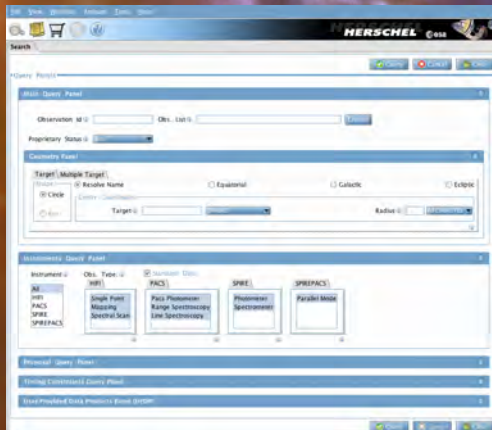


Herschel Status & Legacy



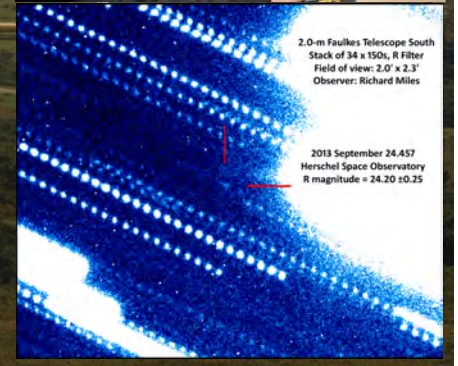
Göran Pilbratt, Herschel Project Scientist
HUG#8 meeting, ESAC, 22-23 May 2014

Launch on 14 May 2009 ...

... EoHe in DTCP#1447 on 29 April 2013

... last telecommand on 17 June 2013

... now in “parking” orbit

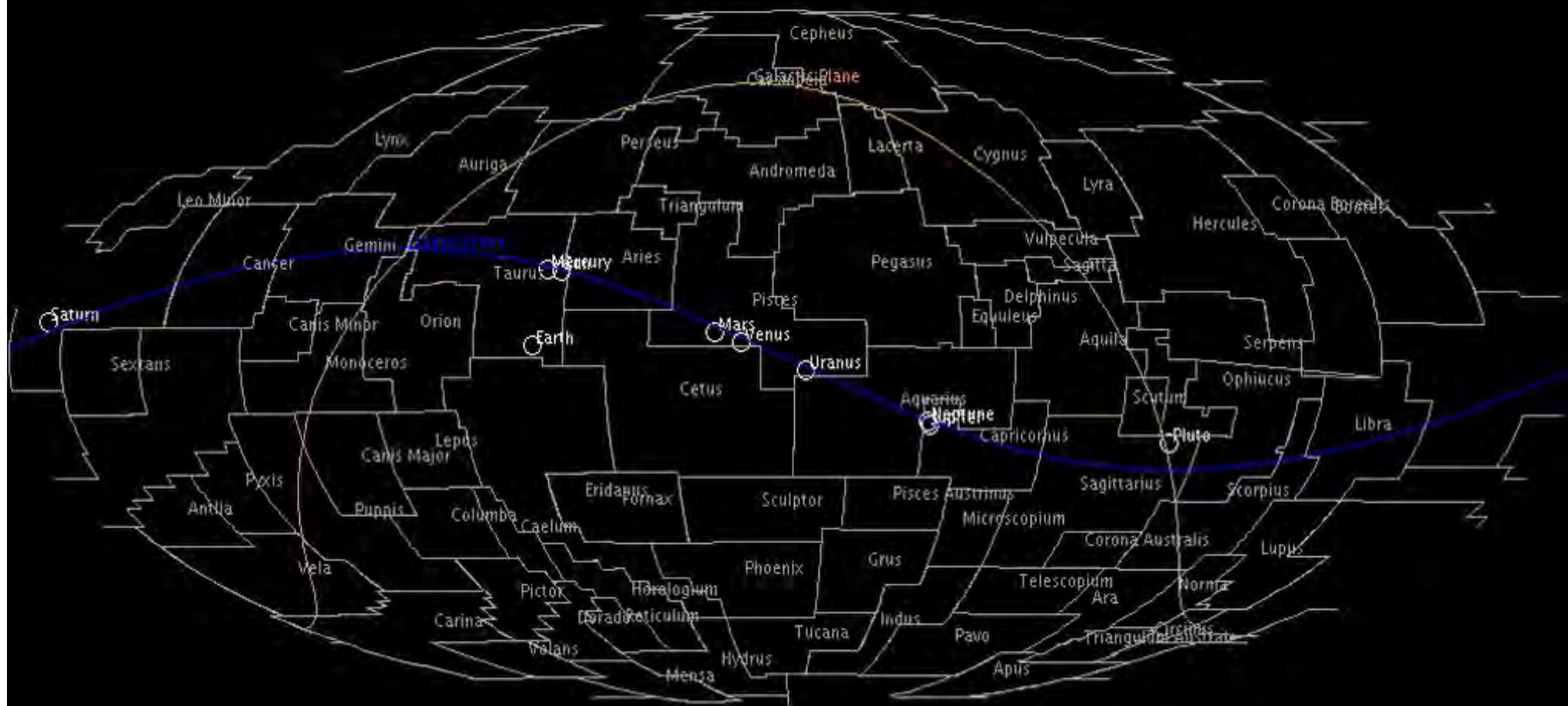




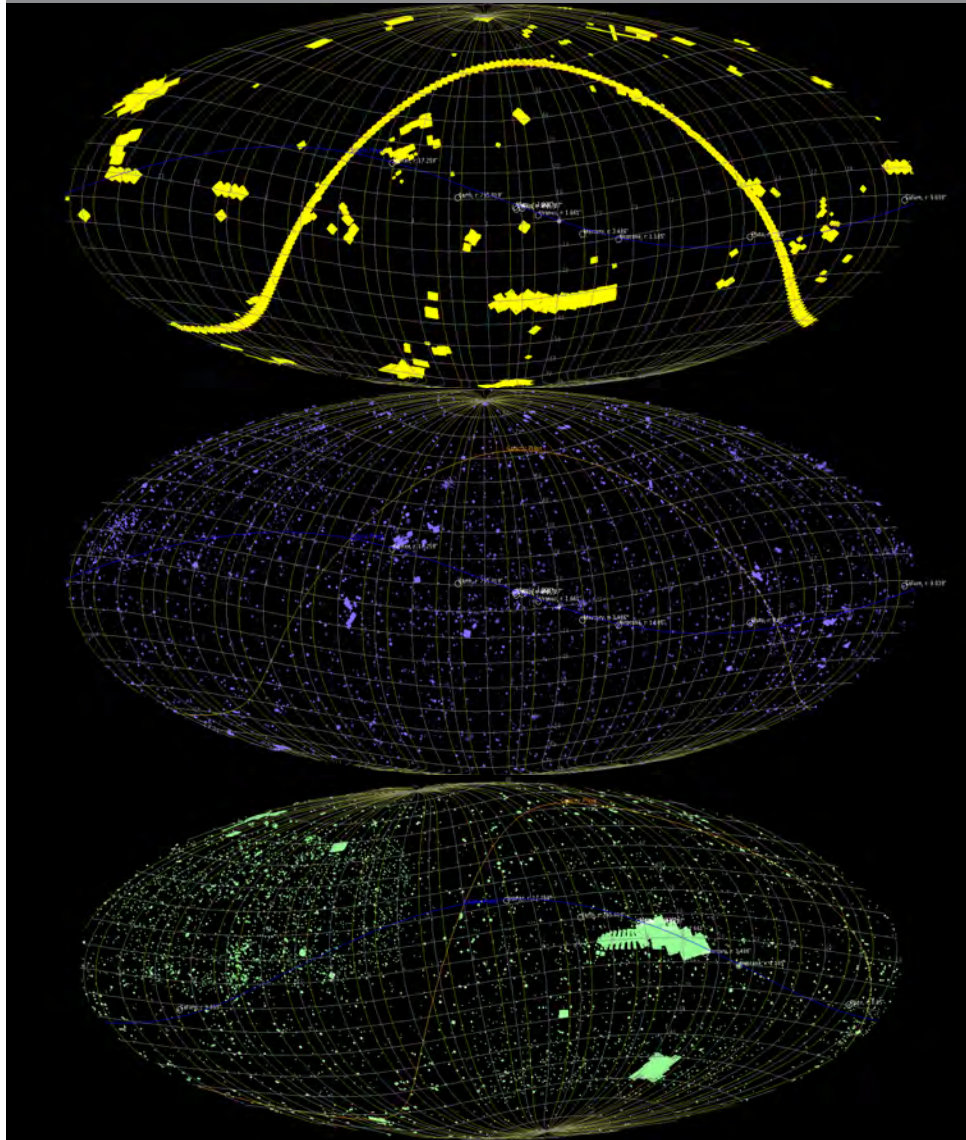
Herschel mission: **impossible!**

OD: 2

Epoch: 2009-05-16T10:51:28Z



Preliminary sky coverage



Totals (uncert +/- 5%)

- S/P parallel 6.44
- PACS phot 0.67
- SPIRE phot 2.28
- PACS spec <0.01
- SPIRE spec <0.01
- HIFI 0.06
- Total Herschel 9.45

These numbers are %-ages of the entire sky (~41,000 sq deg)

Herschel has observed almost 1/10 of the entire sky!

By performing ~23,400 hr of HOTAC approved observing!



HERSCHEL SPACE OBSERVATORY

HSA Science Archive v5.2.1

File View Windows Account Tools Help

HERSCHEL ESA

Search

Query

Cancel

Clear

Query Panels

Main Query Panel

Observation Id Obs. List Choose

Proprietary Status

Geometry Panel

Target \ Multiple Target \

Shape ☒ Circle ☐ Box

☒ Resolve Name ☐ Equatorial ☐ Galactic ☐ Ecliptic

Centre Coordinates

Target Radius

Instruments Query Panel

Instrument Obs. Type: ☒ Standard Data

Single Point Mapping Spectral Scan

Pacs Photometer Range Spectroscopy Line Spectroscopy

Photometer Spectrometer

Parallel Mode

Proposal Query Panel

Timing Constraints Query Panel

User Provided Data Products Panel (UPDP)

All science data are public!

HSA Science Archive v5.2.1

File View Windows Account Tools Help

HERSCHEL Cesa

Search

Query Panels

Query

Cancel

Clear

Main Query Panel

Observation Id Obs. List Choose

Observing statistics

- Total science scheduled (some failed) ~24200 hr
- Total successful HOTAC allocated ~23400 hr ~37,000 AORs
- sanity check (24200-23400)/24200 ~3.3%
- Total science (w/o overheads) 22651 hr
- Sanity check (23400-22651)/23400 ~3.2%
- + Routine science calibration ~2600 hr ~6600 AORs
- Sanity check 2600/23400 ~11%

Proposal Query Panel

Timing Constraints Query Panel

User Provided Data Products Panel (UPDP)

SPiRE
SPiREPACS

Spectral Scan

Line Spectroscopy

HSA Science Archive v5.2.1

File View Windows Account Tools Help

HERSCHEL Cesa

Search

Query Panels

Query

Cancel

Clear

Main Query Panel

Observation Id Obs. List Choose

Proprietary Status

Geometry Panel

Target \ Multiple

Shape

☒ Circle

☐ Box

Instruments Query

Instrument

All

HIFI

PACS

SPIRE

SPIREPACS

Single Point Mapping Spectral Scan

PACS Photometer Range Spectroscopy Line Spectroscopy

Photometer Spectrometer

Parameter Mode

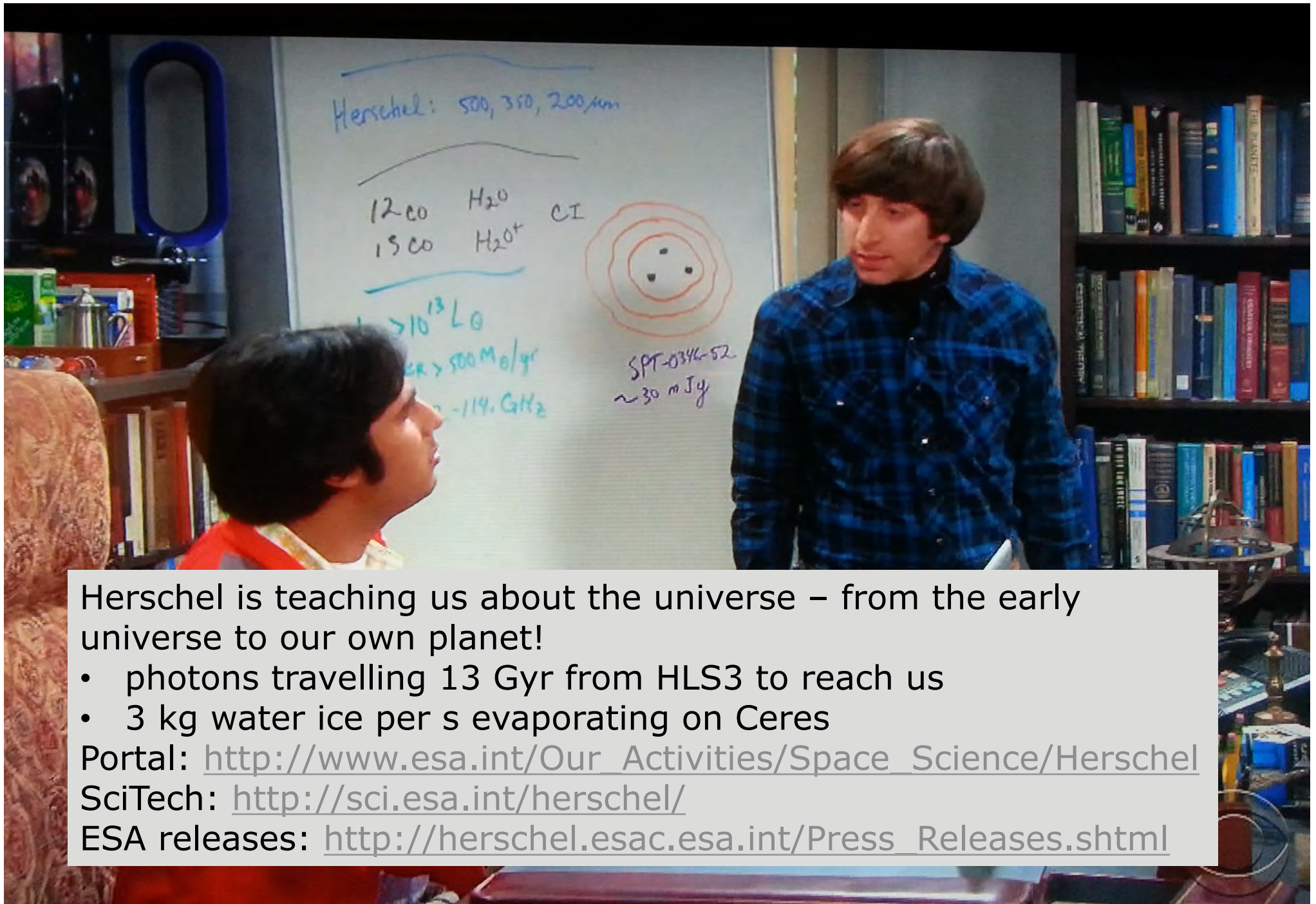
Proposal Query Panel

Timing Constraints Query Panel

User Provided Data Products Panel (UPDP)

Science categories (HOTAC allocations)

• Galaxies/AGNs	6503 hr	28%
• Cosmology	5074 hr	22%
• ISM/SF	9044 hr	39%
• SSO	956 hr	4%
• Stars/SE	1899 hr	8%
• Total	23476 hr	



Herschel is teaching us about the universe – from the early universe to our own planet!

- photons travelling 13 Gyr from HLS3 to reach us
- 3 kg water ice per s evaporating on Ceres


Portal: http://www.esa.int/Our_Activities/Space_Science/Herschel


SciTech: <http://sci.esa.int/herschel/>


ESA releases: http://herschel.esac.esa.int/Press_Releases.shtml


2014

 **Herschel discovers mature galaxies in the young Universe**
ESA SciTech News
29 October 2014


 **Glowing jewels in the Galactic Plane**
ESA Space Science - Image of the week
28 April 2014

 **Herschel completes largest survey of cosmic dust in local Universe**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
18 March 2014


 **Star factory NGC 7538**
ESA Space Science - Image of the week
3 March 2014


 **Bullying black holes force galaxies to stay red and dead**
ESA SciTech News
25 February 2014


 **The whirl of stellar life**
ESA Space Science - Image of the week
27 January 2014


 **Herschel discovers water vapour around dwarf planet Ceres**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
22 January 2014


2013


 **Supernova Fireworks**
ESA Space Science - Image of the Week - also in-depth on [ESA SciTech News](#)
12 December 2013


 **Mission incredible**
ESA Space Science - Image (Movie!) of the week
25 November 2013

 **A Galactic bubble with a large surprise**
ESA Space Science - Image of the week
14 October 2013


 **Herschel helps find elusive signals**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
1 October 2013

 **Embracing Orion**
ESA Space Science - Image of the week
26 August 2013

 **Closing views of an icon**
ESA Space Science - Image of the week
1 July 2013

 **Final command: Herschel ends operations**
ESA Operations News
17 June 2013


 **There is more gas in the Galaxy than we thought**
ESA SciTech News
11 June 2013


 **Rare merger reveals secrets of galaxy evolution**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
22 May 2013


 **Herschel finds hot gas on the men**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
7 May 2013

 **Herschel closes its eyes on the Universe**
ESA Press Release N° 11-2013
See also the [ESA Space Science](#) and [SciTech News](#)
29 April 2013


 **Herschel links Jupiter's water to comets**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
23 April 2013


 **Herschel and Hubble see the Horsehead nebula**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
19 April 2013

 **Star factory in the early Universe**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
17 April 2013

 **Retired star found with planets and a protoplanet**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
9 April 2013

 **Hunting high-mass stars with Herschel**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
27 March 2013


 **Herschel gets to the bottom of black-hole jets**
ESA SciTech News
12 March 2013


 **Herschel to finish observing soon**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
5 March 2013

 **A cool discovery about the Sun's next-door twin**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
20 February 2013

 **Stars can be late parents**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
30 January 2013


 **Cool Andromeda**
ESA Space Science - Image of the Week
28 January 2013

 **Betelgeuse braces for a collision**
ESA Space Science News
22 January 2013

 **Herschel intercepts asteroid Apophis**
ESA Space Science News
9 January 2013

 **A Cradle of Stars**
ESA Space Science - Image of the week
7 January 2013

2012

 **Herschel and Keck take census of the invisible Universe**
ESA Space Science News - also in-depth on [ESA SciTech News](#)
4 December 2012

2014



Herschel completes largest survey of cosmic dust
ESA Space Science News - also in-depth on [ESA SciTech News](#)
18 March 2014



Star fact
ESA Space
3 March 2014



Bullying
ESA SciTech News
25 February 2014



The whirl
ESA Space
27 January 2014



Herschel
ESA Space
22 January 2014



Supernova
ESA Space
12 December 2013



Mission i
ESA Space
25 November 2013



A Galactic
ESA Space Science - Image of the week
14 October 2013



Herschel helps find elusive signals from the early Universe
ESA Space Science News - also in-depth on [ESA SciTech News](#)
1 October 2013



Embracing Orion
ESA Space Science - Image of the week
26 August 2013



Closing views of an icon
ESA Space Science - Image of the week
1 July 2013



Final command: Herschel ends mission
ESA Operations News
17 June 2013



There is more gas in the Galaxy



Hunting high-mass stars with Herschel
ESA Space Science News - also in-depth on [ESA SciTech News](#)
27 March 2013



Herschel gets to the bottom of black-hole jets
ESA SciTech News
12 March 2013



Herschel to finish observing soon
ESA Space Science News - also in-depth on [ESA SciTech News](#)

Herschel doing very well re web-stories

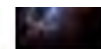
- 2010: 18 releases (incl 9 on 6 May...)
- 2011: 13 releases
- 2012: 15 releases
- 2013: 24 releases (incl 2 EoHe & 7 SSIW)
- 2014: 7 releases so far... (incl 3 SSIW)
- ...and more in the pipeline
- **Suggestions always encouraged!!**



Star factory in the early Univers
ESA Space Science News - also in-depth
17 April 2013



Retired star found with planets
ESA Space Science News - also in-depth
9 April 2013



Herschel and Keck take census of the invisible Universe
ESA Space Science News - also in-depth on [ESA SciTech News](#)
7 January 2013

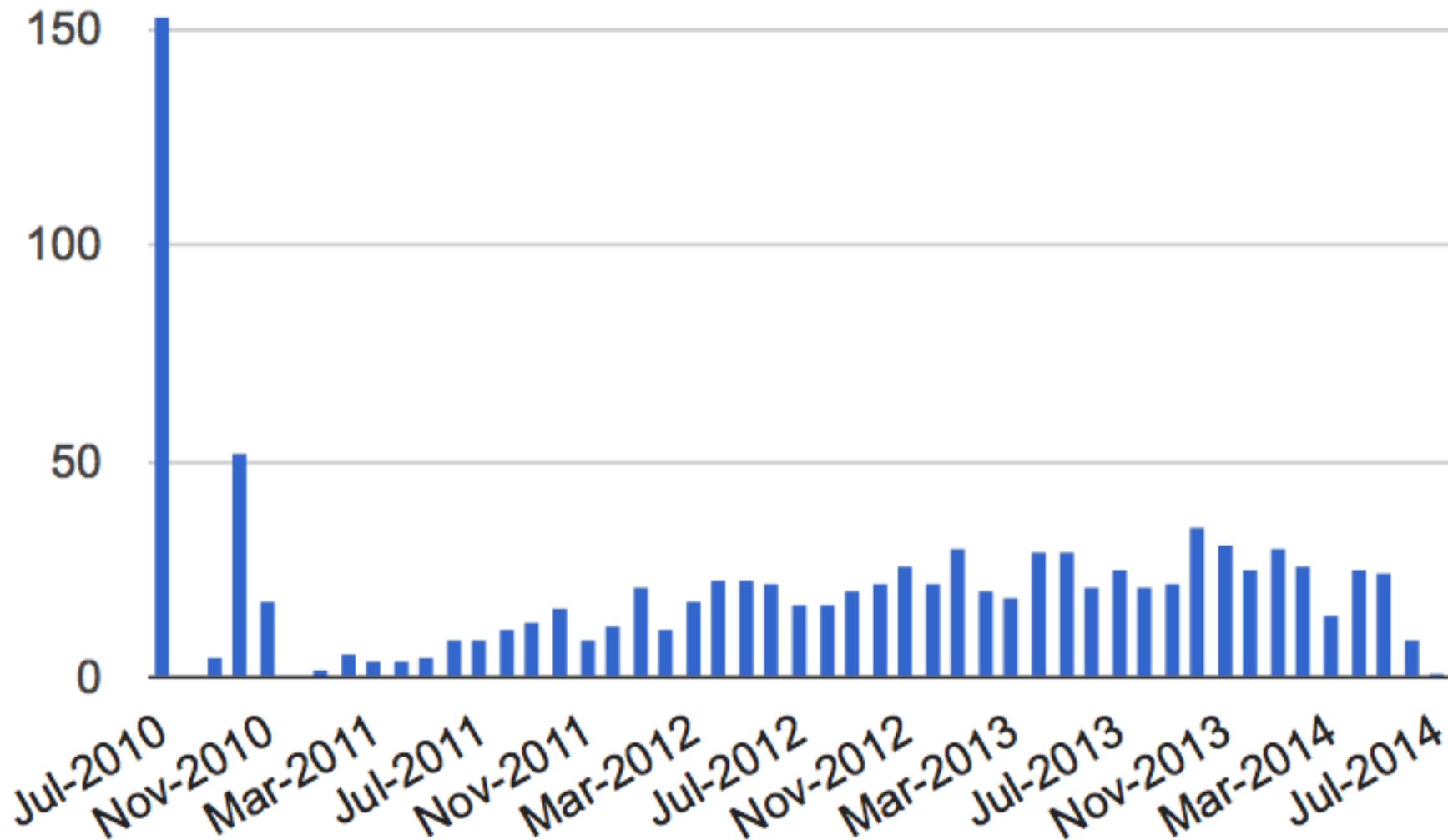
2012



Herschel and Keck take census of the invisible Universe
ESA Space Science News - also in-depth on [ESA SciTech News](#)
4 December 2012

Time distribution of papers

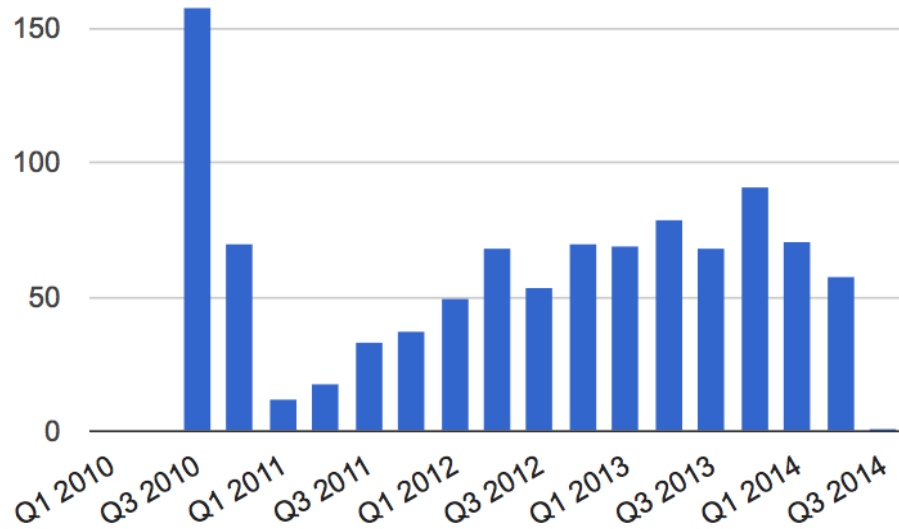
– based on 1007 papers – 20 May 2014



HERSCHEL SPACE OBSERVATORY

Time distribution of papers

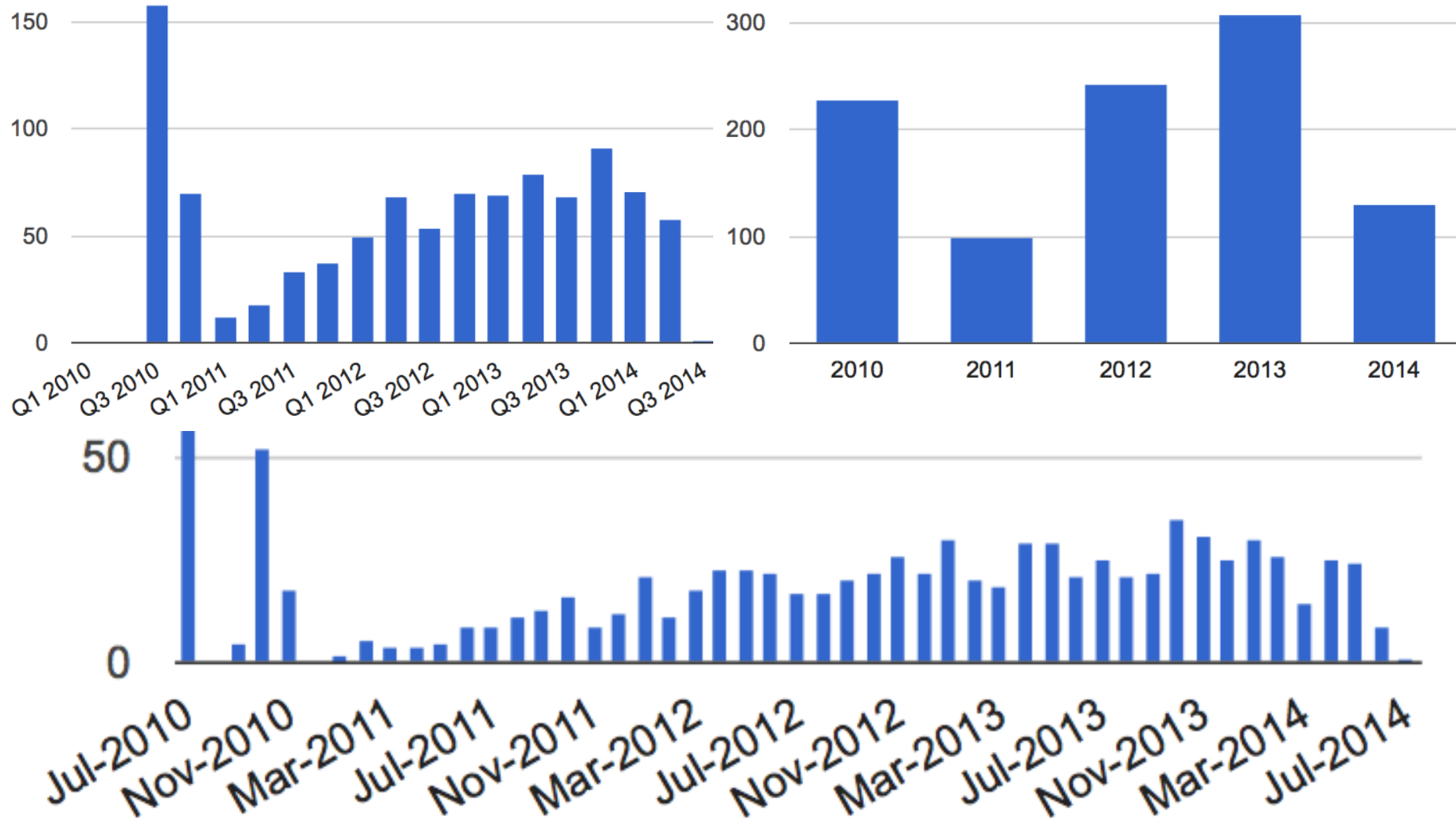
– based on 1007 papers – 20 May 2014



HERSCHEL SPACE OBSERVATORY

Time distribution of papers

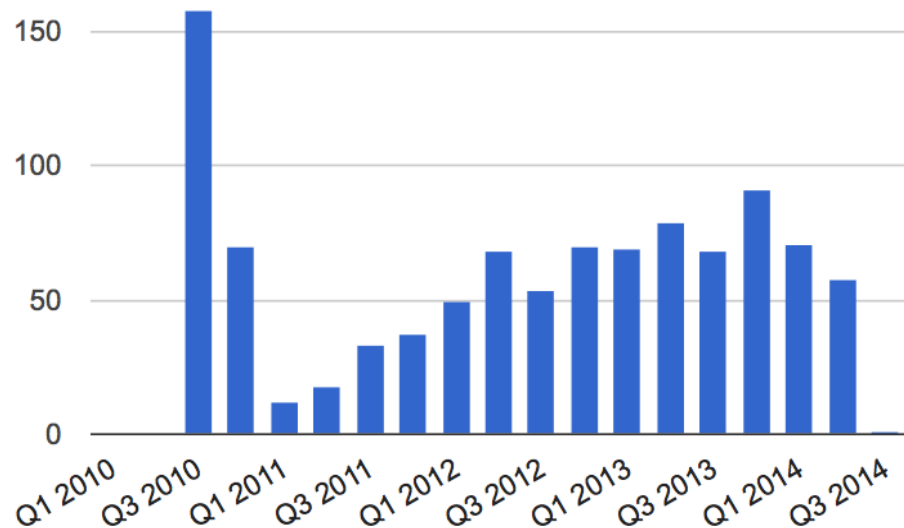
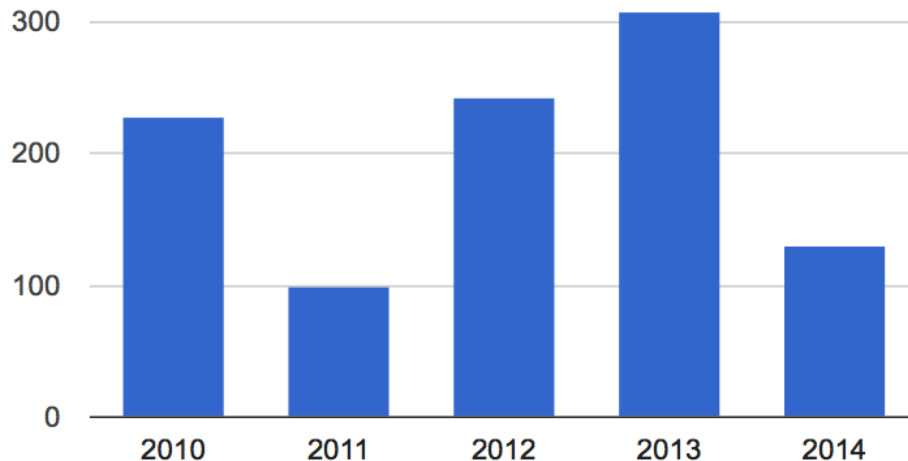
– based on 1007 papers – 20 May 2014



HERSCHEL SPACE OBSERVATORY

Time distribution of papers

– based on 1007 papers – 20 May 2014



Annual numbers:

- 2010: 228 pubs, cumulative 228
- 2011: 100 pubs, cumulative 328
- 2012: 242 pubs, cumulative 567
- 2013: 307 pubs, cumulative 877
- 2014: 130 pubs, cumulative 1007

Peaks & runner-ups:

- Year: 2013, 2012, 2010
- Quarter: Q3-2010, Q4-2013, Q2-2013
- Month: 07-2010, 10-2010, 10-2013

Trends:

- 2014: 4xQ1 ~2013
- 1000 pubs: ~5 years post launch
- Publication #ers are lower limits, and strictly 'connectable' to observations



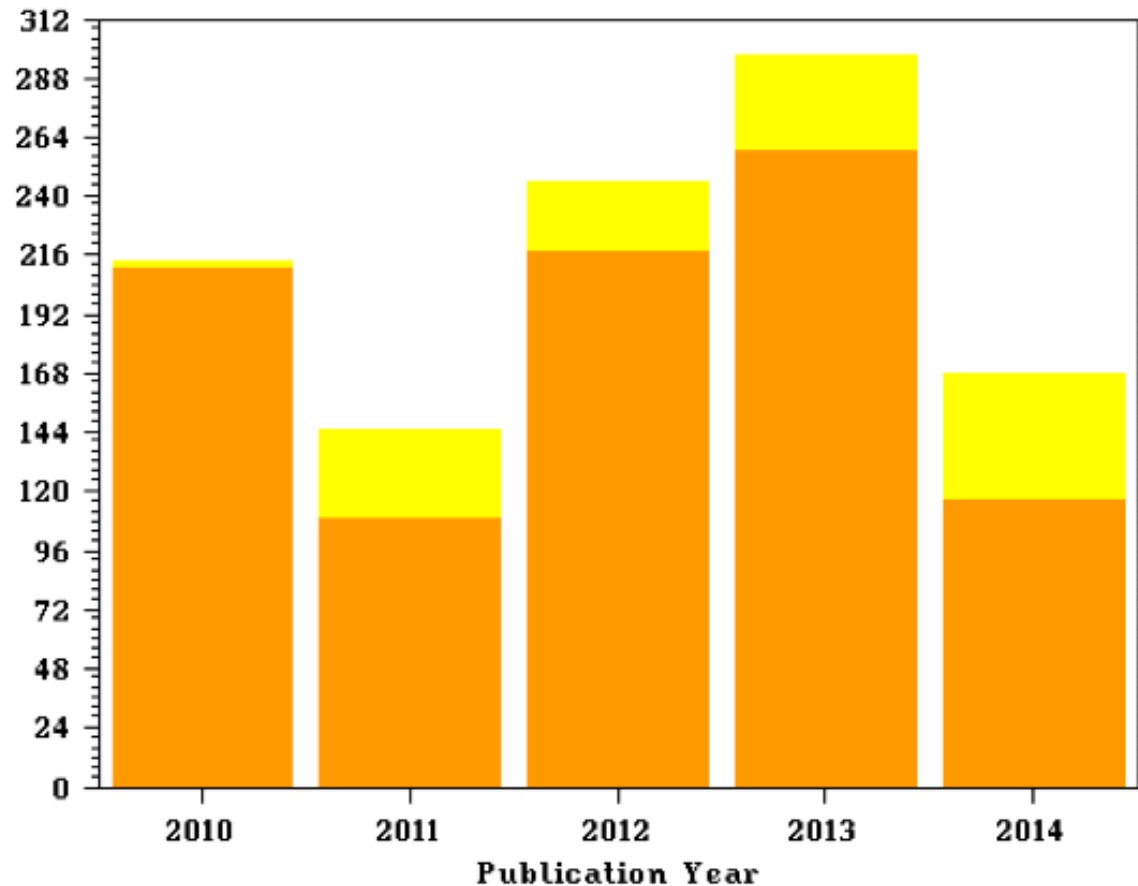
HERSCHEL SPACE OBSERVATORY

Citations to mission paper (ADS)

– based on 1007 papers – 20 May 2014

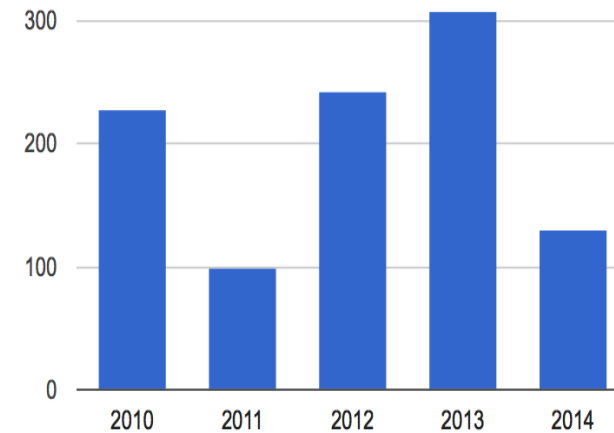


Citations/Publication Year for 2010A&A...518L...1P



■ Unrefereed
■ Refereed

Total citations: 1070
Total refereed: 912



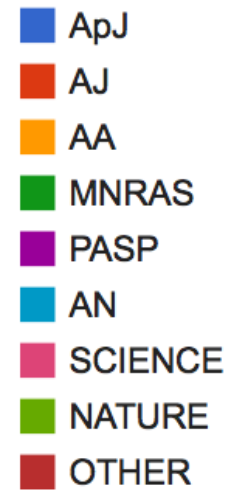
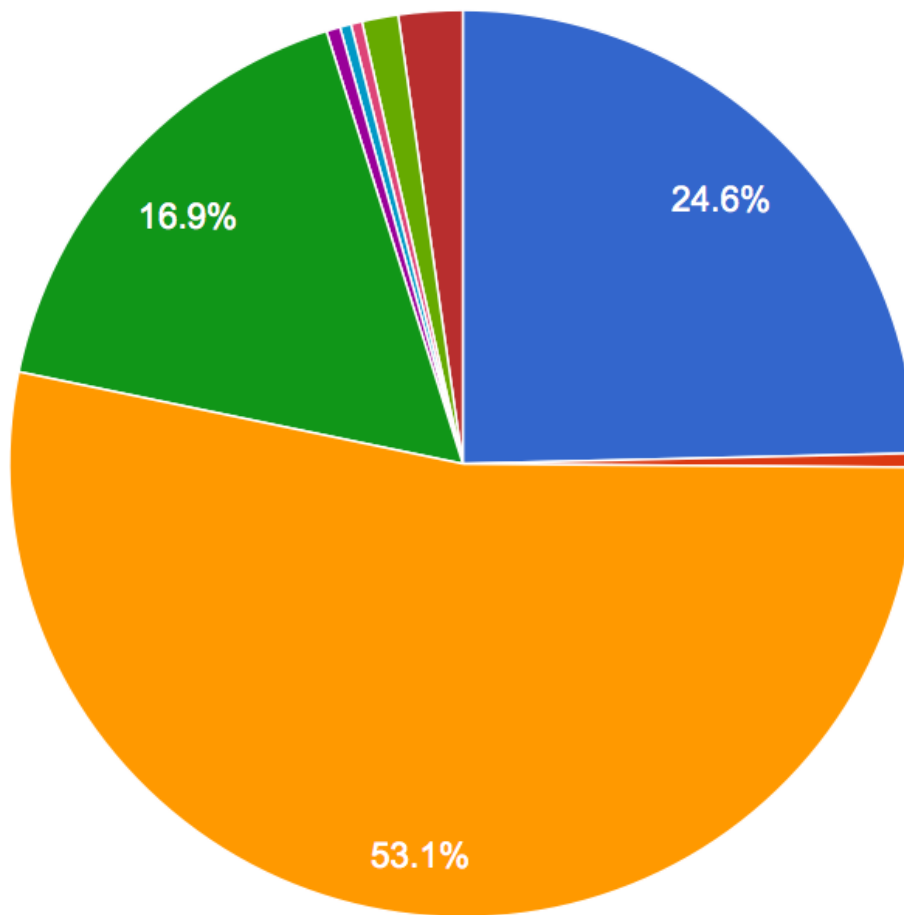
HERSCHEL SPACE OBSERVATORY

Journal distribution of papers

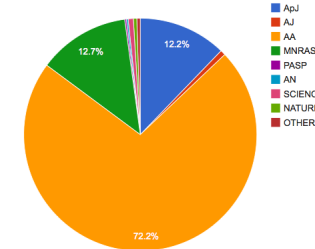
– based on 1007 papers – 20 May 2014



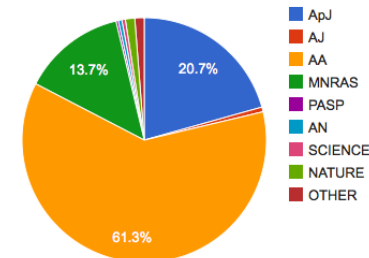
HERSCHEL SPACE OBSERVATORY



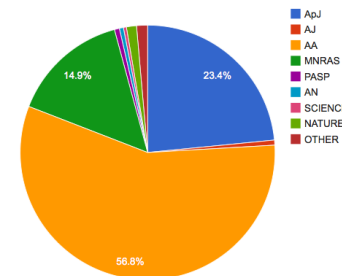
418 papers



644 papers

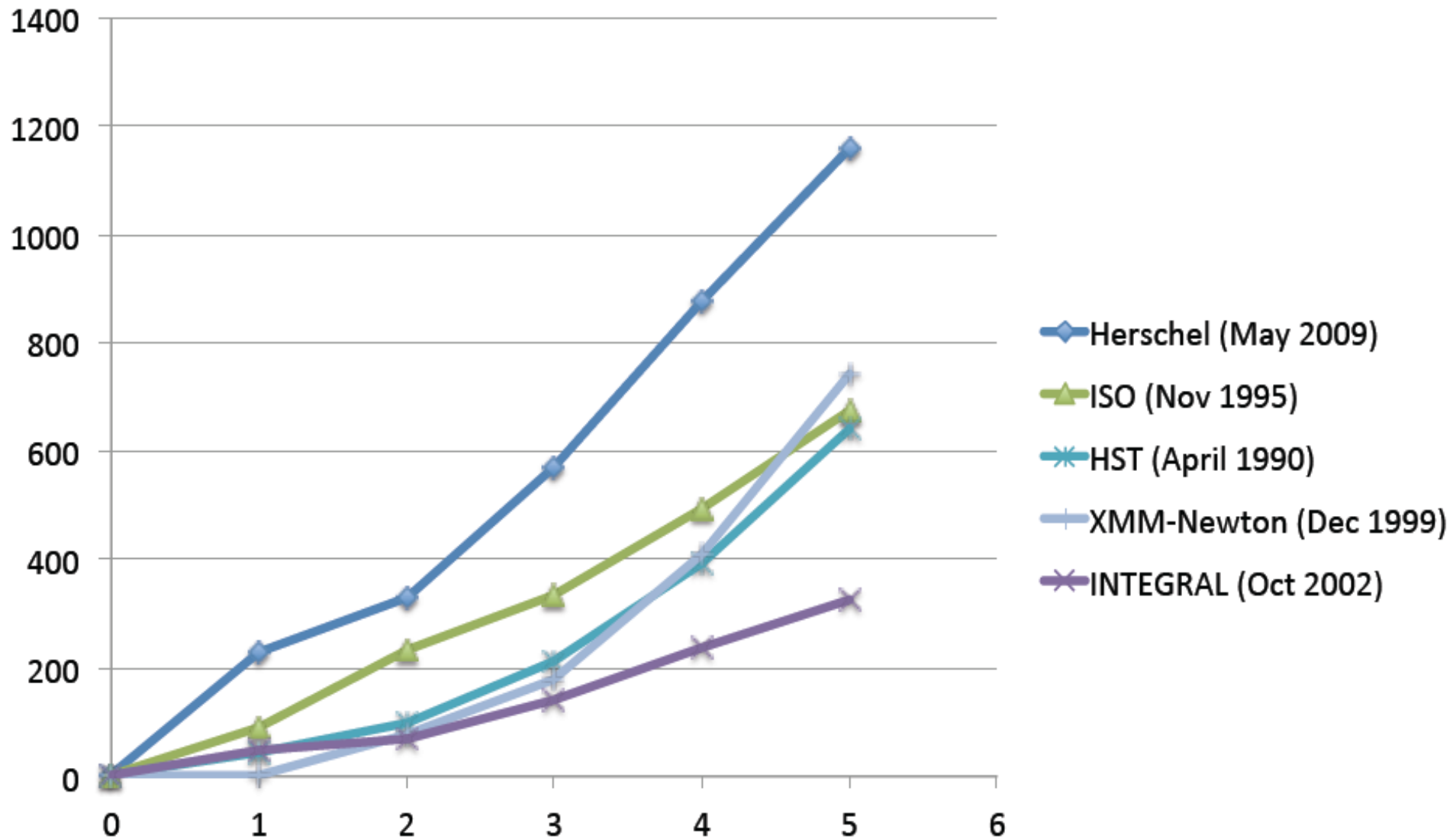


785 papers



#Pubs vs calendar yr after launch

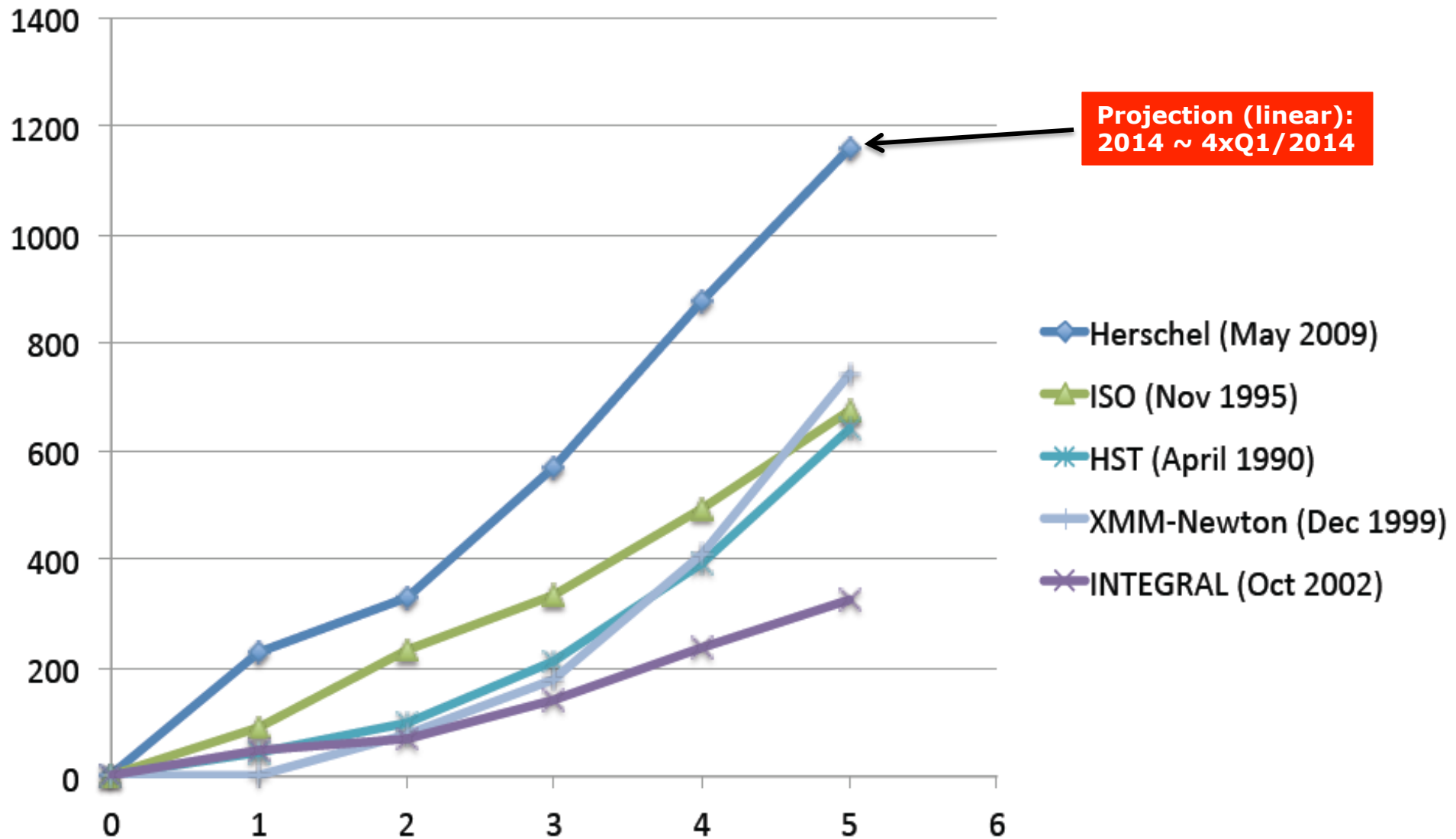
- ESA 'only'



HERSCHEL SPACE OBSERVATORY

#Pubs vs calendar yr after launch

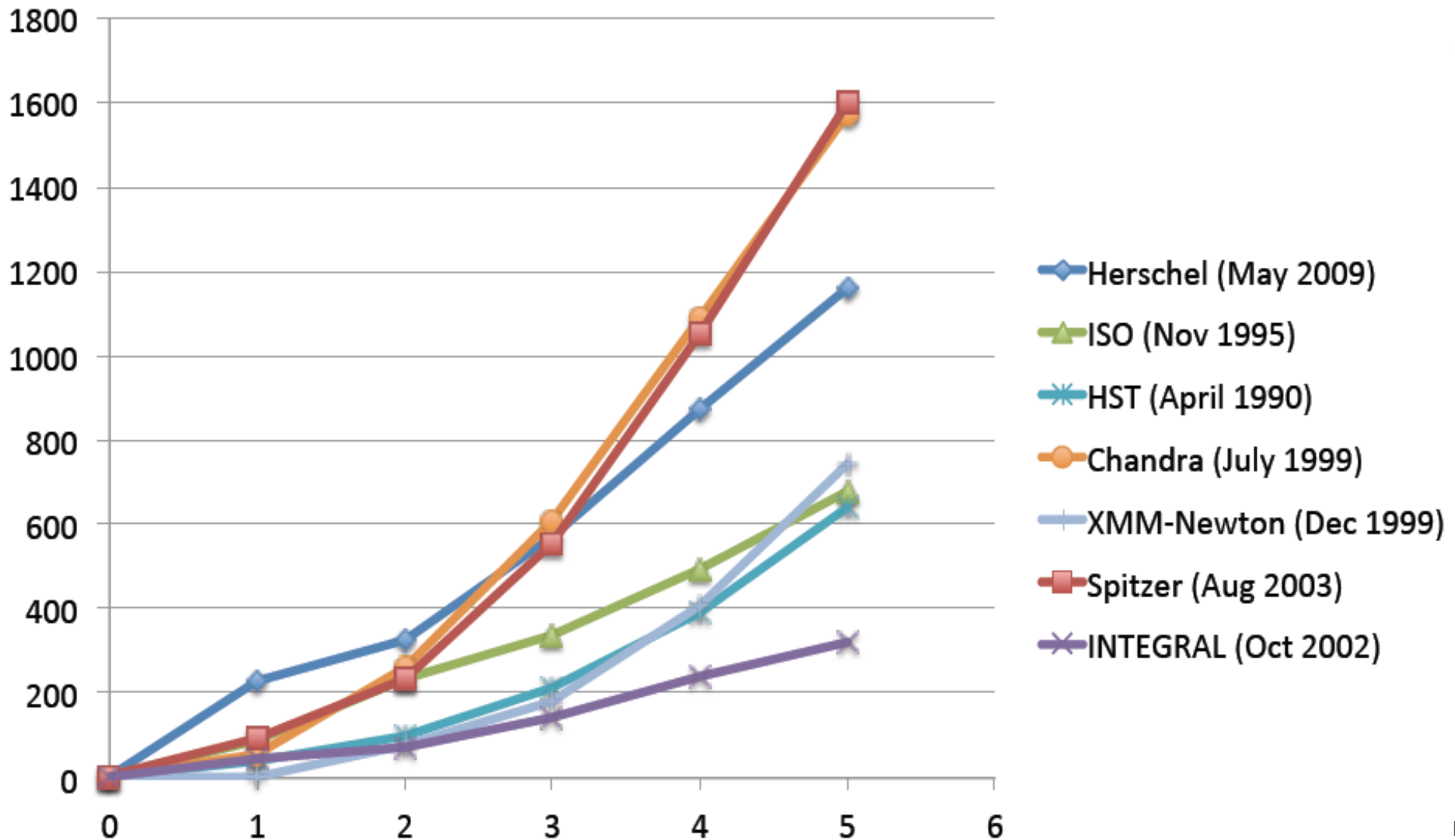
- ESA 'only'



HERSCHEL SPACE OBSERVATORY

#Pubs vs calendar yr after launch

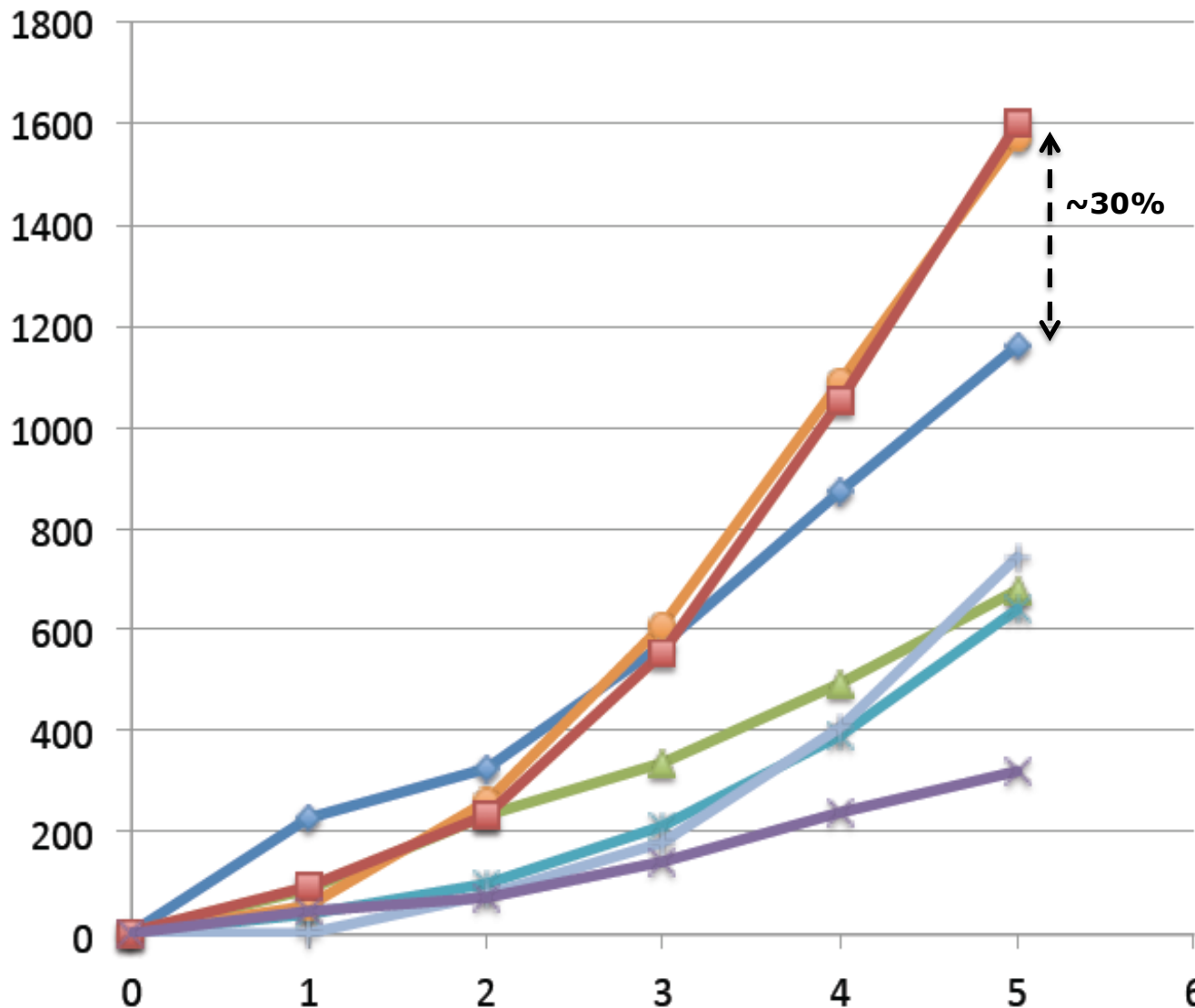
- ESA & NASA



HERSCHEL SPACE OBSERVATORY

#Pubs vs calendar yr after launch

- ESA & NASA



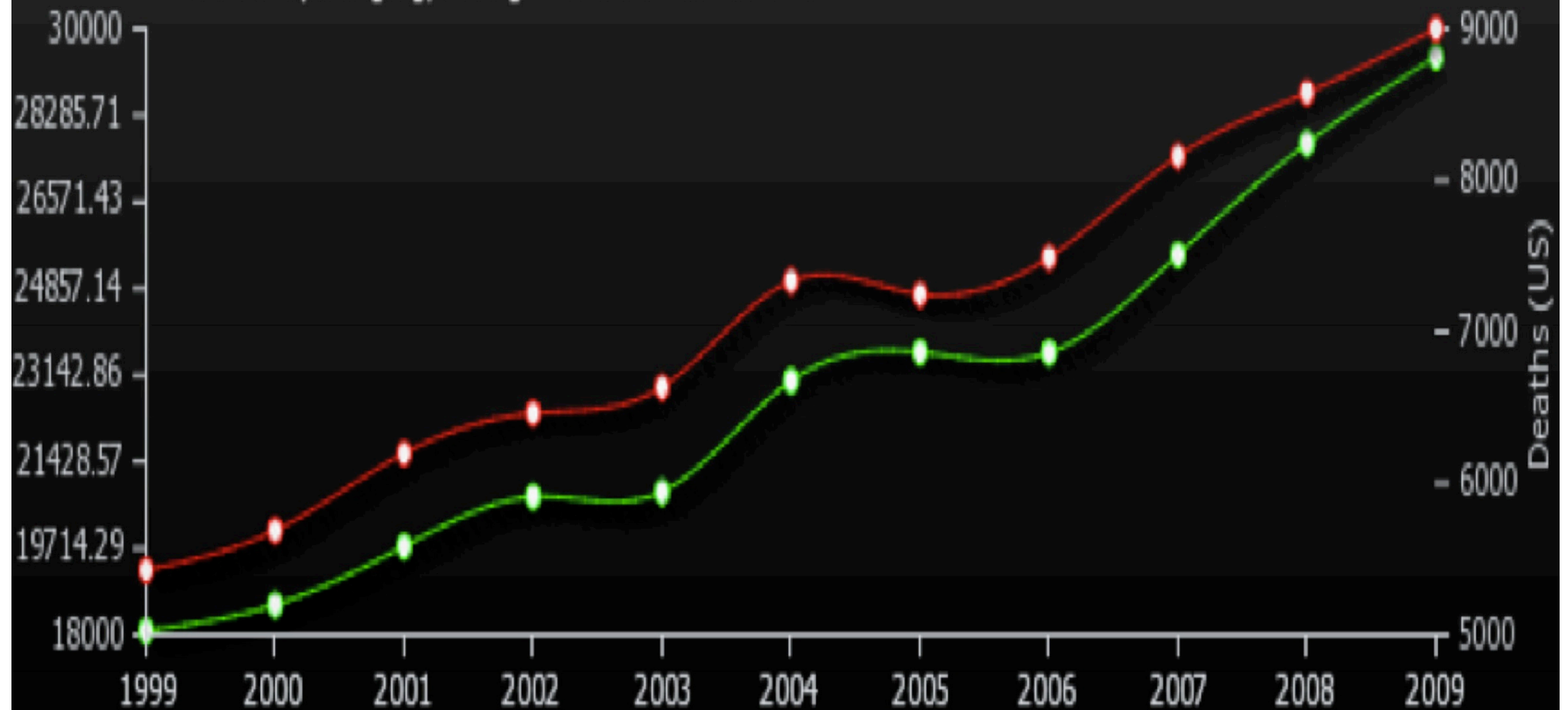
XMM: #NASA ~ 1.3x#ESA
Bottom line 1: Be careful with direct comparisons!

- ◆ Herschel (May 2009)
- ▲ ISO (Nov 1995)
- * HST (April 1990)
- Chandra (July 1999)
- + XMM-Newton (Dec 1999)
- Spitzer (Aug 2003)
- × INTEGRAL (Oct 2002)



HERSCHEL SPACE OBSERVATORY

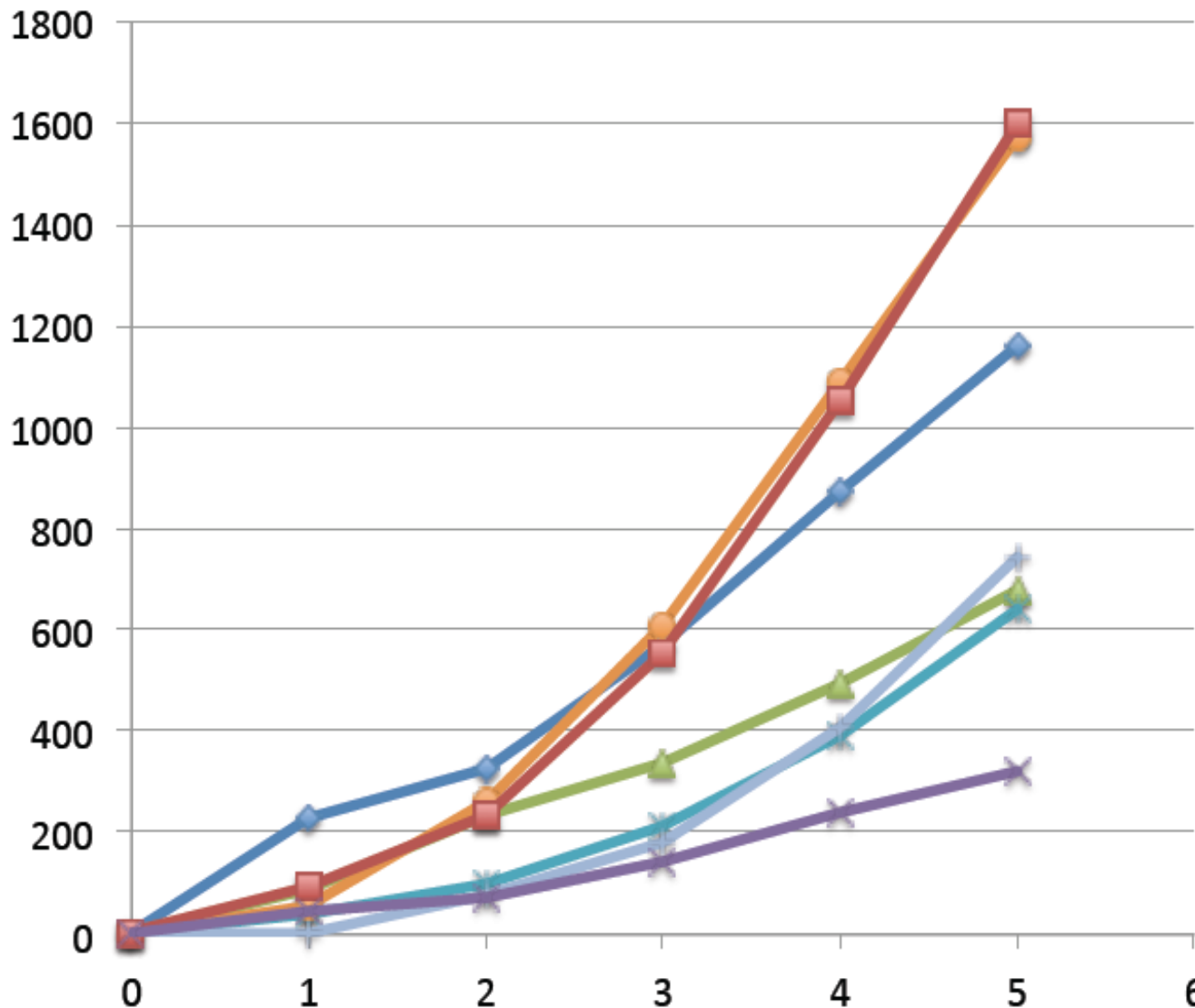
- US spending on science, space, and technology
- Suicides by hanging, strangulation and suffocation



Correlation: 99% Sources: US OMB & CDC tylervigen.com

#Pubs vs calendar yr after launch

- ESA & NASA



**Bottom line 2:
Herschel doing well!**

- ◆ Herschel (May 2009)
- ▲ ISO (Nov 1995)
- * HST (April 1990)
- Chandra (July 1999)
- + XMM-Newton (Dec 1999)
- Spitzer (Aug 2003)
- × INTEGRAL (Oct 2002)



HERSCHEL SPACE OBSERVATORY

Simpleminded: OBSIDs linked to publ

- 5 May 2014



Name	Executed obs	Executed time (h)	Published obs	Published number %	Published time (h)	Published time % ▼
SDP	544	565.31	456	<div><div></div></div> 83.82	523.40	<div><div></div></div> 92.59
KPOT	6412	5,067.37	4921	<div><div></div></div> 76.75	3,477.06	<div><div></div></div> 68.62
KPGT	7111	4,991.58	3699	<div><div></div></div> 52.02	3,039.47	<div><div></div></div> 60.89
GT1	1106	500.22	319	<div><div></div></div> 28.84	237.66	<div><div></div></div> 47.51
TOO	208	34.65	78	<div><div></div></div> 37.50	15.67	<div><div></div></div> 45.24
TOTAL	37141	21,805.79	12084	<div><div></div></div> 32.54	8,687.24	<div><div></div></div> 39.84
AOTVAL	55	25.06	20	<div><div></div></div> 36.36	9.71	<div><div></div></div> 38.73
OT1	11392	5,333.49	2186	<div><div></div></div> 19.19	875.18	<div><div></div></div> 16.41
DDT	656	274.21	60	<div><div></div></div> 9.15	36.68	<div><div></div></div> 13.38
Calibration	11696	4,389.90	1571	<div><div></div></div> 13.43	517.81	<div><div></div></div> 11.80
OT2	9110	4,608.96	327	<div><div></div></div> 3.59	462.23	<div><div></div></div> 10.03
GT2	457	346.50	18	<div><div></div></div> 3.94	10.18	<div><div></div></div> 2.94
OBS	90	58.45	0	<div><div></div></div> 0.00	0.00	<div><div></div></div> 0.00
				<div><div></div></div>		<div><div></div></div>

Simpleminded: OBSIDs linked to publ

- 5 May 2014



Name	Executed obs	Executed time (h)	Published obs	Published number %	Published time (h)	Published time % ▼
SP_PAR	760	3,045.88	372	<div><div></div></div> 48.95	1,896.17	<div><div></div></div> 62.25
S_PHOT	5124	1,474.62	1341	<div><div></div></div> 26.17	797.37	<div><div></div></div> 54.07
H_7a	166	114.65	55	<div><div></div></div> 33.13	59.05	<div><div></div></div> 51.50
P_PHOT	16567	5,648.25	6551	<div><div></div></div> 39.54	2,861.26	<div><div></div></div> 50.66
H_5b	19	23.94	6	<div><div></div></div> 31.58	10.87	<div><div></div></div> 45.40
TOTAL	37141	21,805.79	12084	<div><div></div></div> 32.54	8,687.24	<div><div></div></div> 39.84
H_2b	540	206.73	92	<div><div></div></div> 17.04	72.69	<div><div></div></div> 35.16
H_6b	357	228.26	126	<div><div></div></div> 35.29	76.28	<div><div></div></div> 33.42
H_4b	763	519.18	232	<div><div></div></div> 30.41	172.04	<div><div></div></div> 33.14
H_2a	304	137.67	64	<div><div></div></div> 21.05	42.45	<div><div></div></div> 30.83
H_1b	1020	446.54	247	<div><div></div></div> 24.22	130.61	<div><div></div></div> 29.25
H_1a	1222	542.48	248	<div><div></div></div> 20.29	158.52	<div><div></div></div> 29.22
P_SPEC	5050	5,381.42	1492	<div><div></div></div> 29.54	1,548.71	<div><div></div></div> 28.78
H_3b	352	183.38	41	<div><div></div></div> 11.65	48.89	<div><div></div></div> 26.66
H_7b	1402	1,018.62	634	<div><div></div></div> 45.22	264.84	<div><div></div></div> 26.00
H_5a	715	443.83	172	<div><div></div></div> 24.06	105.08	<div><div></div></div> 23.68
H_6a	180	148.76	30	<div><div></div></div> 16.67	32.02	<div><div></div></div> 21.52
H_4a	989	375.57	153	<div><div></div></div> 15.47	75.02	<div><div></div></div> 19.98
S_SPEC	1100	1,654.86	154	<div><div></div></div> 14.00	312.81	<div><div></div></div> 18.90
P_ENG	41	24.10	6	<div><div></div></div> 14.63	2.92	<div><div></div></div> 12.13
H_3a	470	187.06	68	<div><div></div></div> 14.47	19.64	<div><div></div></div> 10.50

Simpleminded: OBSIDs linked to publ

- 5 May 2014



Name	Executed obs	Executed time (h)	Published obs	Published number %	Published time (h)	Published time %
SP_PAR	760	3,045.88	372	48.95	1,896.17	62.25
S_PHOT						54.07
H_7a						51.50
P_PHOT						50.66
H_5b						45.40
TOTAL						39.84
H_2b						35.16
H_6b						33.42
H_4b						33.14
H_2a						30.83
H_1b						29.25
H_1a						29.22
P_SPEC						28.78
H_3b						26.66
H_7b	1402	1,018.62	634	45.22	264.84	26.00
H_5a	715	443.83	172	24.06	105.08	23.68
H_6a	180	148.76	30	16.67	32.02	21.52
H_4a	989	375.57	153	15.47	75.02	19.98
S_SPEC	1100	1,654.86	154	14.00	312.81	18.90
P_ENG	41	24.10	6	14.63	2.92	12.13
H_3a	470	187.06	68	14.47	19.64	10.50

‘Disclaimer’

- There is some signal here, but do not overinterpret!
- Can be helpful to identify problems – observing modes etc
- We actually do not know what to expect as function of time
- It is not at all clear what to prioritize or whether
 - observations with few/no publications
 - observations with several/many publications
- have the greatest future potential!

Simpleminded: OBSIDs linked to publ

- 5 May 2014



Name	Executed obs	Executed time (h)	Published obs	Published number %	Published time (h)	Published time %
SP_PAR	760	3,045.88	372	<div><div></div></div> 48.95	1,896.17	<div><div></div></div> 62.25
S_PHOT						<div><div></div></div> 54.07
H_7a						<div><div></div></div> 51.50
P_PHOT						<div><div></div></div> 50.66
H_5b						<div><div></div></div> 45.40
TOTAL						<div><div></div></div> 39.84
H_2b						<div><div></div></div> 35.16
H_6b						<div><div></div></div> 33.42
H_4b						<div><div></div></div> 33.14
H_2a						<div><div></div></div> 30.83
H_1b						<div><div></div></div> 29.25
H_1a						<div><div></div></div> 29.22
P_SPEC						<div><div></div></div> 28.78
H_3b						<div><div></div></div> 26.66
H_7b						<div><div></div></div> 26.00
H_5a						<div><div></div></div> 23.68
H_6a						<div><div></div></div> 21.52
H_4a	989	375.57	153	<div><div></div></div> 15.47	75.02	<div><div></div></div> 19.98
S_SPEC	1100	1,654.86	154	<div><div></div></div> 14.00	312.81	<div><div></div></div> 18.90
P_ENG	41	24.10	6	<div><div></div></div> 14.63	2.92	<div><div></div></div> 12.13
H_3a	470	187.06	68	<div><div></div></div> 14.47	19.64	<div><div></div></div> 10.50

‘Disclaimer’

- There is some signal here, but do not overinterpret!
- Can be helpful to identify problems – observing modes etc
- We actually do not know what to expect as function of time
- It is not at all clear what to prioritize or whether
 - observations with few/no publications
 - observations with several/many publications
- have the greatest future potential!
- **BTW, it is also simpleminded just to count publications...**
- **... but people do this and (therefore) it is important**

Herschel Ground Segment Meeting 2014 @ CEA-Saclay / IAP, Paris (12-14 May 2014)



Registration

- Target audience:
 - everyone currently working for Herschel at any of the various centres involved in Post-Operations: HSC/ICC/NHSC
 - anyone interested in contributing to the success of Herschel POPs
- Click [here](#) to register.
- Note that there will be a **small registration fee of 50 Euro**. The money will be collected in **cash** on Monday 12 May



Vision & Legacy



Herschel Legacy Software: Status and Plans (plenary session)

Coffee Break

Herschel Legacy Calibration: Status and Plans (plenary session)

Herschel Legacy Data Products: Status and Plans (plenary session)

Herschel Legacy Documentation: Status and Plans (plenary session)

Lunch break

Herschel and the community (plenary session)

Herschel in 2017 and beyond (plenary session)

Wrap-up (plenary session)



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Herschel Legacy Software: Status and Plans (plenary session)

Coffee

The buzz-word is LEGACY!

- When we turn off the light and go home
- ... what is there is 'forever' is what we are working on now!
- We are here to discuss the work ahead of us!

Lunch break

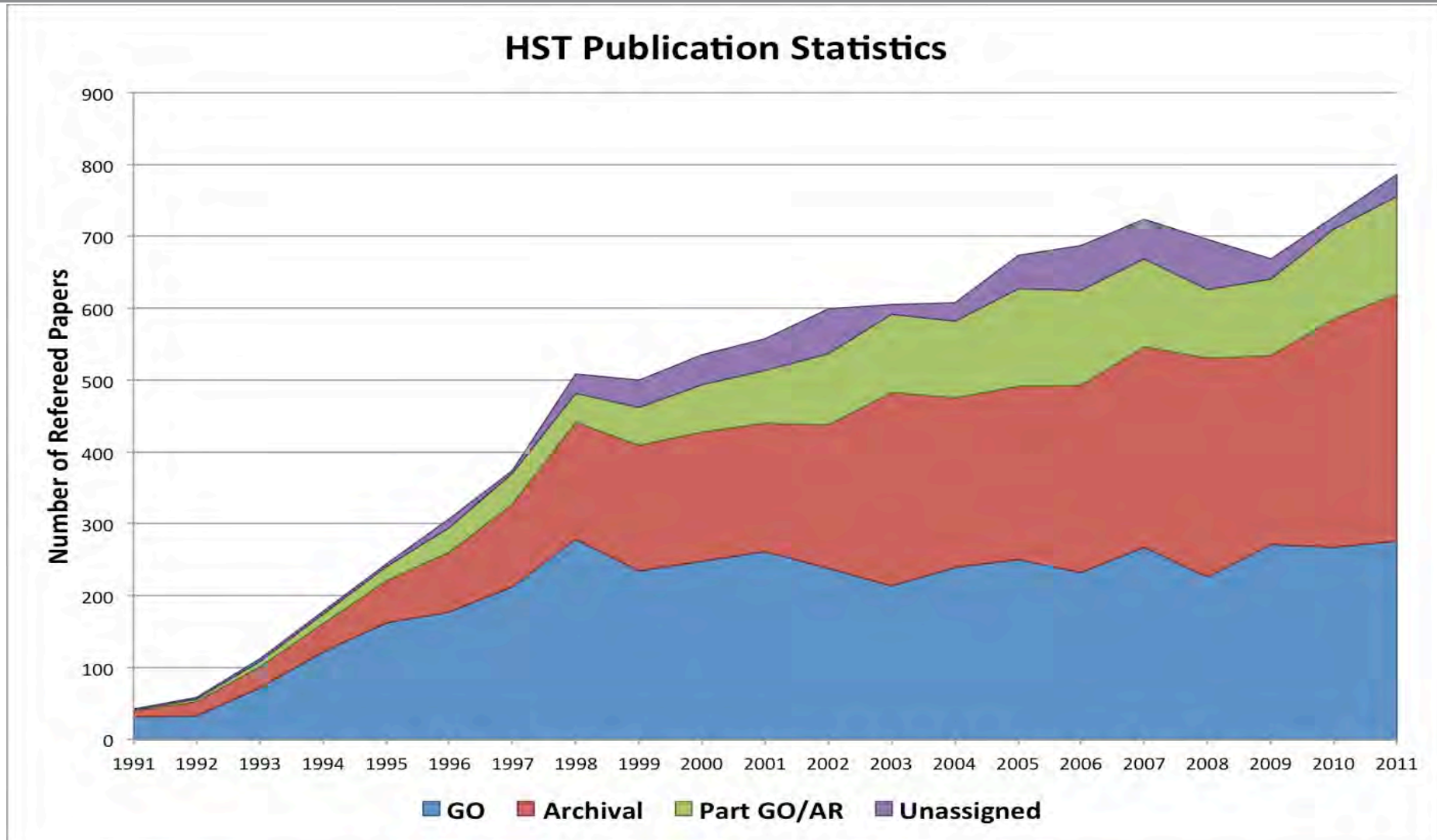
Herschel and the community (plenary session)

Herschel in 2017 and beyond (plenary session)

Wrap-up (plenary session)

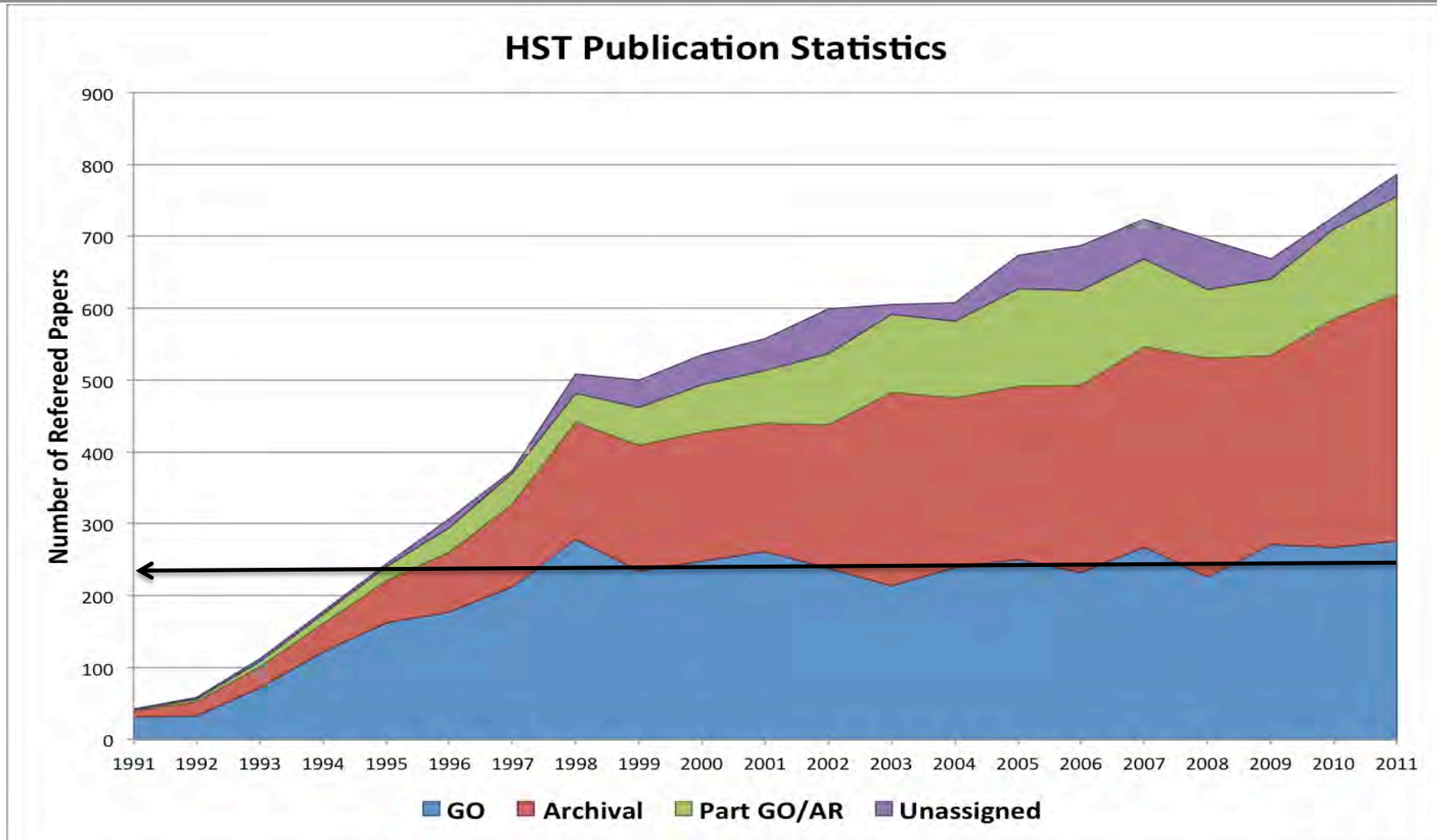


Hubble – importance of archive



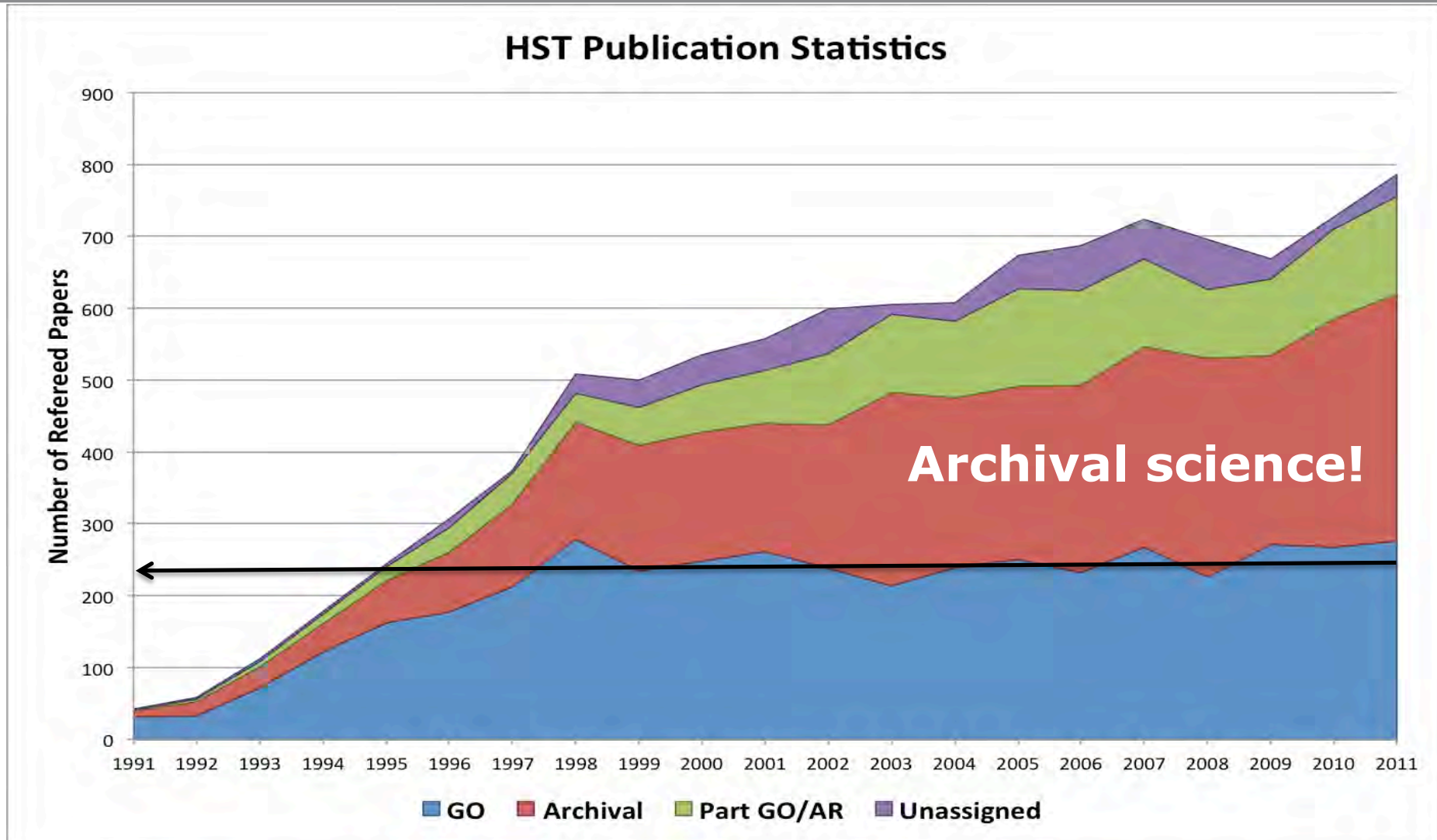
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Hubble – importance of archive



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Hubble – importance of archive

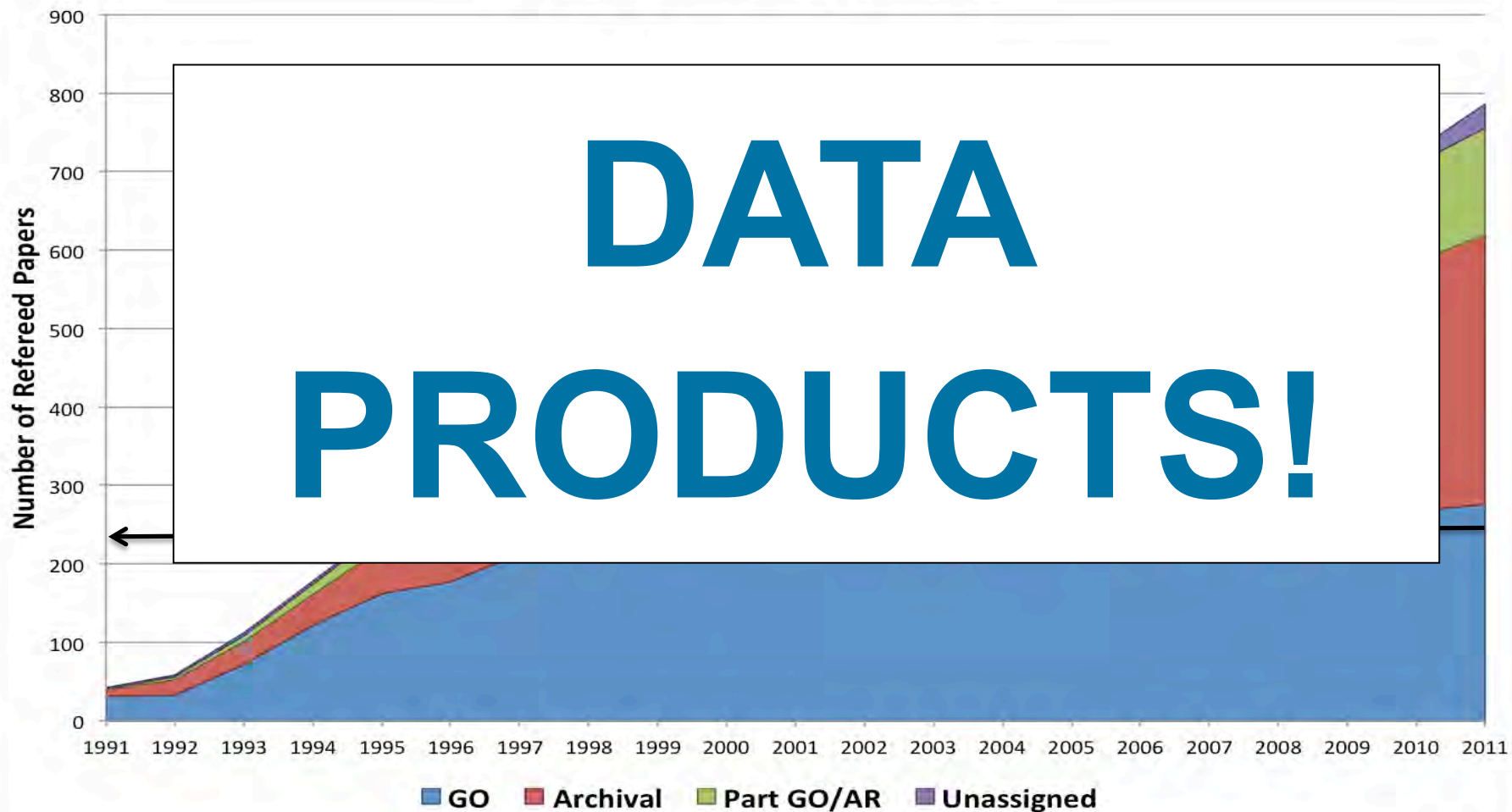


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Hubble – importance of archive



HST Publication Statistics



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Herschel in 2017 and beyond



Data products, information, and tools – but no people



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Herschel in 2017 and beyond – nay, now esa

Data products, information, and tools – but no people



- Resources in SGS are declining across the board!
 - HSC & NHSC until late 2017 (Dec & Sep respectively)
 - ICCs earlier, e.g. SPIRE June 2016
 - All with declining resources – as planned, but ‘turbulence’...?
- For HSC attrition of staff steeper than planned
 - => recruiting! (e.g. Tanya Lim!)
 - Part-time work on other missions win-win situation
 - Example: PS 25% on PLATO since April; others: Euclid, Rosetta, ...
- HIPE 13 seen as last version with ‘major’ updates
 - HIPE 14 & 15: bugfixing, performance, stability, documentation, ...
- Herschel astronomical community will outlive ‘Herschel’
- Strong interest to feed community effort into ‘Herschel’
 - e.g. FP7 consortia and other efforts

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Herschel in 2017 and beyond



Data products, information, and tools – but no people



- SPG products – all levels
- ‘Standalone Legacy Products’
 - ‘VO’ and other ‘overlays’ compatible
- UPDPs – provided by observers ‘as is’ (at some point) – KPs!!
- HPDPs – Highly Processed Data Products
- ‘Higher’-level (‘science’) products – source & line catalogues etc
- Community (e.g. FP7 consortia) links/collaborations
- Herschel data products *must be robust* for a potential ‘life after HIPE’ – or simply for non-HIPE users
- HIPE will exist until it ‘breaks’ and may continue to exist in VM
- Irregardless of ‘fate’ of HIPE – Herschel products *must* be usable for science without it

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Herschel in 2017 and beyond



Data products 'guidance'



- Not all users have same needs!
- Challenge: How do we help the users first to (i) understand and then to (ii) obtain what they really want/need? (Do they know themselves?)
- 'Recommended product' information – 'best choice' (for what?)
 - e.g. multiple PACS maps
 - e.g. 'old' UPDPs vs 'newer' pipeline products
 - HPDP – if available always best choice? (for what?)
- Quality information (Do we have it? Can we get it? How?)
 - Do we have a 'definition' of what to provide/what is needed?
- Products needs descriptions – preferably at time of downloading
- Associated information – source HSC website, origin data provider

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Data products ‘sources’ – and ‘easy of use’



- **HSA – Herschel Science Archive (maintained as ESA resource)**
 - Also need website maintained as resource
 - Also need tools e.g. Helpdesk, possibly HSpot, HROST
- **HSC Tools: Pubtool, Observing Log**
- **ESA multi-mission interface overlay ‘EMMI’**
 - Should be ‘astronomy’-oriented
 - Eventually should comprise all (astronomy) ESA archives
- **Other archives e.g. IRSA – provide additional functionality & context**
- **Tools: SIMBAD (link to Observing Log), VizieR (catalogs), ADS (observations connected to paper listed with postcards), NED?, ...**
- **HSC website as the source of information (in widest sense) must be maintained. Helpdesk (‘best effort’) would be useful.**

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Herschel in 2017 and beyond



Calibration



- **Is good – and is being improved – setting the standard!(!?)**
 - **We need to state just how good it is**
 - **Also cross-calibration**
- **Planck connection**
 - **Planck calibration ultimately to be connected to CMB**
 - **Herschel-Planck Xcal using overlap spectral range**
 - **Any chance of extension (e.g. to 160 μm)? (Published papers claim to have done this already!)**
- **Calibration is an important Herschel Legacy in its own right!**
- **Plus:**
 - **Improved planetary & asteroid models**
 - **Stellar models extended for longer wavelengths**

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Herschel in 2017 and beyond



Software



- HIPE contains a lot of Herschel knowledge – e.g. pointing:
- HIPE 12.0 most recent:
 - Contains pointing products updated with respect to STR distortions for the whole mission.
 - PACS jitter task available for astronomer use in HCSS 12.
- HIPE 13.1 bulk reproc
 - Jitter together with distortion (based on PACS task) placed in pointing products (using auxiliary processing)
- HIPE 13.1+
 - Working to improve pointing issues associated with heating of the STR due to ‘warm SAAs’
- This knowledge needs to be ‘incorporated’ into the products
- HIPE itself beyond Herschel? HIPE in virtual machine?
- Other Herschel software: HSpot, HROST, ...

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Herschel in 2017 and beyond



Documentation



- **Agreed very important!**
 - **The ‘Herschel knowledge’ needs to be captured ‘in one place’**
 - **Do not forget to point out what we do not know, limitations, etc**
- **Will be served through HSC website ‘indefinitely’**
 - **Webpages**
 - **Documents**
 - **Webinars**
 - **Software**
 - **Other resources e.g. links**
- **How important is a/the usual ‘Explanatory Supplement’**
 - **In what form?**
 - **How many want a printed copy? (For whom?)**

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