan)
Ranga Chary	California Institute of Technology (USA)
Isabelle Cherchneff	Basel, University of (Switzerland)
Aeree Chung	Yonsei University (South Korea)
Lucas Cieza	Universidad Diego Portales (Chile)
Cathie Clarke	Cambridge, University of (United Kingdom)
Luis Colina	Centro de astrobiología (INTA-CSIC) (Spain)
Martin Cordiner	National Aeronautics and Space Administration (USA)
Diane Cormier	Heidelberg, University of (Germany)

Alessandra Corsi	Texas Tech University (USA)
Emanuele Daddi	CEA Saclay (France)
Imke de Pater	California, Berkeley, University of (USA)
Miroslava Dessauges-Zavadsky	Geneva, University of (Switzerland)
Mark Dickinson	National Optical Astronomy Observatory (USA)
Ana Duarte Cabral	Exeter, University of (United Kingdom)
Michael Dunham	Harvard-Smithsonian Center for Astrophysics (USA)
Ken Ebisawa	Japan Aerospace Exploration Agency (Japan)
Barbara Ercolano	Munich, University of (Germany)
Duncan Farrah	Virginia Polytechnic Institute & State University (USA)
Davide Fedele	INAF (Italy)
Yanga Fernandez	Central Florida, University of (USA)
Jacqueline Fischer	Naval Research Laboratory (USA)
Dale Gary	New Jersey Institute of Technology (USA)
Maryvonne Gerin	Paris Observatory (France)
Sarah Gibson	University Corporation for Atmospheric Research (USA)
Uma Gorti	National Aeronautics and Space Administration (USA)
Jane Greaves	Cardiff University (United Kingdom)
Pin-Gao Gu	Academia Sinica (Taiwan)
Antoine Gusdorf	ENS, Paris (France)
Graham Harper	Colorado at Boulder, Univ of (USA)
Jennifer Hatchell	Exeter, University of (United Kingdom)
Petr Heinzel	Astronomical Institute, Academy of Sciences of the Czech Republic (Czech Republic)
Tomoya Hirota	National Astronomical Observatory of Japan (Japan)
Martin Houde	Western Ontario, University of (Canada)
Annie Hughes	Institut de Recherche en Astrophysique et Planétologie (France)
Charles Hull	Harvard-Smithsonian Center for Astrophysics (USA)
Edo Ibar	Valparaiso, University of (Chile)
Akio Inoue	Osaka Sangyo University (Japan)
Andrea Isella	Rice University (USA)
Pascale Jablonka	Lausanne, Technical Federal School (EPFL) (Switzerland)
Knud Jahnke	Max-Planck-Institute for Astronomy (Germany)
Eric Jensen	Swarthmore College (USA)
Kelsey Johnson	Virginia, University of (USA)
Jes Jorgensen	Copenhagen, University of (Denmark)
Kay Justtanont	Chalmers University of Technology (Sweden)
Inga Kamp	University of Groningen (Netherlands)
Hyosun Kim	Academia Sinica (Taiwan)
Stefan Kimeswenger	Catolica of the North, University (Chile)
Pamela Klaassen	UK ATC (United Kingdom)
Tadayuki Kodama	National Astronomical Observatory of Japan (Japan)
Shinya Komugi	Kogakuin University (Japan)
Agnes Kospal	Max-Planck-Institute for Astronomy (Germany)
Yi-Jehng Kuan	National Taiwan Normal University (Taiwan)
Guilaine Lagache	Paris-Sud University (France)
Claudia Lagos	International Centre for Radio Astronomy Research (Australia)
Shih-Ping Lai	National Tsing-Hua University (Taiwan)

Cornelia Lang	Iowa, University of (USA)
Chang Won Lee	Korea Astronomy and Space Science Institute (South Korea)
Jeong-Eun Lee	Kyung Hee University (South Korea)
Emmanuel Lellouch	Paris Observatory (France)
Lihwai Lin	Academia Sinica (Taiwan)
Paulina Lira	Chile, University of (Chile)
Leslie Looney	Illinois at Urbana-Champaign, University of (USA)
Lori Lubin	California, Davis, University of (USA)
Sangeeta Malhotra	Arizona State University (USA)
Claudia Maraston	Portsmouth, University of (United Kingdom)
Diego Mardones	Chile, University of (Chile)
Dan Marrone	Arizona, University of (USA)
Anaelle Maury	CEA Saclay (France)
Stefanie Milam	National Aeronautics and Space Administration (USA)
Tom Millar	Queen's University Belfast (United Kingdom)
Munetake Momose	Ibaraki University (Japan)
Kentaro Motohara	University of Tokyo (Japan)
Frederique Motte	Institut de Planetologie et d'Astrophysique de Grenoble (France)
Takayuki Muto	Kogakuin University (Japan)
Tohru Nagao	Ehime University (Japan)
Naomasa Nakai	University of Tsukuba (Japan)
Hiroyuki Nakanishi	Kagoshima University (Japan)
Jun-ichi Nakashima	Ural Federal University (Russia)
Masatoshi Ohishi	National Astronomical Observatory of Japan (Japan)
Monica Orienti	INAF (Italy)
Deborah Padgett	National Aeronautics and Space Administration (USA)
Ilaria Pascucci	Arizona, University of (USA)
Jenny Patience	Arizona State University (USA)
Laura Perez	Chile, University of (Chile)
Ismael Perez-Fournon	Astrophysical Institute of Canarias (Spain)
Ylva Pihlstrom	New Mexico, University of (USA)
Jaime Pineda	Max-Planck-Institute for Extraterrestrial Physics (Germany)
Linda Podio	INAF (Italy)
Jose Prieto	Universidad Diego Portales (Chile)
Cristina Ramos Almeida	Astrophysical Institute of Canarias (Spain)
Jill Rathborne	Astronomy and Space Science (Australia)
Giulia Rodighiero	Padova, University of (Italy)
Erik Rosolowsky	Alberta, University of (Canada)
Hideo Sagawa	Kyoto Sangyo University (Japan)
Raghvendra Sahai	California Institute of Technology (USA)
Masao Saito	National Astronomical Observatory of Japan (Japan)
Kazushi Sakamoto	Academia Sinica (Taiwan)
Colette Salyk	Vassar College (USA)
Claudia Scarlata	Minnesota, University of (USA)
Peter Schilke	Cologne, University of (Germany)
Marta Sewilo	National Aeronautics and Space Administration (USA)
Hsien Shang	Academia Sinica (Taiwan)

Hiroshi Shibai	Osaka University (Japan)
Kazuhiro Shimasaku	The University of Tokyo (Japan)
Snezana Stanimirovic	Wisconsin at Madison, University of (USA)
Lisa Storrie-Lombardi	California Institute of Technology (USA)
Eckhard Sturm	Max-Planck-Institute for Extraterrestrial Physics (Germany)
Nial Tanvir	Leicester, University of (United Kingdom)
Tomoka Tosaki	Joetsu University of Education (Japan)
Ezequiel Treister	Catolica of Chile, Pontifica University (Chile)
Grant Tremblay	Yale University (USA)
Esko Valtaoja	Turku, University of (Finland)
Jacqueline van Gorkom	Columbia University (USA)
Hans Van Winckel	Leuven, Catholic University (Belgium)
Geronimo Villanueva	National Aeronautics and Space Administration (USA)
Catherine Walsh	Leiden University (Netherlands)
Natalie Webb	Institut de Recherche en Astrophysique et Planétologie (France)
Tracy Webb	McGill University (Canada)
Ann Wehrle	Space Science Institute (USA)
Christine Wilson	McMaster University (Canada)
Sebastian Wolf	Kiel University (Germany)
Tony Wong	Illinois at Urbana-Champaign, University of (USA)
Toru Yamada	Institute of Space and Astronautical Science (Japan)
Satoshi Yamamoto	The University of Tokyo (Japan)
Takaaki Yokoyama	The University of Tokyo (Japan)
Lisa Young	New Mexico Tech (USA)
Luis Zapata	Mexico, National Autonomous University of (Mexico)
Maria Rosa Zapatero Osorio	Centro de Astrobiologia (INTA-CSIC) (Spain)