



Basic ESO Publication Statistics

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Introduction

What is the ESO Telescope Bibliography?

The ESO Telescope Bibliography (telbib) is a database of refereed papers published by the ESO users' community. All papers use partly or exclusively data from ESO telescopes.

Paper classification / selection criteria

Papers pertaining to the ESO Telescope Bibliography use partly or exclusively data from ESO facilities. These can be observations taken by the authors or data obtained from the ESO Science Archive or other sources, regardless of whether or not the observations have been published before. However, papers that merely quote results from the literature, that are derived from ESO data, are excluded. Likewise, papers that describe instrumentation or software, simply mention ongoing projects (e.g., surveys or Large Programmes), suggest future observations with ESO facilities, develop models or run simulations, using data merely as examples, are not included in telbib. Also excluded are papers which show ESO images as a visual reference rather than using them to achieve scientific results.

The ESO librarians communicate with authors as well as ESO instrument scientists and archive specialists to determine if, and which, observations were used in publications. The final decision about inclusion or exclusion of a given paper lies with the ESO Director for Science.

Coverage and Completeness

telbib contains records from publication year 1996 onwards. New records are added approx. 3 weeks after they appear with their final bibcode on the NASA ADS Abstract Service. The following journals are routinely screened: *A&A*, *A&ARv*, *AJ*, *AN*, *ApJ*, *ApJS*, *ARA&A*, *EM&P*, *Icarus*, *MNRAS*, *Nature*, *NewA*, *NewAR*, *PASJ*, *PASP*, *P&SS*, *Science*.

For VLT/VLTI and Chajnantor facilities, instrument-level information and program IDs are available since the beginning of operations. All papers based on data from La Silla facilities are tagged with telescope labels since 1996, but instrument labels and program IDs have only been assigned to papers from publishing year 2000 onwards. In addition, some instruments (e.g., FEROS@1.5 m telescope) may have been operated under special agreements for which no program IDs exist.

We make extensive efforts in order to identify all refereed papers that use ESO data (see also the telbib Help pages at <http://telbib.eso.org/help.html>) and consider telbib essentially complete.

Populating the Database

telbib is compiled by scanning the major astronomy journals for scientific papers that contain any of the ESO-defined keywords (e.g., telescope and instrument names). Bibliographic information, citations and some further metadata are imported from the NASA ADS Abstract Service. Standardized descriptions of telescopes and instruments, survey names and other tags as well as ESO program IDs are assigned by the librarians.

Access, Reports, Statistics

telbib's public interface is available at <http://telbib.eso.org>. While the public interface provides access to some publications that use data obtained during non-ESO time (such as APEX observations obtained during Max Planck, Onsala, or Chilean observing time), statistics reported in this document include only papers based on data from telescopes and instruments for which observing time is recommended by the ESO OPC (Observing Programmes Committee), unless explicitly mentioned otherwise.

Metrics derived from the database can be explored in various ways:

- search results are shown in tabular format. Whenever possible, entries include ESO program IDs that provide direct links to the data in ESO Archive. The results can be exported for further use
- search results can be visualized as animated charts which are created on-the-fly, based on the user's queries
- interactive graphs of selected statistics are available in the telbib Statistics area (<http://telbib.eso.org/telbibstats/>)
- an overview of publication statistics is available at http://telbib.eso.org/pubstats_overview.php. In order to make our statistics more transparent and reproducible, the numbers are linked to the corresponding records in the telbib database
- various metrics as well as instrument-level statistics derived from the database can be found in this document, "Basic ESO Statistics", which is available on the [ESO Libraries homepage](#) or directly at <http://www.eso.org/libraries/edocs/ESO/ESOstats.pdf>
- lists of papers included in the ESO telescope bibliography are available as Supplements to the ESO Annual Report (<http://www.eso.org/public/products/annualreports/>).

For more detailed reports, contact the ESO librarians (library@eso.org).

Publications

ESO publication statistics are derived from the Telescope Bibliography (telbib), a database of refereed articles that directly use ESO data. telbib is maintained by the ESO library. Here, we provide some basic statistics to give an overview of publications and citations for the publication years 1996-2017.

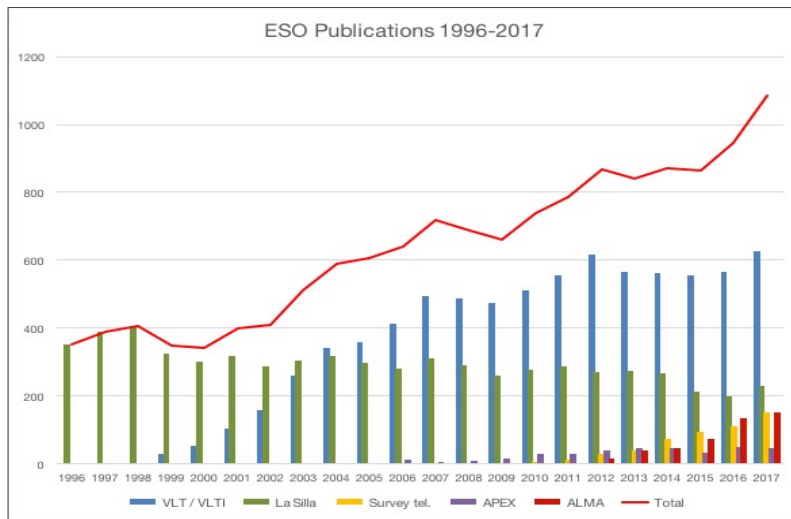


Fig. 1: Refereed papers using ESO data

Notes:

VLT/VLTI: papers using data generated by VLT and VLTI instruments, including visitor instruments for which observing time is recommended by the ESO OPC (Observing Programmes Committee), e.g., VLT Ultracam, VLTI PIONIER.

La Silla: papers using data generated by facilities located on La Silla, including visitor instruments for which observing time is recommended by the ESO OPC, e.g., NTT Ultracam. Papers based on data from non-ESO telescopes or observations obtained during 'private' periods are not included.

Survey telescopes: papers using data generated by ESO's survey telescopes VISTA and VST

APEX: papers using data generated by APEX, including visitor instruments for which observing time is recommended by the ESO OPC, e.g., APEX P-Artemis, APEX Z-Spec. Other visitor instruments (e.g., APEX/CONDOR) are excluded. Only papers based (entirely or partly) on ESO APEX time are included.

ALMA: papers using data generated by ALMA. Only papers based (entirely or partly) on European ALMA time are included.

Papers can use data from more than one facility, therefore the total number cannot be calculated by simply adding all publications of the individual sites, telescopes, or instruments.

Publication and citation statistics mentioned in this report date from February 2018.

	VLT / VLTI	La Silla	Survey tel.	APEX	ALMA	Total
1996		350				350
1997		388				389
1998		405				405
1999	29	324				348
2000	52	300				342
2001	105	316				399
2002	159	288				408
2003	260	305				512
2004	342	316				588
2005	359	297				607
2006	413	279		12		640
2007	495	312		1		718
2008	486	289		8		689
2009	473	260		15		660
2010	510	277	2	28		738
2011	555	286	13	27		786
2012	616	270	30	40	16	867
2013	567	273	38	44	40	842
2014	563	267	73	47	47	871
2015	555	211	94	33	73	865
2016	566	199	109	49	134	947
2017	628	229	151	46	152	1.084

Table 1: Number of refereed papers using ESO data (see also http://telbib.eso.org/pubstats_overview.php)

Citations

In bibliometric studies, numbers of publications show the observatory's productivity, citations the impact papers have made among the community. Since it takes time to gather citations, older papers typically have higher citation numbers than recent ones.

While it is tempting to use publication and citation statistics for comparisons, this has to be done with **utmost care** as the numbers may have been obtained with different methodologies.

	Pubs	Cites	Average
1996	350	16,708	47.70
1997	389	17,407	44.70
1998	405	31,838	78.60
1999	348	26,271	75.50
2000	342	17,312	50.60
2001	399	19,991	50.10
2002	408	22,448	55.00
2003	512	33,701	65.80
2004	588	40,432	68.80
2005	607	32,342	53.30
2006	640	39,234	61.30
2007	718	37,723	52.50
2008	689	33,902	49.20
2009	660	36,873	55.90
2010	738	35,189	47.70
2011	786	31,204	39.70
2012	867	29,62	34.20
2013	842	28,885	34.30
2014	871	22,672	26.00
2015	865	17,586	20.30
2016	947	11,664	12.30
2017	1,084	5,521	5.10

Table 2: Total and average citations of refereed papers using ESO data

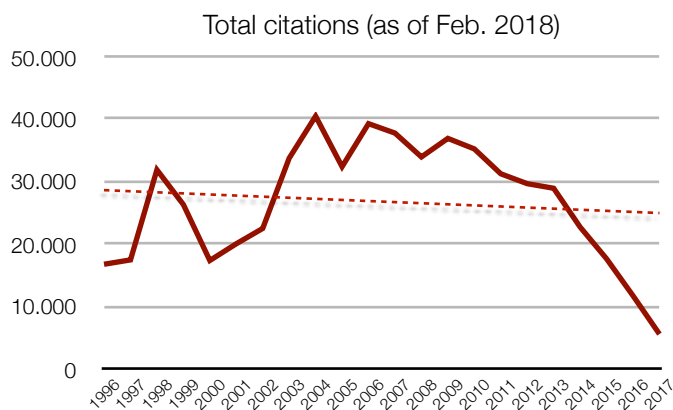


Fig. 2a: Total citations of papers using ESO data (with trend line)

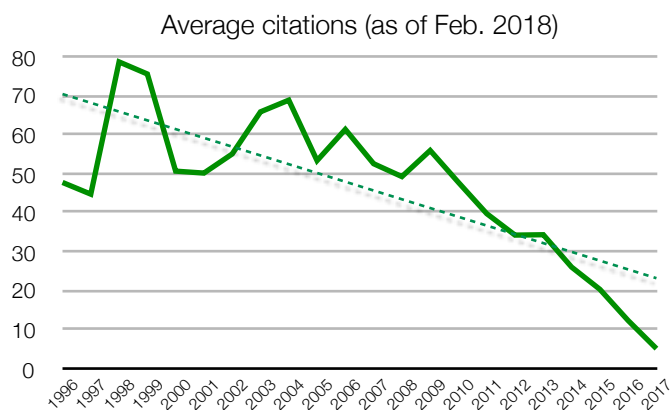


Fig. 2b: Average citations of papers using ESO data (with trend line)

ESO and other Observatories

In order to put ESO's research output into context, we give an overview of the total numbers of publications of major observatories for the publication years 1996 to 2015 (if already available). Note that some facilities date back further than that; their early years are not included in this graph.

The **most simplistic way** of comparing facilities is to look at the numbers of publications. Obviously, this favors large institutions with many facilities over smaller ones. **A more meaningful investigation should normalize the numbers** in some way, for instance by number of observing hours, by actual share of data used in the papers (as many scientific articles use data from more than one observatory), or by budget (telescope construction costs and maintenance).

When comparing publication statistics among different observatories, it is essential to assess the **selection criteria** applied by each observatory. To the best of our knowledge, the observatories shown in this graph include only papers that actually use observational data from their facilities (as opposed to merely referencing them). All papers were published in refereed journals.

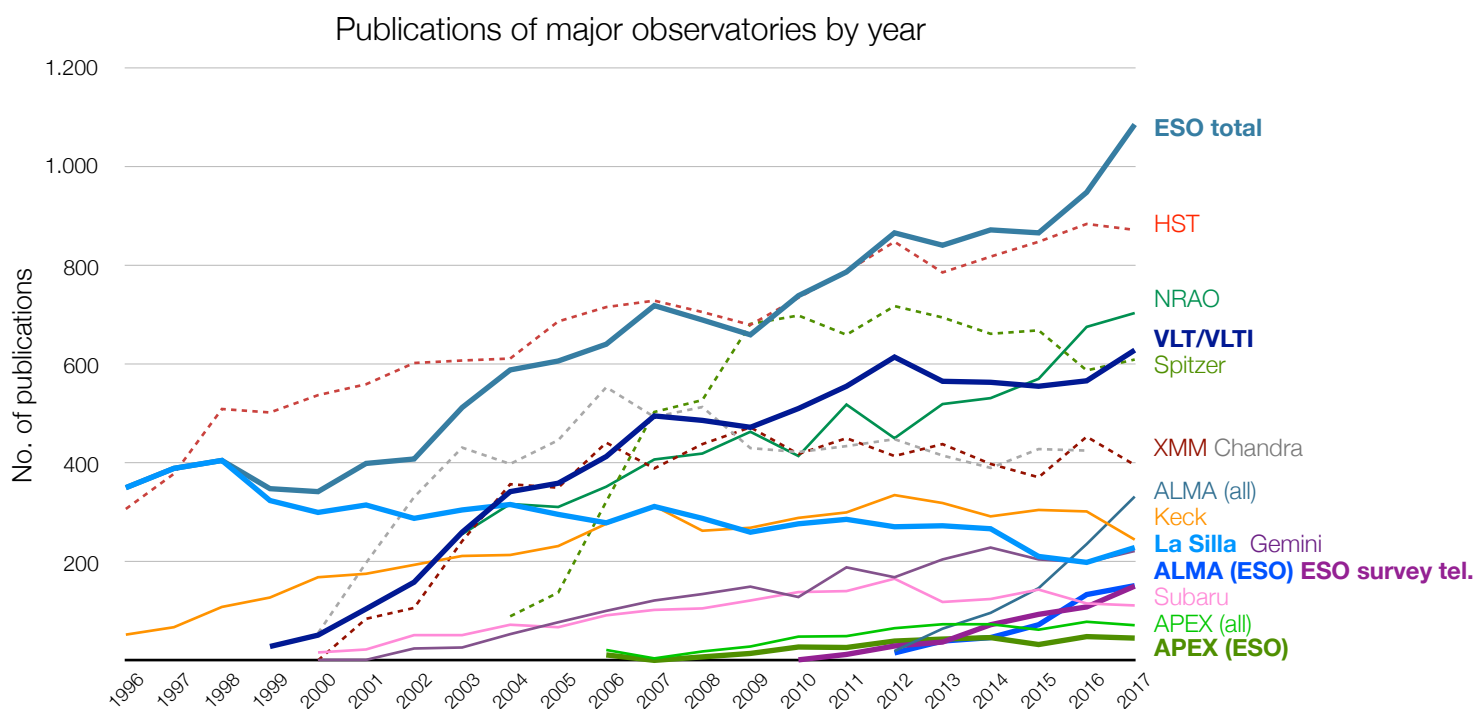


Fig. 3: Refereed publications by ESO and other observatories (as of Feb. 2018)

Thick lines: ESO facilities. **Thin lines:** other ground-based facilities. **Dashed lines:** space-based facilities.

Please note that selection criteria for inclusion or exclusion of papers vary among observatories

The statistics shown in Fig. 3 and Table 3 were obtained as follows:

ESO total, VLT/VLTI, La Silla, ESO survey telescope, APEX (ESO and all partners), **ALMA** (Europe and all partners):

ESO Telescope Bibliography (<http://telbib.eso.org>)

Chandra: Chandra Bibliographic Statistics (<http://cxc.harvard.edu/cda/bibstats/bibstats.html> 'Refereed Chandra Science Papers' and www.eso.orghttp://cxc.harvard.edu/cda/bibstats/plots/Current/Papers_by-year.txt)

Gemini: Gemini publications, (www.gemini.edu/science/publications/)

HST: HST Publication Statistics (<http://archive.stsci.edu/hst/bibliography/pubstat.html>)

Keck: Keck Science Bibliography (http://www2.keck.hawaii.edu/library/keck_papers.html)

NRAO: NRAO Publication Statistics (<http://www.nrao.edu/library/pubstats.shtml>)

Spitzer: Spitzer Bibliographical Database (<http://sohelp2.ipac.caltech.edu/bibsearch/>)

Subaru: ADS (Filters / Select References In, http://esoads.eso.org/abstract_service.html#jouse1)

XMM: XMM-Newton in the Journals (<http://heasarc.gsfc.nasa.gov/docs/xmm/xmmbib.html>). Number of publications per year provided by Norbert Schartel, ESA, Madrid, Spain

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Bibliographies
ESO total	350	389	405	348	342	399	408	512	588	606	640	718	689	659	738	786	865	840	871	865	947	1,084	ESO telbib
VL/ VLT/ VLT/				29	52	105	159	260	342	359	413	495	486	472	510	555	614	565	563	555	566	628	ESO telbib
La Silla	350	389	405	324	300	316	288	305	316	296	279	312	288	260	277	286	271	273	267	211	199	229	ESO telbib
ESO sur- vey tel.															2	13	30	38	73	94	109	151	ESO telbib
APEX (ESO)											12	1	8	15	28	27	40	44	47	33	49	46	ESO telbib
ALMA (ESO)																	16	40	47	73	134	152	ESO telbib
APEX (all)											22	5	19	29	49	50	66	74	74	63	79	72	ESO telbib
ALMA (all)																	19	65	97	147	236	332	ESO telbib
Chandra					56	198	331	431	398	446	553	493	523	430	422	434	448	415	390	428	425		Chandra Bibliography
Gemini					2	2	25	27	54	78	101	122	135	150	129	189	169	205	229	205	199	222	Gemini publications
HST	307	378	509	502	537	559	602	607	611	686	715	728	705	679	734	787	847	785	817	847	883	871	HST
Keck	53	68	109	128	169	176	194	212	214	232	277	313	263	269	289	300	335	319	292	305	302	245	Keck Science Bibliography
NRAO								256	317	311	352	407	419	463	414	518	450	519	531	570	675	703	NRAO Publication Stats
Spitzer									90	138	322	503	527	681	698	659	717	694	661	668	587	609	Spitzer Biblio. DB
Subaru					17	23	52	52	73	68	92	103	106	122	139	141	166	119	125	144	116	112	Subaru via ADS
XMM					1	85	107	242	357	350	441	389	438	472	418	450	414	438	398	371	453	396	XMM

Table 3: Number of refereed papers using data from ESO and other observatories

ESO Top 20

The ESO Top 20 list contains the 20 articles that gathered the highest number of citations. All papers directly use ESO data and were published in refereed journals.

The first two papers are the two highest quoted refereed papers listed on the ADS (see <http://tinyurl.com/lwb2tbc>)

#	Bibcode	Citations	Title	Authors	Telescopes / Instruments
1	1998AJ....116.1009R	10.594	Observational Evidence from Supernovae for an Accelerating Universe and a Cosmological Constant	Riess et al.	EMMI/NTT, 3.6m, 1.5m
2	1999ApJ...517..565P	10.584	Measurements of Omega and Lambda from 42 High-Redshift Supernovae	Perlmutter et al.	EFOSC2/3.6m
3	2004ApJ...607..665R	3.128	Type Ia Supernova Discoveries at $z > 1$ from the Hubble Space Telescope: Evidence for Past Deceleration and Constraints on Dark Energy Evolution	Riess et al.	FORS2

(Contd. from previous page)

#	Bibcode	Citations	Title	Authors	Telescopes / Instruments
4	2006A&A...447...31A	1.942	The Supernova Legacy Survey: measurement of Ω_M , Ω_Λ and w from the first year data set	Astier et al.	FORS1
5	1998Natur.391...51P	1.753	Discovery of a supernova explosion at half the age of the universe	Perlmutter et al.	EFOSC1/3.6m
6	2003ApJ...594....1T	1.493	Cosmological Results from High- z Supernovae	Tonry et al.	FORS1, ISAAC
7	1998Natur.395..670G	1.381	An unusual supernova in the error box of the γ -ray burst of 25 April 1998	Galama et al.	EMMI/NTT
8	2003ApJ...598..102K	1.310	New Constraints on Ω_M , Ω_Λ , and w from an Independent Set of 11 High-Redshift Supernovae Observed with the Hubble Space Telescope	Knop et al.	FORS1, EFOSC2/3.6m
9	2004ApJ...600L..93G	1.202	The Great Observatories Origins Deep Survey: Initial Results from Optical and Near-Infrared Imaging	Giavalisco et al.	FORS1, FORS2, ISAAC, WFI/2.2m, SOFI/NTT
10	2004A&A...418..989N	1.172	The Geneva-Copenhagen survey of the Solar neighbourhood. Ages, metallicities, and kinematic properties of $\sim 14\,000$ F and G dwarfs	Nordström et al.	Danish 1.5m
11	2013Sci...340..448A	1.108	A Massive Pulsar in a Compact Relativistic Binary	Antoniadis et al.	FORS2
12	2008ApJ...686..749K	1.107	Improved Cosmological Constraints from New, Old, and Combined Supernova Data Sets	Kowalski et al.	Danish 1.5m, EFOSC2/3.6m
13	1998ApJ...507...46S	1.017	The High- Z Supernova Search: Measuring Cosmic Deceleration and Global Curvature of the Universe Using Type IA Supernovae	Schmidt et al.	EMMI/NTT, 3.6m, 1.5m
14	2003Natur.423..847H	988	A very energetic supernova associated with the γ -ray burst of 29 March 2003	Hjorth et al.	FORS1, FORS2
15	2006ApJ...648L.109C	965	A Direct Empirical Proof of the Existence of Dark Matter	Clowe et al.	WFI, FORS1
16	2007ApJS...172....1S	960	The Cosmic Evolution Survey (COSMOS): Overview	Scoville et al.	VIMOS
17	2010ApJ...716..712A	954	Spectra and Hubble Space Telescope Light Curves of Six Type Ia Supernovae at $0.511 < z < 1.12$ and the Union2 Compilation	Amanullah et al.	FORS1, ISAAC, SUSI2
18	2007ApJ...670..156D	945	Multiwavelength Study of Massive Galaxies at $z \sim 2$. I. Star Formation and Galaxy Growth	Daddi et al.	FORS2, ISAAC
19	2009ApJ...692.1075G	886	Monitoring Stellar Orbits Around the Massive Black Hole in the Galactic Center	Gillessen et al.	NACO, SINFONI
20	1997Natur.386..686V	701	Transient optical emission from the error box of the γ -ray burst of 28 February 1997	van Paradijs et al.	EFOSC2/NTT

Table 4: ESO Top 20 papers (as of February 2018)

VLT instruments

VLT papers use data generated by VLT instruments. Visitor instruments for which observing time is recommended by the ESO OPC (Observing Programmes Committee), e.g., VLT Ultracam, are included in the general VLT statistics (see page 3), but are not shown in Fig. 4. Instrument-level data for the VLT are available since the beginning of operations, i.e., from publication year 1999 onwards.

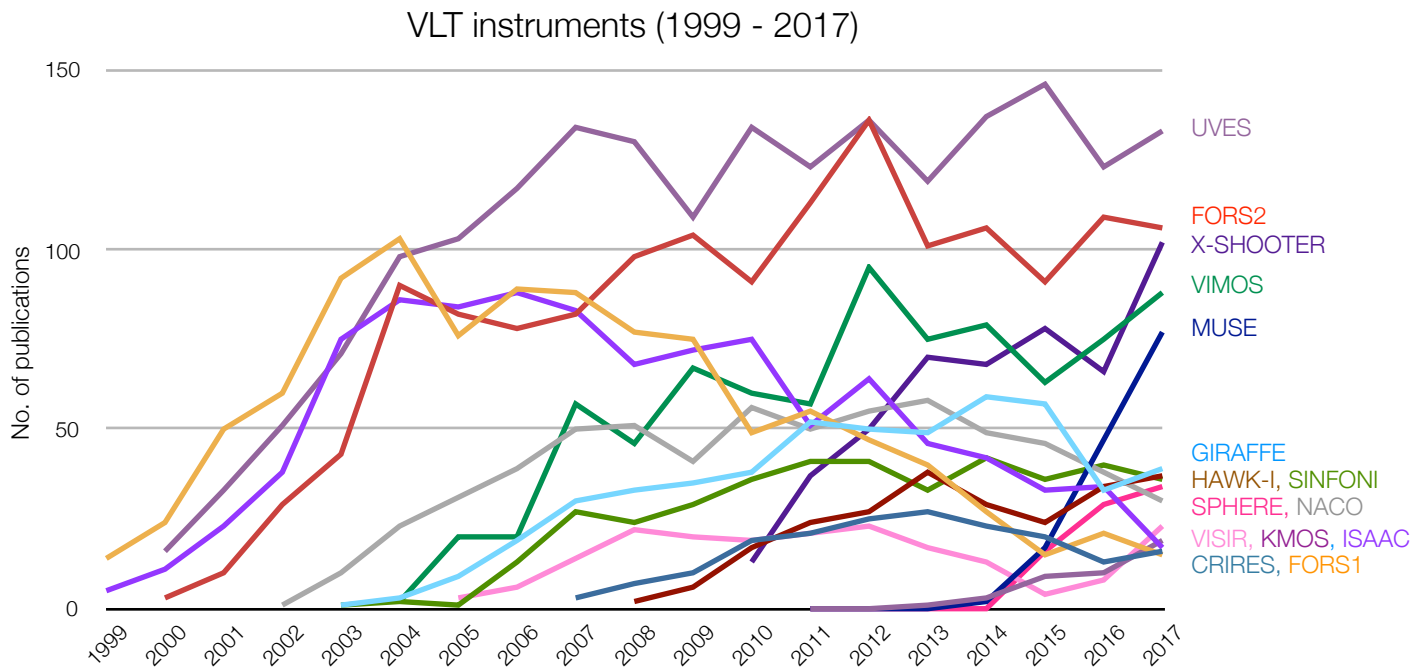


Fig. 4: Refereed publications using data from VLT instruments

FLAMES papers are listed as GIRAFFE and/or UVES
 NACO = NAOS + CONICA, SINFONI = SPIFFI + MACAO

VLT															
	CRIRES	FORS1	FORS2	GIRAFFE	HAWK-I	ISAAC	KMOS	MUSE	NACO	SINFONI	SPHERE	UVES	VIMOS	VISIR	X-SHOOTER
1999		14				5									
2000		24	3			11						16			
2001		50	10			23						33			
2002		60	29			38			1			51			
2003		92	43	1		75			10	1		71			
2004		103	90	3		86			23	2		98	2		
2005		76	82	9		84			31	1		103	20	3	
2006		89	78	19		88			39	13		117	20	6	
2007	3	88	82	30		83			50	27		134	57	14	
2008	7	77	98	33	2	68			51	24		130	46	22	
2009	10	75	104	35	6	72			41	29		109	67	20	
2010	19	49	91	38	17	75			56	36		134	60	19	13
2011	21	55	113	52	24	51	0	0	50	41	0	123	57	21	37
2012	25	47	136	50	27	64	0	0	55	41	0	136	95	23	50
2013	27	40	101	49	38	46	1	0	58	33	0	119	75	17	70
2014	23	27	106	59	29	42	3	2	49	42	0	137	79	13	68
2015	20	15	91	57	24	33	9	17	46	36	16	146	63	4	78
2016	13	21	109	33	34	34	10	47	38	40	29	123	75	8	66
2017	16	15	106	39	37	17	19	77	30	36	34	133	88	23	102

Table 5: Number of refereed papers using VLT data

VLT instruments

VLT papers use data generated by VLT instruments, including visitor instruments for which observing time is recommended by the ESO OPC (Observing Programmes Committee), e.g. VLT PIONIER. Instrument-level data for the VLT are available since the beginning of operations, i.e., from publication year 2002 onwards.

VLT				
	AMBER	MIDI	PIONIER	VINCI
2002				1
2003				6
2004		3		12
2005		5		12
2006	1	11		6
2007	9	19		4
2008	12	11		1
2009	13	18		4
2010	12	6		1
2011	16	13	4	1
2012	18	8	2	1
2013	20	20	3	0
2014	15	12	13	1
2015	11	9	4	0
2016	13	7	11	0
2017	10	5	15	1

Table 6: Number of refereed publications using data from VLT instruments

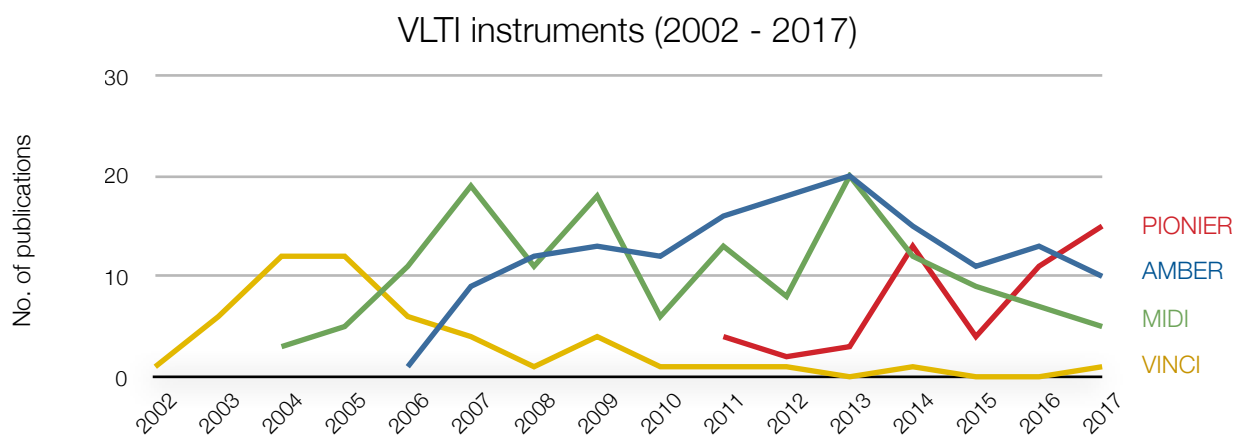


Fig. 5: Refereed publications using data from VLT instruments

Survey telescopes: VISTA + VST

ESO's Visible and Infrared Survey Telescope for Astronomy (VISTA), with its VIRCAM camera, has produced science papers since 2010. Papers mostly use data from the VV, VIKING, VMC, UltraVISTA, VHS, and VIDEO surveys. Observations with OmegaCAM at the VLT Survey Telescope (VST) led to the first data papers in 2014.

	VISTA (VIRCAM)	VST (OmegaCAM)
2010	2	0
2011	13	0
2012	30	0
2013	38	0
2014	65	8
2015	72	24
2016	95	18
2017	101	55

Table 7: Number of refereed publications using data from the VISTA and VST telescopes

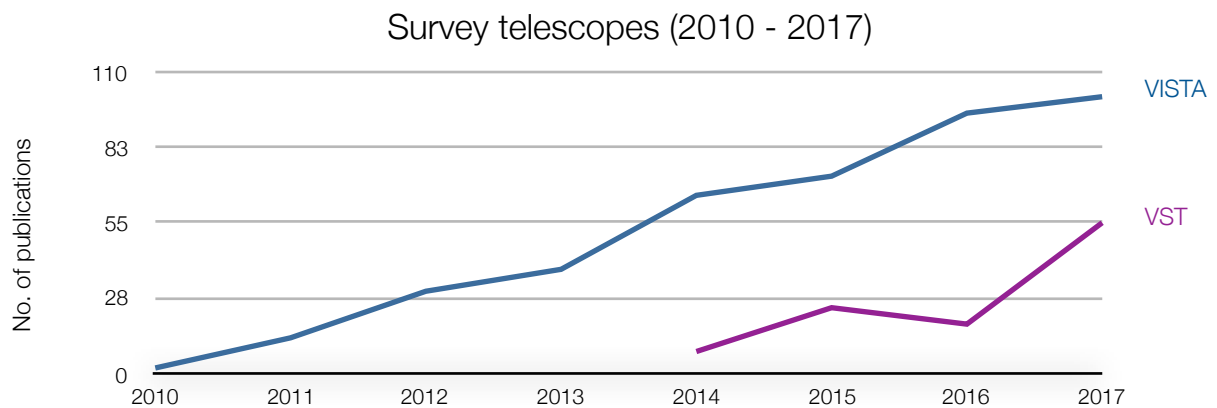
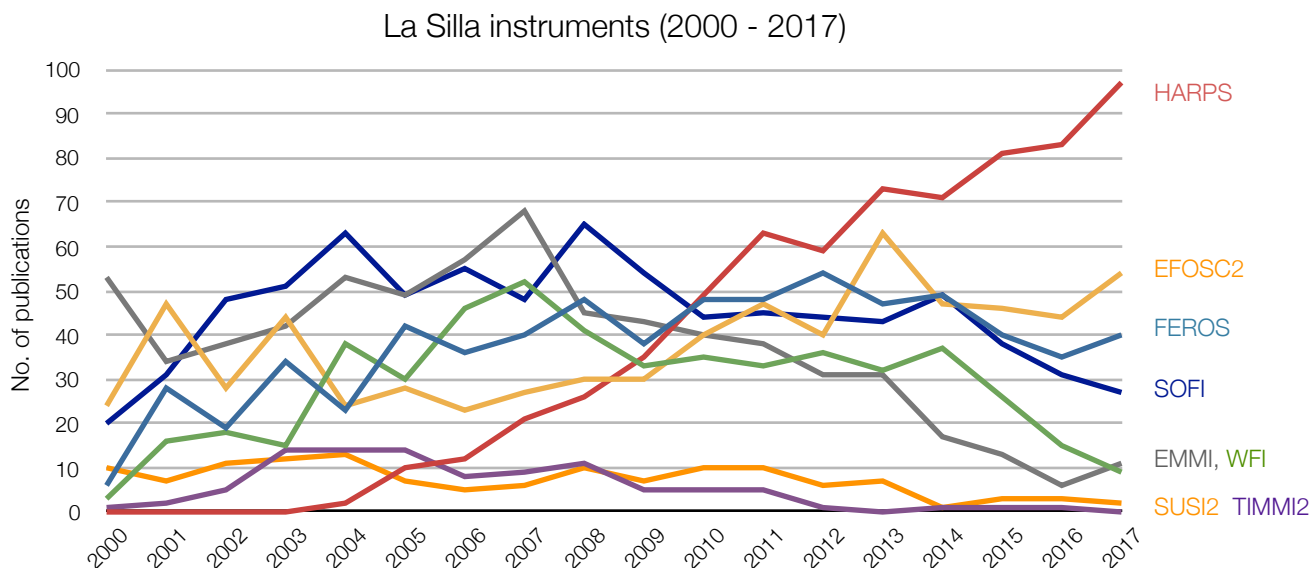


Fig. 6: Refereed publications using data from the survey telescopes

La Silla instruments

This section reports on papers that use data generated by other facilities of the La Silla Paranal (LSP) Observatory, located on La Silla. Papers based on data from non-ESO telescopes or observations obtained during reserved periods (e.g., national allocations of time) are not included. Instrument-level data for La Silla facilities are shown below from publication year 2000 onwards. Only papers based on data from FEROS (1.5m and 2.2m tel. combined), WFI (2.2m) EFOSC2 (2.2m, 3.6m, NTT combined), HARPS, TIMMI2 (both 3.6m), EMMI, SOFI, and SUSI2 (all NTT) are included in the graph. The table also shows papers based on data from smaller or decommissioned La Silla facilities if observations took place during ESO time. Visitor instruments for which observing time is recommended by the OPC (e.g., NTT Ultracam) are included in the general statistics (see p. 3), but are not shown in Fig. 7.



EFOSC2 = EFOSC2@NTT, EFOSC2@3.6m + EFOSC2@2.2m
 FEROS = FEROS@1.5m + FEROS@2.2m
 La Silla decomm. = small or decommissioned facilities.
 National telescopes (e.g., Swiss Euler Tel.) are **excluded**

Fig 7 (above) and Table 8 (below): Number of refereed papers using data from La Silla facilities

	2.2m		3.6m		NTT				La Silla decomm.
	FEROS	WFI	HARPS	TIMMI2	EFOSC2	EMMI	SOFI	SUSI2	
2000	6	3		1	24	53	20	10	231
2001	28	16		2	47	34	31	7	209
2002	19	18		5	28	38	48	11	164
2003	34	15		14	44	42	51	12	146
2004	23	38	2	14	24	53	63	13	153
2005	42	30	10	14	28	49	49	7	122
2006	36	46	12	8	23	57	55	5	78
2007	40	52	21	9	27	68	48	6	84
2008	48	41	26	11	30	45	65	10	60
2009	38	33	35	5	30	43	54	7	56
2010	48	35	49	5	40	40	44	10	41
2011	48	33	63	5	47	38	45	10	35
2012	54	36	59	1	40	31	44	6	27
2013	47	32	73	0	63	31	43	7	31
2014	49	37	71	1	47	17	49	1	33
2015	40	26	81	1	46	13	38	3	13
2016	35	15	83	1	44	6	31	3	16
2017	40	9	97	0	54	11	27	2	18

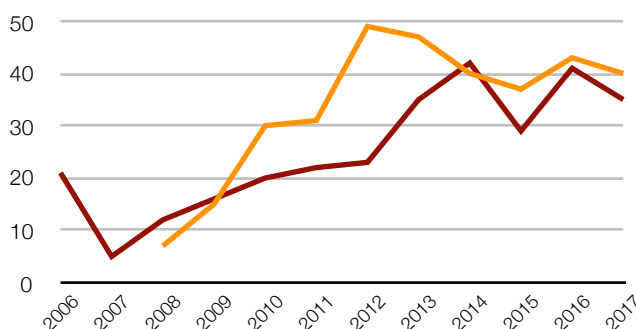
APEX

APEX is a collaboration between the Max-Planck-Institute for Radio Astronomy (MPIfR, 50%), the Onsala Space Observatory (OSO, 23%), and ESO (27%). The telescope is located on the Chajnantor plateau in Chile's Atacama region and is operated by ESO.

Publication information for APEX is available since the beginning of operations, i.e., from publication year 2006 onwards. Papers based on data from all APEX partners are recorded in the ESO Telescope Bibliography (telbib), but only those that use ESO/APEX data are counted in the ESO statistics.

APEX		
	ESO/APEX	all APEX
2006	12	22
2007	1	5
2008	8	19
2009	15	29
2010	28	49
2011	27	50
2012	40	66
2013	44	74
2014	47	74
2015	33	63
2016	49	79
2017	46	72
Total	350	602

Table 9: Number of refereed publications using ESO/APEX data and data generated by all APEX partners, respectively.



Imagers: APEX-SZ, Artemis, LABOCA, P-Artemis, SABOCA
Spectrographs: APEX-2A, CHAMP+, CONDOR, FLASH, MPL_1.1THz, PI230,

SEPIA,

Fig. 8: Number of refereed publications using APEX bolometer and heterodyne instruments, respectively. Data are from observations by all APEX partners. Note that the sum of papers from imagers and spectrographs can be higher than the real total since papers can use data from both groups.

APEX publications (2006 - 2017)

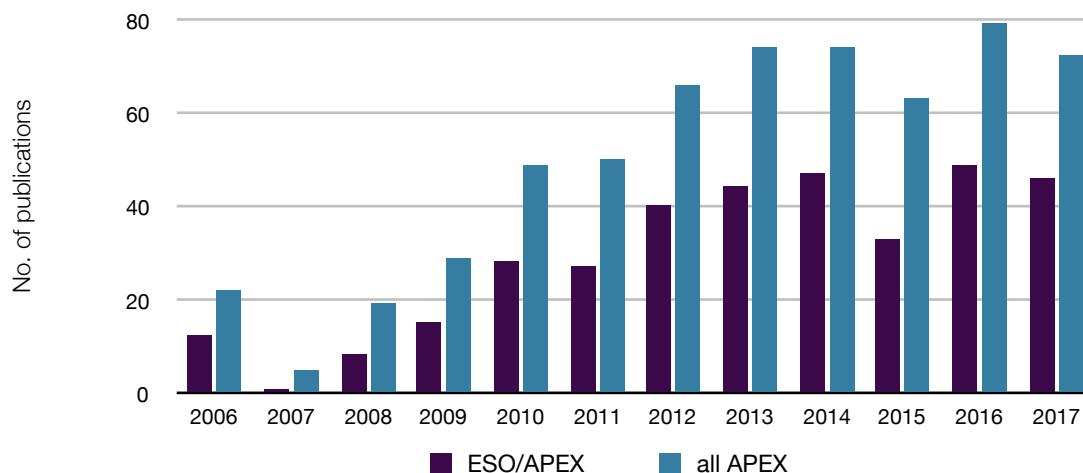


Fig. 9: Refereed publications using ESO/APEX data. For comparison, all APEX papers are shown.

ALMA

ALMA, the Atacama Large Millimeter/submillimeter Array, is an international collaboration between Europe, East Asia, and North America in cooperation with the Republic of Chile. The European executive is represented by ESO, which also hosts the European ALMA Regional Centre. The other partners North America and East Asia are represented by NRAO and NAOJ, respectively. The ALMA telescope bibliography is maintained by the librarians at ESO and NRAO as well as by NAOJ.

Papers based on European observing time as well as on data from all ALMA partners are recorded in the ESO Telescope Bibliography (telbib), but only those that use ESO/ALMA data are counted in the ESO statistics. Both numbers are shown below for comparison.

Papers resulting from science verification data are attributed to the four ALMA partners JAO, ESO, North America, and East Asia.

ALMA		
	ESO/ALMA	all ALMA
2012	16	19
2013	40	65
2014	47	97
2015	73	147
2016	134	236
2017	152	332
Total	462	896

Table 10: Number of refereed publications using ESO/ALMA data and data generated by all ALMA partners per year, respectively.

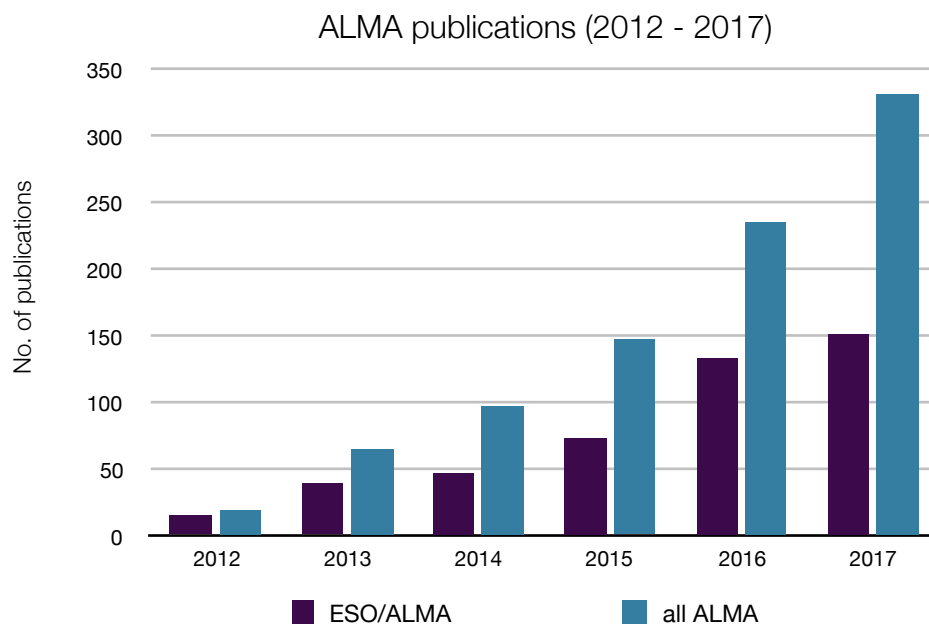


Fig. 10: Refereed publications using ESO/ALMA data. For comparison, all ALMA papers are shown. The graph is not cumulative.

Further Information

Articles and Presentations

For articles and presentations related to the ESO Telescope Bibliography, see http://www.eso.org/sci/libraries/useful_links/publications.html

Further telbib-related links:

Search: [ESO Telescope Bibliography \(telbib\)](#)

Cite: [ESO data citation policy](#)

Understand: [telbib Methodology](#)

Explore: [More info, reports, statistics](#)