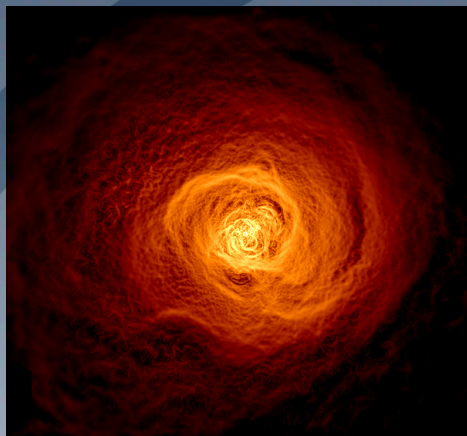
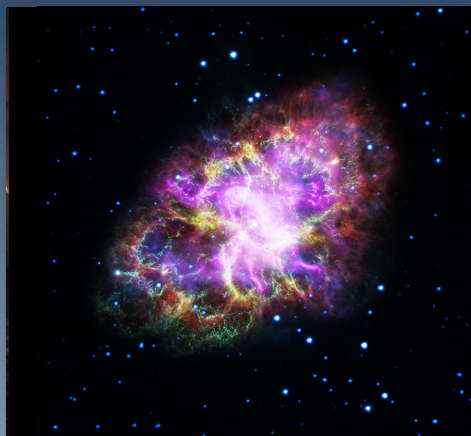
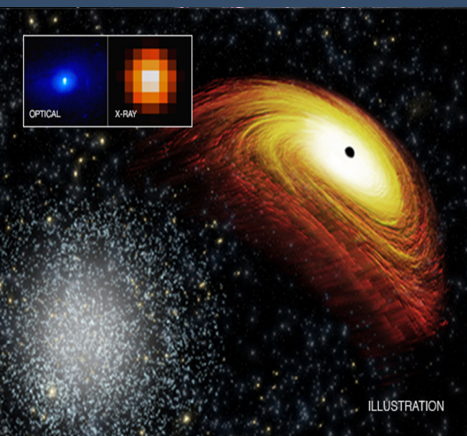


Astrophysics



NASA Astrophysics Research Update

Astrophysics Advisory Committee

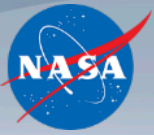
October 19, 2017

Daniel Evans

Lead for Astrophysics Research

Science Mission Directorate

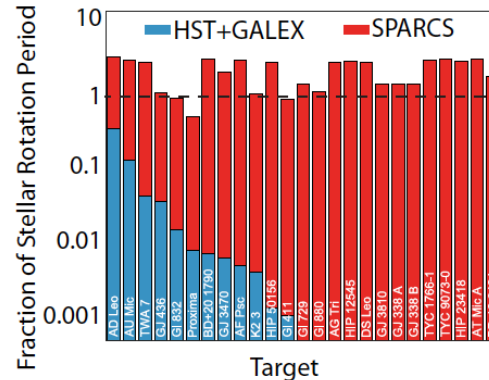
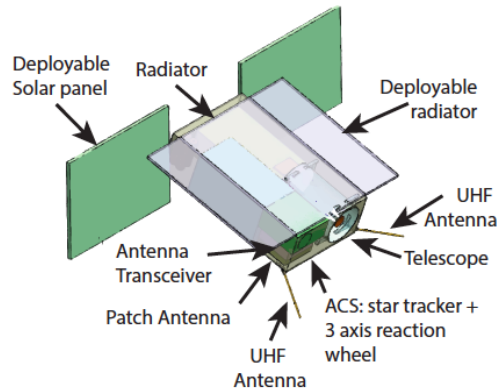
NASA Headquarters



R&A News and Selections

Recent APRA Selection - SPARCS

Star-Planet Activity Research CubeSat



- **APRA-16 CubeSat Award**
- **PI:** Eygenya Shkolnik, AZ State U.
- **LRD:** 2 years from initiation.
- **Science Objectives:** Determine rate, strength and color of bright UV flares from a select 25 M dwarfs, with an eye towards how these flares effect the habitability of planets within their habitable zones.
- **Operations:** 2 years to complete full survey, which will cover 1 to 3 complete rotations of each star (periods 4-45 days); 6 months to do threshold mission.

Key Facts:

- **Science:** First mission dedicated to provide the time-dependent spectral slope, intensity and evolution of M dwarf stellar FUV and NUV radiation. These measurements are crucial to interpreting observations of planetary atmospheres around low-mass stars. Target list includes young, old, (in)-active, (non)-planet hosting M stars. 1.8 degree FOV allows much ancillary science.
- **Technologies:** 6U CubeSat advancing science, JPL delta-doped e2V CCD, red-leak suppressing filters, 9 cm R-C telescope, ASU downlink station to be completed in 2017 for AOSat CubeSat
- **Orbit:** sun synchronous to ensure 2 year life-time.

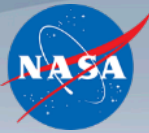
Proposal Status Update



Status: October 19, 2017

	Proposal Due Date	Notify Date	Days since received	Number received	Number selected	% selected
SOFIA GI – Cycle 5	July 1, 2016	Oct 25, 2016	116	179	71	40%
Astrophysics Theory	July 8, 2016	Dec 9, 2016	154	201	36	18%
Swift GI – Cycle 13	Sep 23, 2016	Jan 17, 2017	147	155	39	25%
K2 GO – Cycle 5	Dec 15, 2016	April 4, 2017	110	91	28	31%
NuSTAR GO – Cycle 3	Jan 27, 2017	May 10, 2017	103	217	80	37%
NESSF-17	Feb 1, 2017	June 1, 2017	120	143	8	6%
Fermi GI – Cycle 10	Feb 24, 2017	May 30, 2017	95	183	43	23%
Chandra GO – Cycle 19	Mar 16, 2017	July 10, 2017	116	574	155	27%
Roman Tech Fellowship	Mar 17, 2017	Sep 8, 2017	175	12	2	17%
SAT (Technology)	Mar 17, 2017	Sep 8, 2017	175	30	9	30%
APRA (Basic Research)	Mar 17, 2017	Sep 8, 2017	175	141	53	38%
Hubble GO – Cycle 25	Apr 7, 2017	June 26, 2017	80	971	271	28%
ADAP (Data Analysis)	May 16, 2017	Sep 11, 2017	118	264	35	13%
Exoplanet Research	May 25, 2017	Oct 8, 2017	136	50	9	18%
SOFIA GI – Cycle 6	June 30, 2017		111	198		
Astrophysics Theory	July 27, 2017		84	220		
Webb Early Rel. Science	Aug 18, 2017		62	106		
Swift GI – Cycle 14	Sep 28, 2017		21	146		
TESS – Cycle 1	Oct 6, 2017		13	143		
K2 GO – Cycle 6	Oct 12, 2017		7	69		

2017 Balloon Campaigns



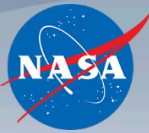
- ✓ Completed Spring FY17 Super Pressure Balloon Campaign @ New Zealand
 - ✓ **SPB/EUSO** (Extreme Universe Space Observatory on a Super Pressure Balloon) MO A. Olinto, U of Chicago - Launched April 24 from Wanaka, New Zealand.
 - **Flight duration:** 12.2 days: Flight had to be terminated due to (suspected) leak in balloon; controlled manner balloon and payload were sunk in Pacific Ocean ~255 miles SSE of Easter Island.
 - An independent Engineering Review Team is looking into the cause of the leak. Report due later in 2017. No New Zealand campaign in 2018 due to need for flights from Sweden.
- ✓ Summer FY17 Conventional Balloon Campaign @ Palestine, TX (June 2017).
 - ✓ **BETTI** (Balloon Experimental Twin Telescope for Infrared Interferometry)/S. Rinehart/GSFC.
 - Rotator failure-induced freefall of payload at end of mission (close call investigation).
 - **SuperBIT** (Balloon-borne Imaging Telescope)/W. Jones/Princeton. (*Rescheduled to Fall*)
 - **PIPER** (Primordial Inflation Polarization Explorer)/A. Kogut/GSFC. (*Rescheduled to Fall*)
- ✓ Fall FY17 Conventional Balloon Campaign @ Fort Sumner, NM (Sep – Oct 15, 2017).
 - ✓ **PIPER** /A. Kogut/GSFC, launched Oct 13, successful 7h at float engineering flight
 - **SuperBIT** /W. Jones/Princeton, launch attempt on last day of campaign, canceled due to ground wind
 - ~~**FIREBALL**~~ (Faint Intergalactic medium Redshift Emission Balloon)/C. Martin/Caltech
 - Plus: ✓ **HASP** (student flight); ~~**Remote**~~ (upper atmosphere); ~~**WASP**~~ (test flight); ~~**Big 60**~~ (test flight)
- Winter FY18 Long Duration Balloon Campaign in Antarctica (December 2017)
 - **SuperTIGER** (Super Trans-Iron Galactic Element Recorder) W.R. Binns/Washington U St Louis

<https://www.csbf.nasa.gov/index.html>



HASP in flight

Early FY2018 Sounding Rocket Launches



DEUCE (Dual-channel Extreme Ultraviolet Continuum Experiment)

PI - **J. Green** / Univ. of Colorado ~Oct 2017

Technology development for future UV missions, physics of re-ionization from B stars at extreme UV.



DXL (Diffuse X-ray emission from the Local galaxy)

PI - **M. Galeazzi** / Univ. of Miami ~Jan 2018

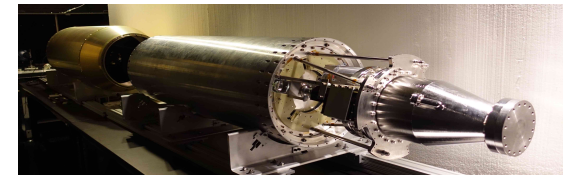
Characterizing the Diffuse X-ray Emission from the Local Galaxy.



ACCESS (Absolute Color Calibration Experiment for Standard Stars)

PI - **M.E. Kaiser** / Johns Hopkins Univ. ~Jan 2018

Absolute spectrophotometric calibration of 3 stars, enabling study of Dark Energy through observation of SNe Ia.

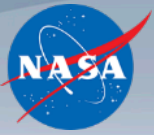


Micro-X

PI - **E. Figueroa** / Northwestern Univ. ~Feb 2018

Characterizing plasma conditions in Puppis A SNR using Transition-Edge Sensors.





2017 R&A Program

Astrophysics Research Elements



Supporting Research and Technology

- Astrophysics Research & Analysis (APRA)
- Strategic Astrophysics Technology (SAT)
- Astrophysics Theory Program (ATP)
- Theoretical and Computational Astrophysics Networks (TCAN)
- Exoplanet Research Program (XRP)
- Roman Technology Fellowships (RTF)

Data Analysis

- Astrophysics Data Analysis (ADAP)
- GO/GI programs in ROSES for:
 - Fermi
 - Kepler/K2
 - Swift
 - NuSTAR
 - TESS

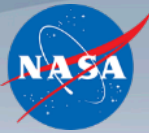
Mission Science and Instrumentation

- SOFIA next-generation instrumentation
- Sounding rocket, balloon, cubesat, and ISS payloads through APRA
- XARM Participating Scientists

Separately Solicited

- GO/GI/Archive/Theory programs for:
 - Chandra
 - Hubble
 - SOFIA
 - Spitzer
 - Webb
- Postdoctoral Fellowships (Einstein, Hubble, Sagan)
- Graduate Student Fellowships (NESSF)

Astrophysics Research Elements



Supporting Research and Technology

- Astrophysics Research & Analysis (APRA)
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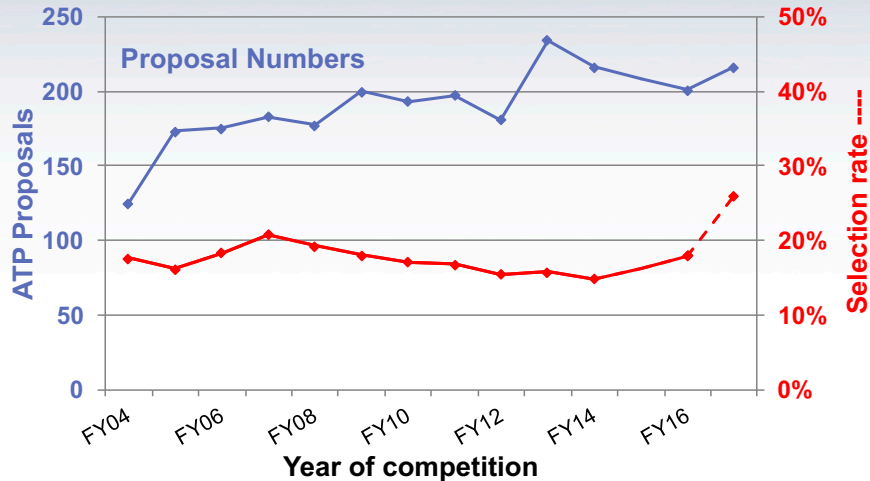
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- GO/GI/Archive/Theory programs for:
 - Chandra
 - Hubble
 - SOFIA
 - Spitzer
 - Webb
- Postdoctoral Fellowships (Einstein, Hubble, Sagan)
- Graduate Student Fellowships (NESSF)



ROSES-2017 Changes

Astrophysics Theory Program (ATP)



- ATP selection rates have been <20% for the past decade
 - Increases burden on proposers and reviewers
 - Most VG proposals do not receive funding
- Beginning in ROSES-2017, ATP proposals will be solicited every other year
- No reduction to ATP budget: twice as many selections, half as often
- **Received 220 proposals this year, c.f., 201 last year.**
- **Success rates projected to be 25-30%**

Theoretical and Computational Astrophysics Networks (TCAN)

- TCAN supports coordinated efforts in fundamental theory and computational techniques.
- TCAN aims to unite researchers in collaborative networks that cross institutional and geographical divides.
- NASA has issued a call for proposals for TCAN. Deadline is January 25, 2018.

New Process for Nancy Grace Roman Technology Fellowship



1 For early-career applicants:

Submit APRA proposal

Tick RTF box, include one-page application

Undergo successful review, APRA proposal selected

Receive the title "Roman Technology Fellow"

2 When a previously selected RTF gains a permanent or permanent-track position:

Submit proposal for up to \$300k in Fellowship Funds

Undergo successful review

Use Fellowship Funds to start lab or research group



Omid Noroozian (NRAO)



Abigail Viereggs (Chicago)

Upcoming Proposal Opportunities

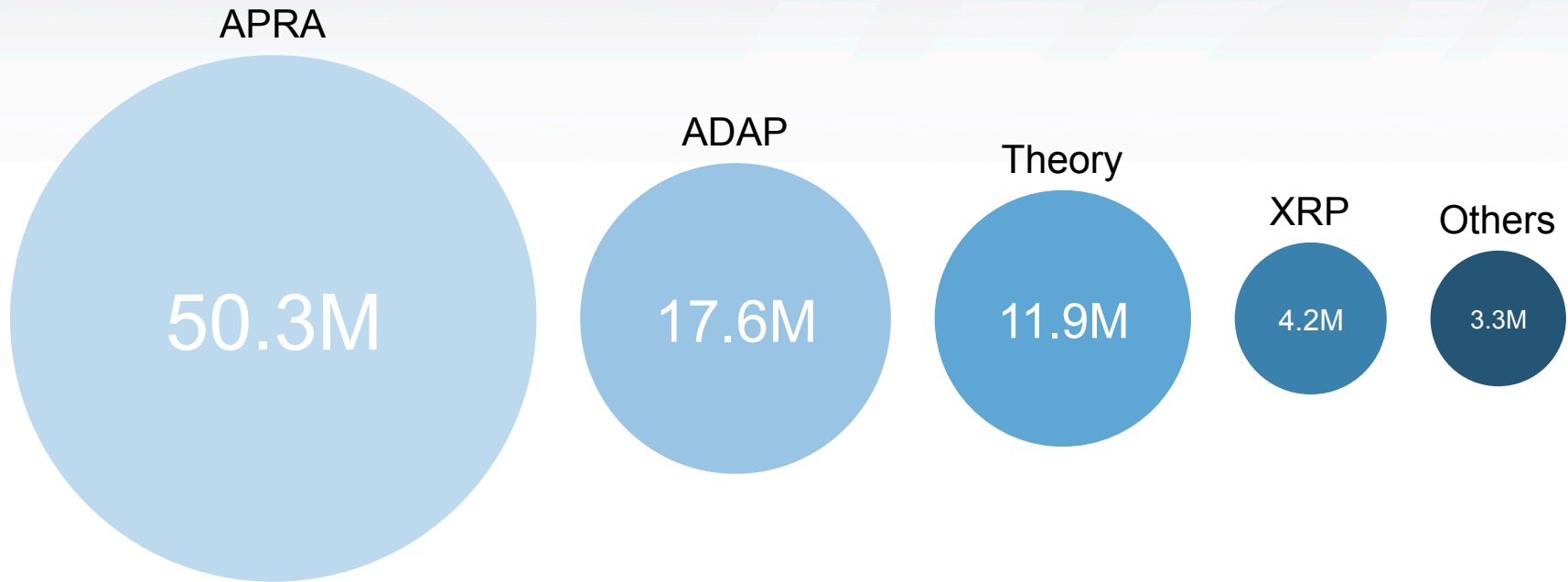
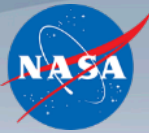


	Proposal Due Date	Reference
XARM Participating Scientists	Oct 24, 2017 (mandatory step 1); Dec 13 (step 2)	ROSES-16 D.14
NuSTAR General Observer - Cycle 4	January 18, 2018	ROSES-16 D.10
TCAN	January 25, 2018	ROSES-17 D.12
NESSF	Approx February 2018	NSPIRES
Fermi Guest Investigator - Cycle 11	February 23, 2018 (TBC)	ROSES-16 D.6
Webb General Observer - Cycle 1	March 2, 2018	jwst.stsci.edu
Chandra General Observer - Cycle 20	Approx March 2018	cxc.harvard.edu
Roman Technology Fellowship	March 15, 2018	ROSES-16 D.9
Strategic Astrophysics Technology (SAT)	March 15, 2018	ROSES-16 D.8
Astrophysics Research and Analysis (APRA)	March 15, 2018	ROSES-16 D.3
SOFIA next-generation instrumentation	TBD	ROSES-17 D.13

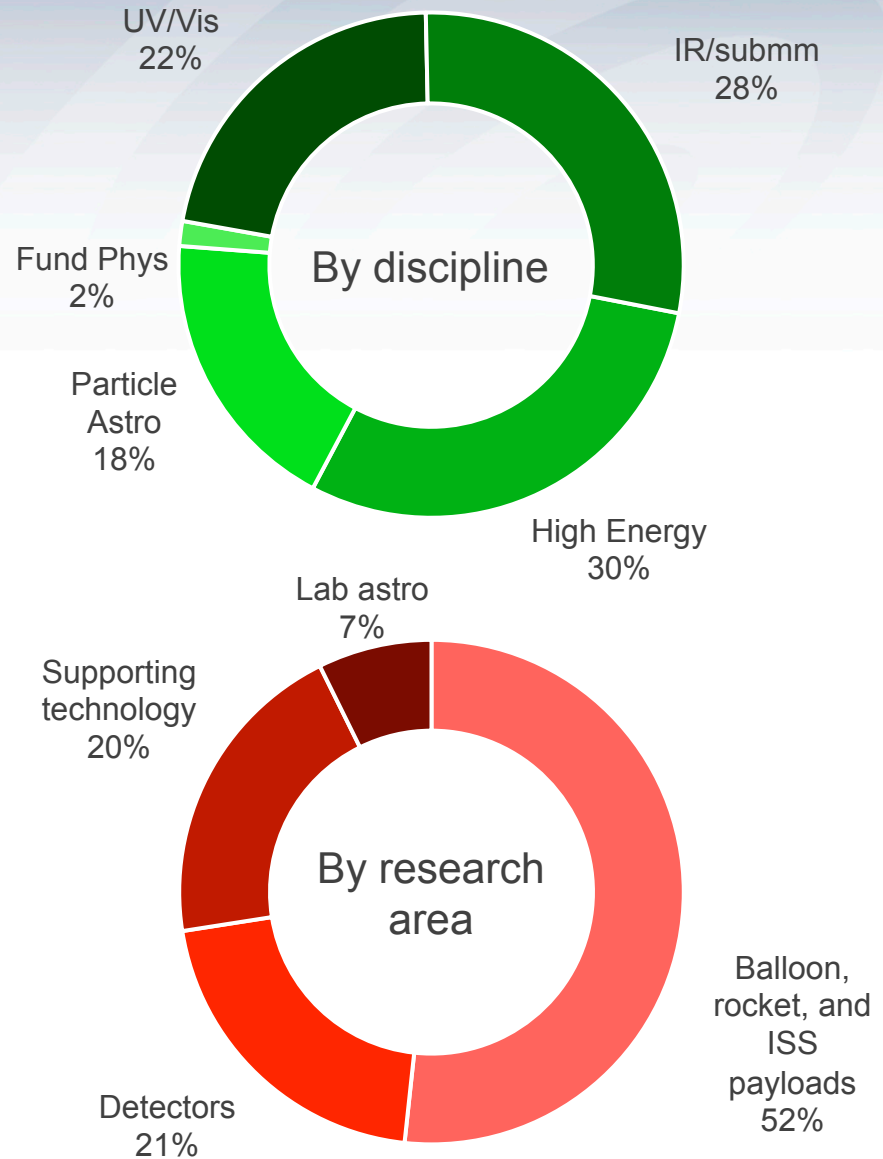
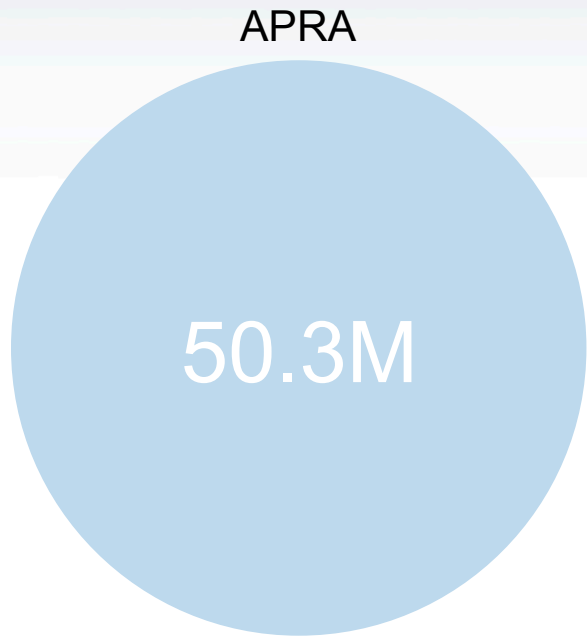
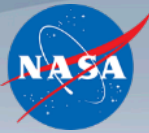


R&A Statistics

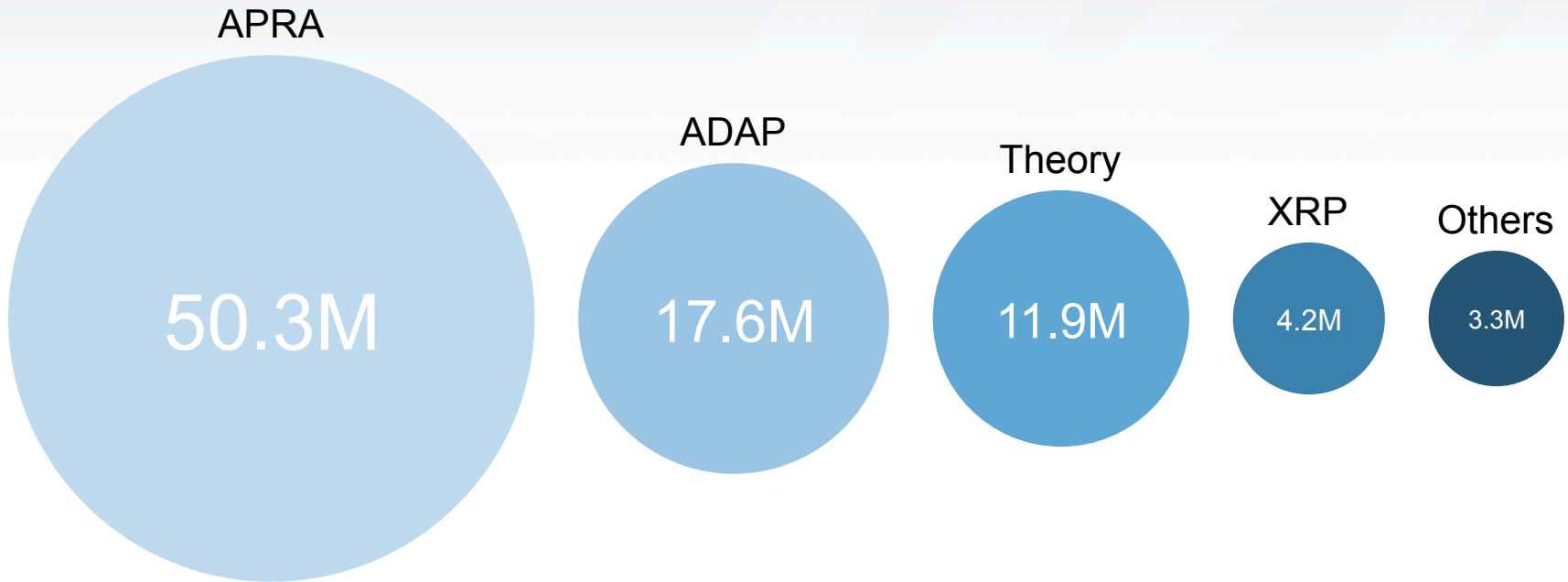
FY16 R&A Summary



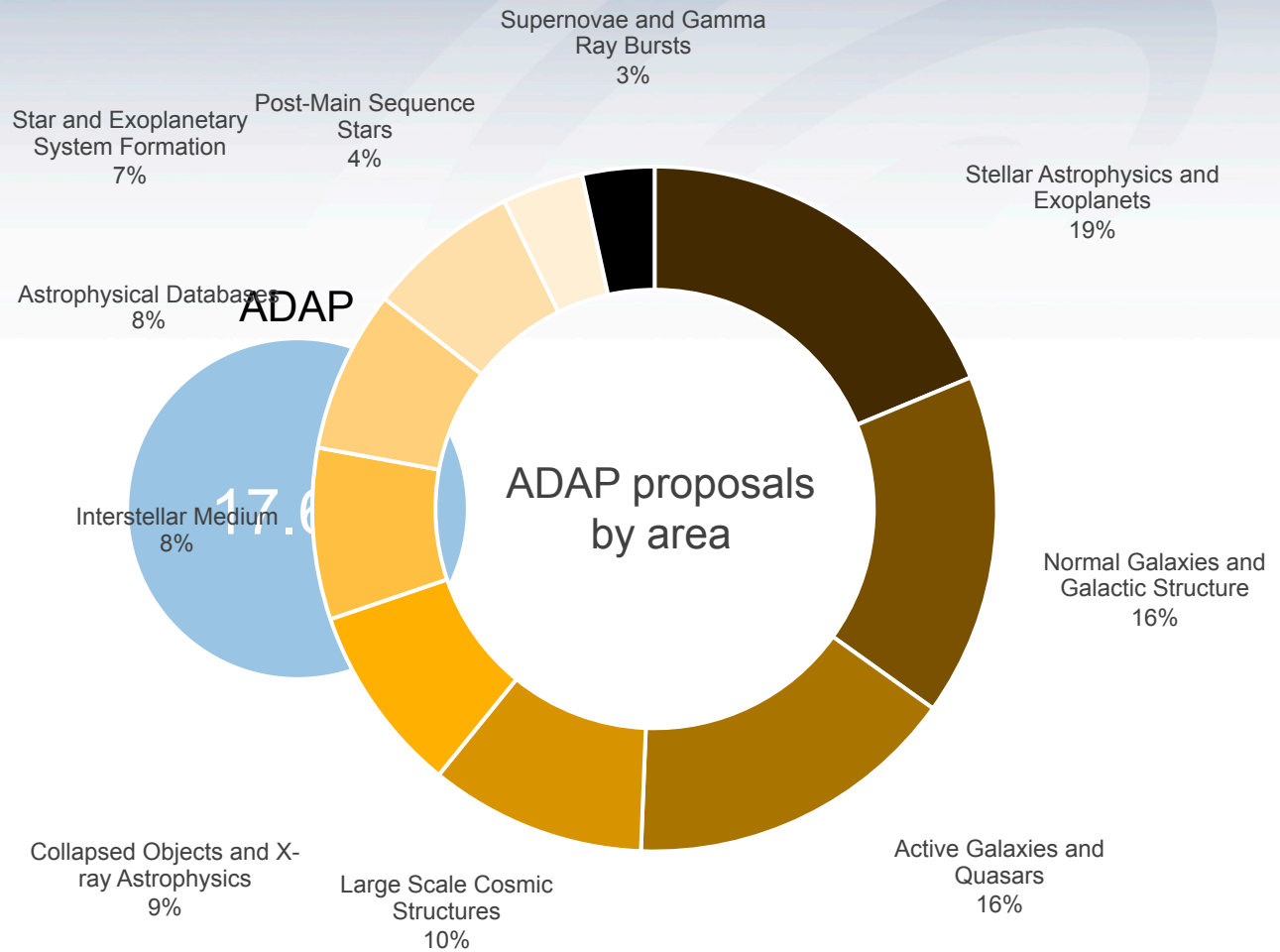
FY16 R&A Summary



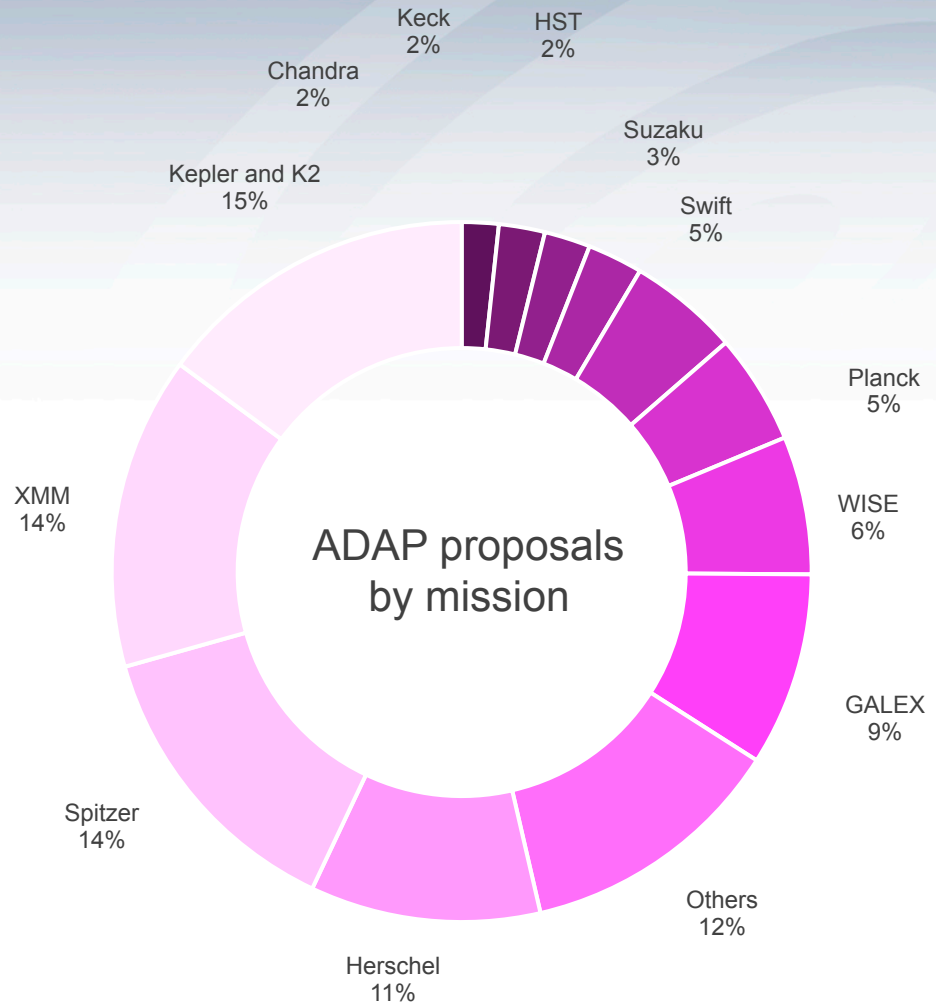
FY16 R&A Summary



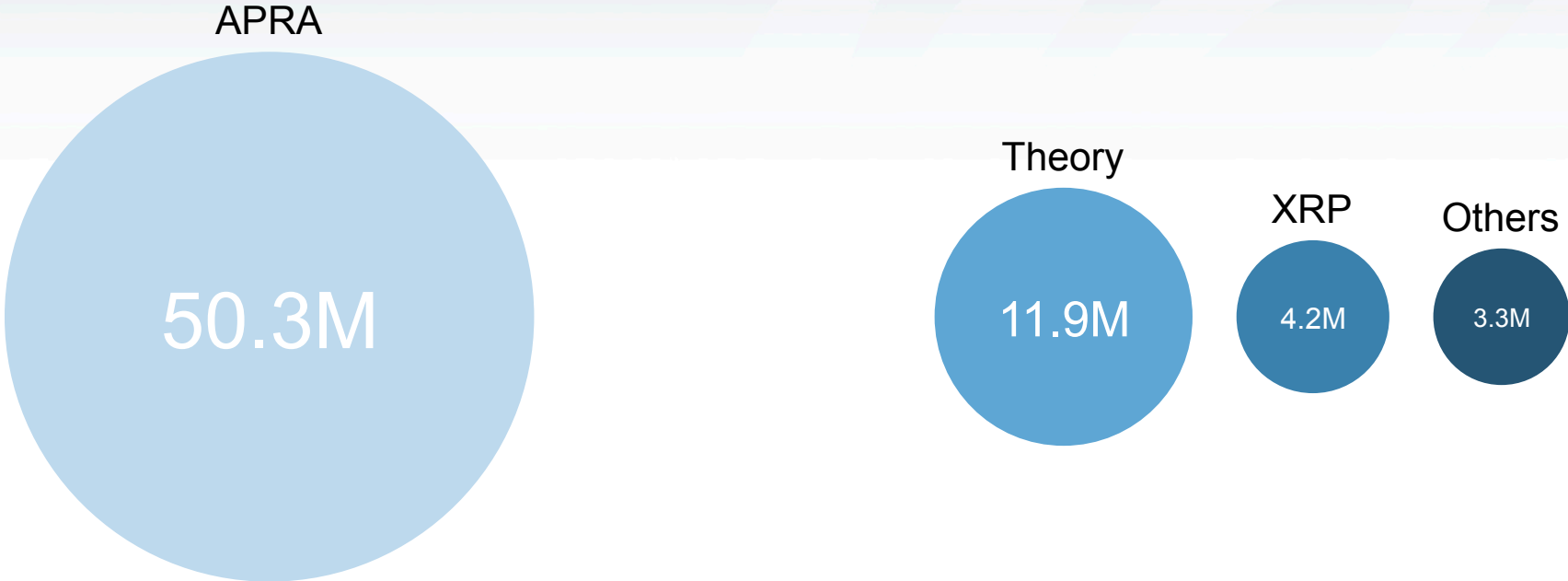
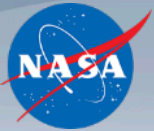
FY16 R&A Summary



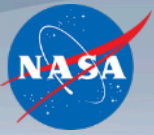
FY16 R&A Summary



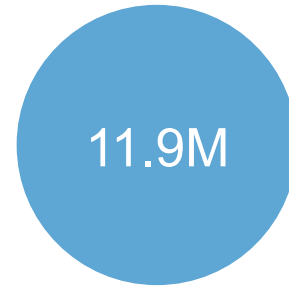
FY16 R&A Summary



FY16 R&A Summary

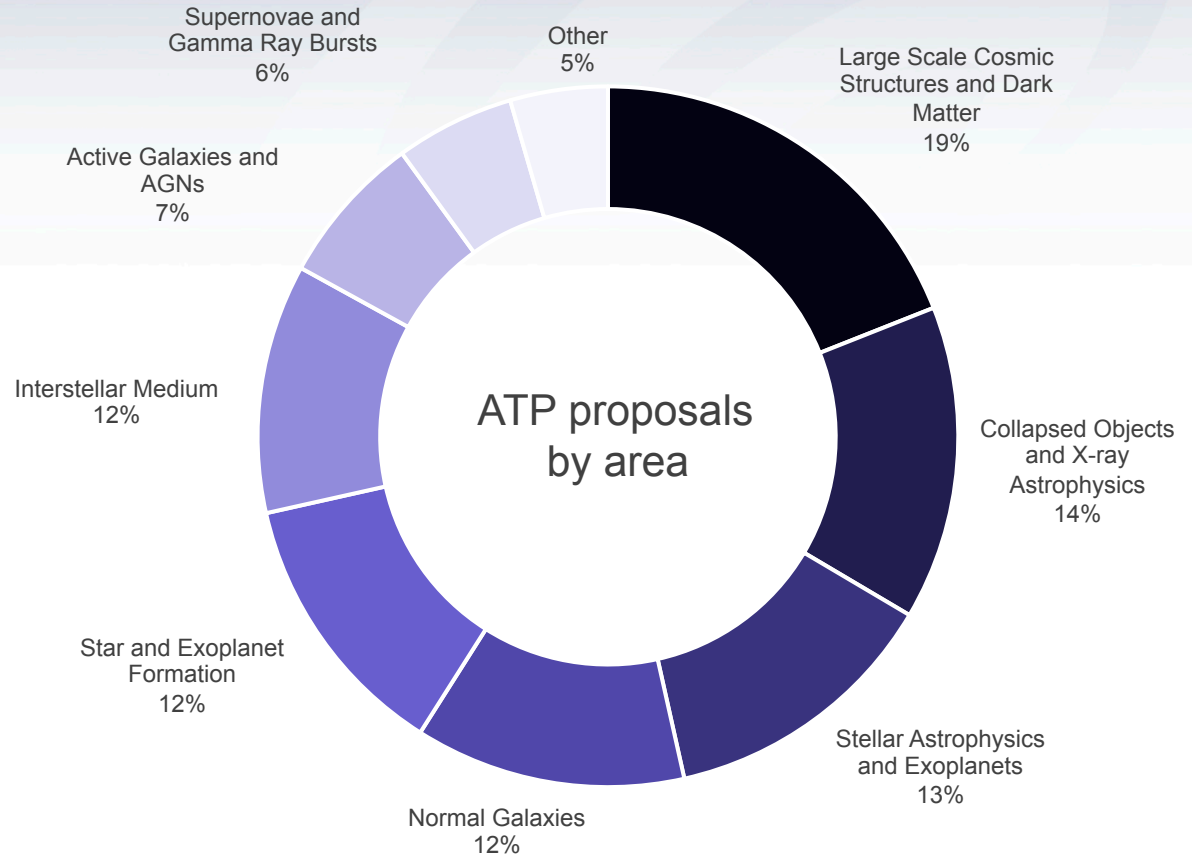


Theory

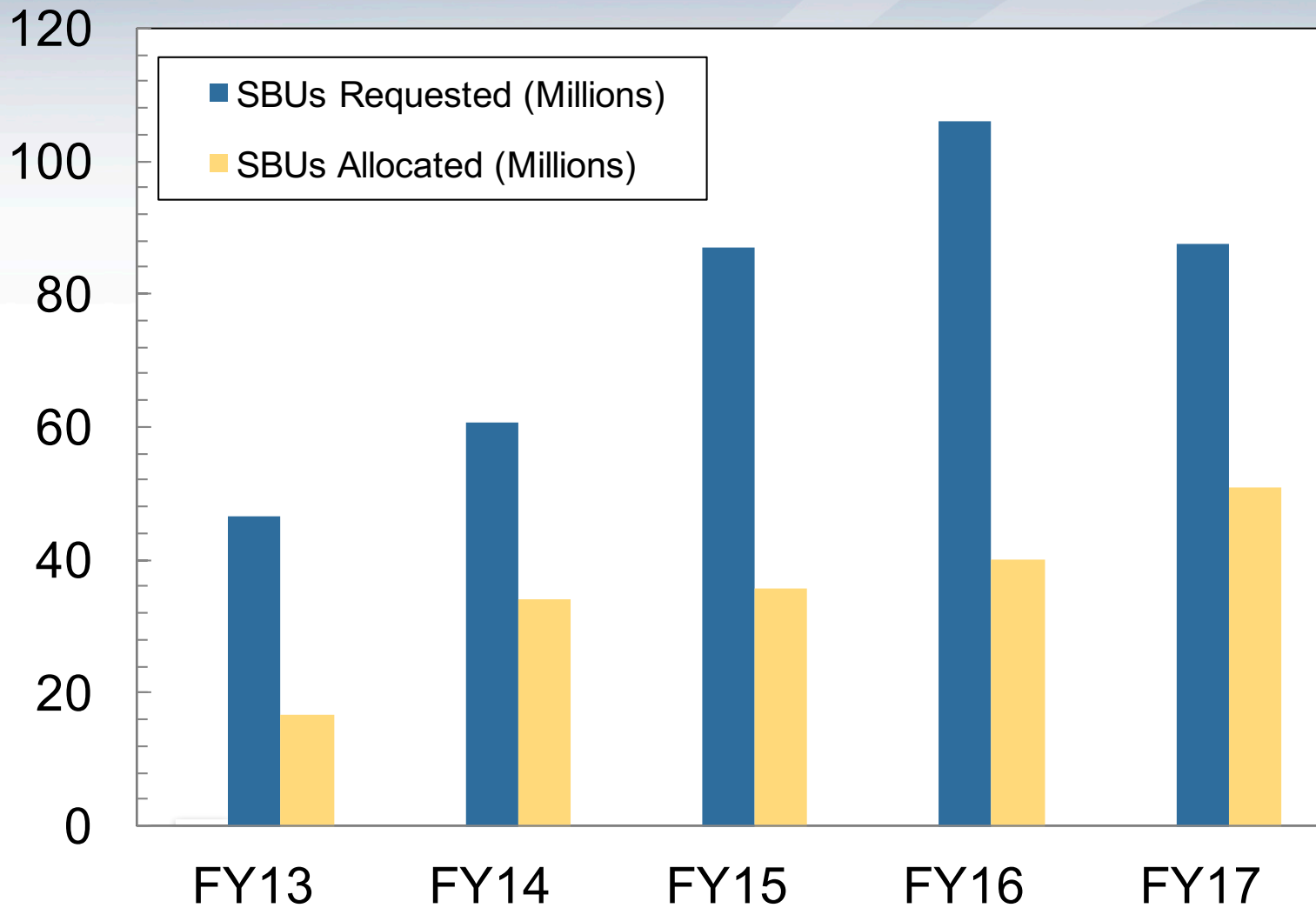


11.9M

FY16 R&A Summary

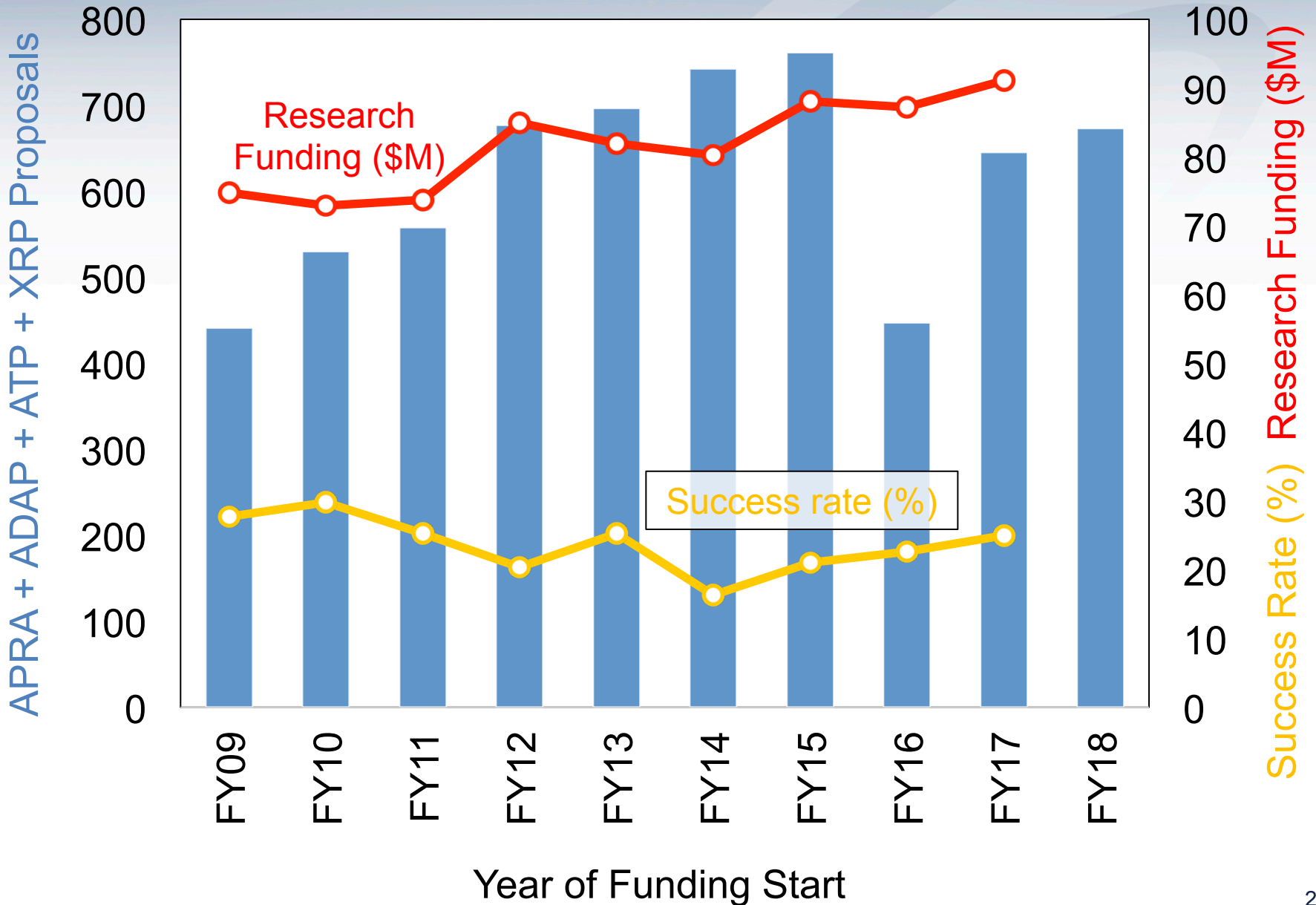


High-End Computing Requests

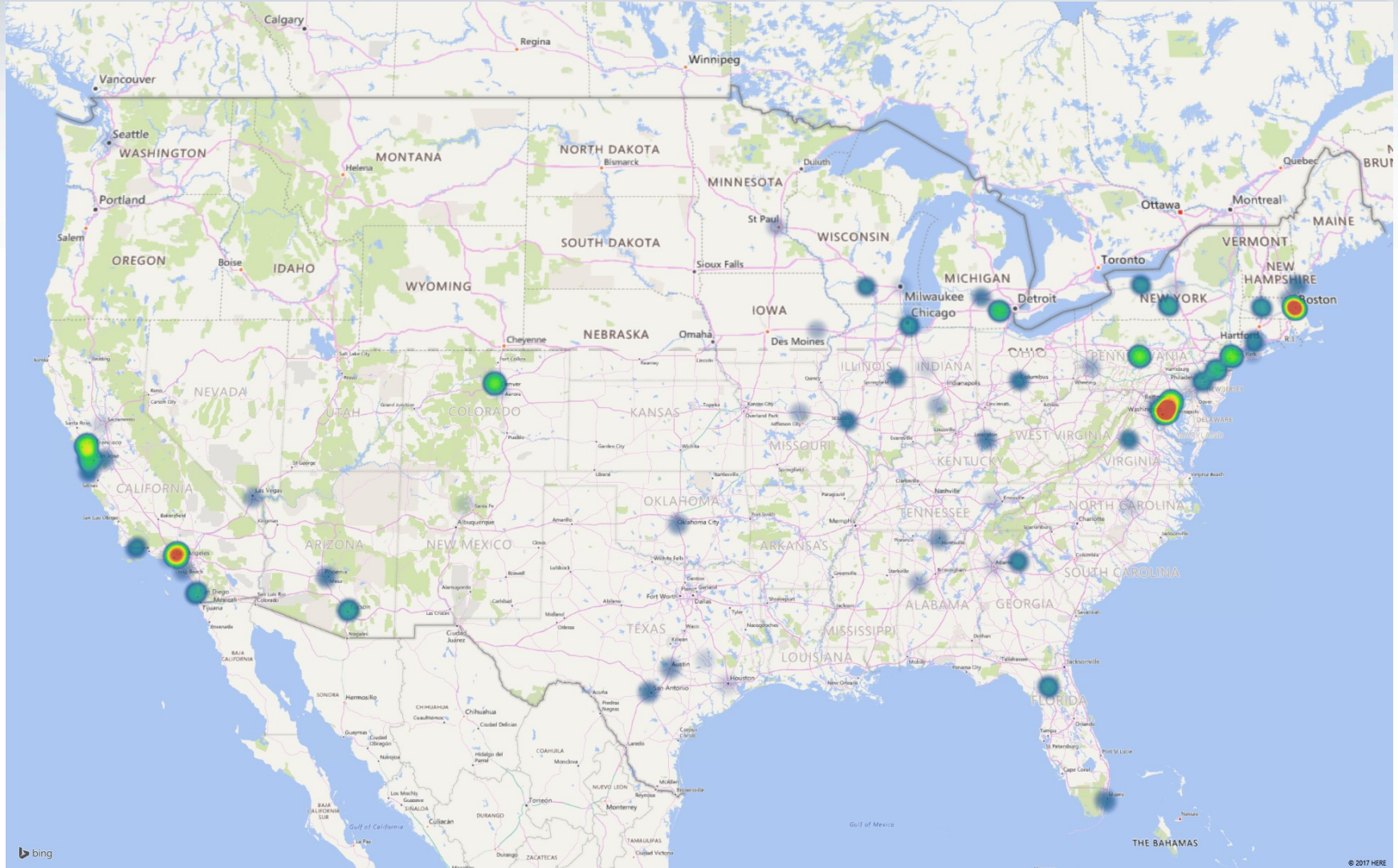
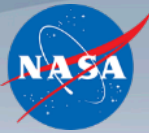


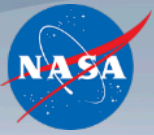


Proposal Pressure



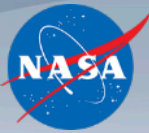
Heat Map of Awards (Last 3 Years)



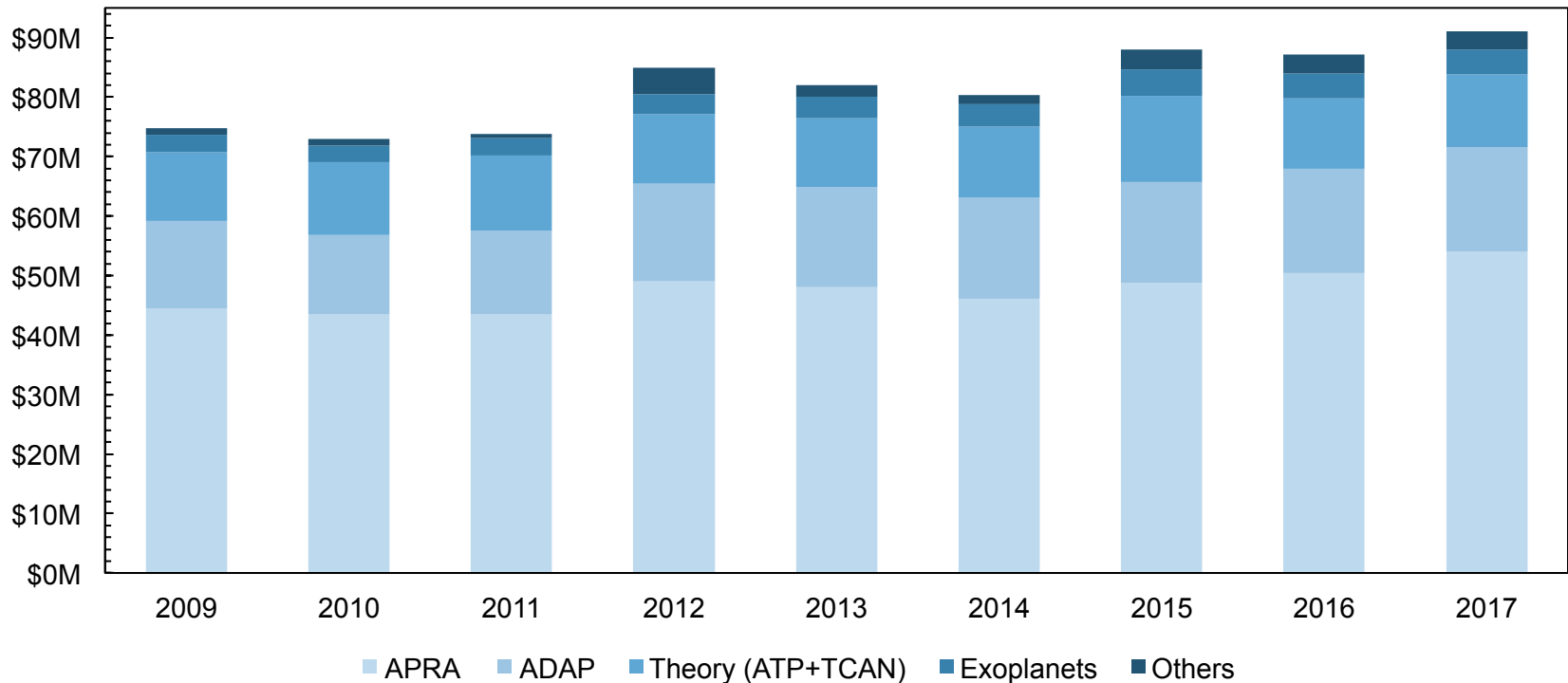


Budget Information

Historical R&A Budget Trends



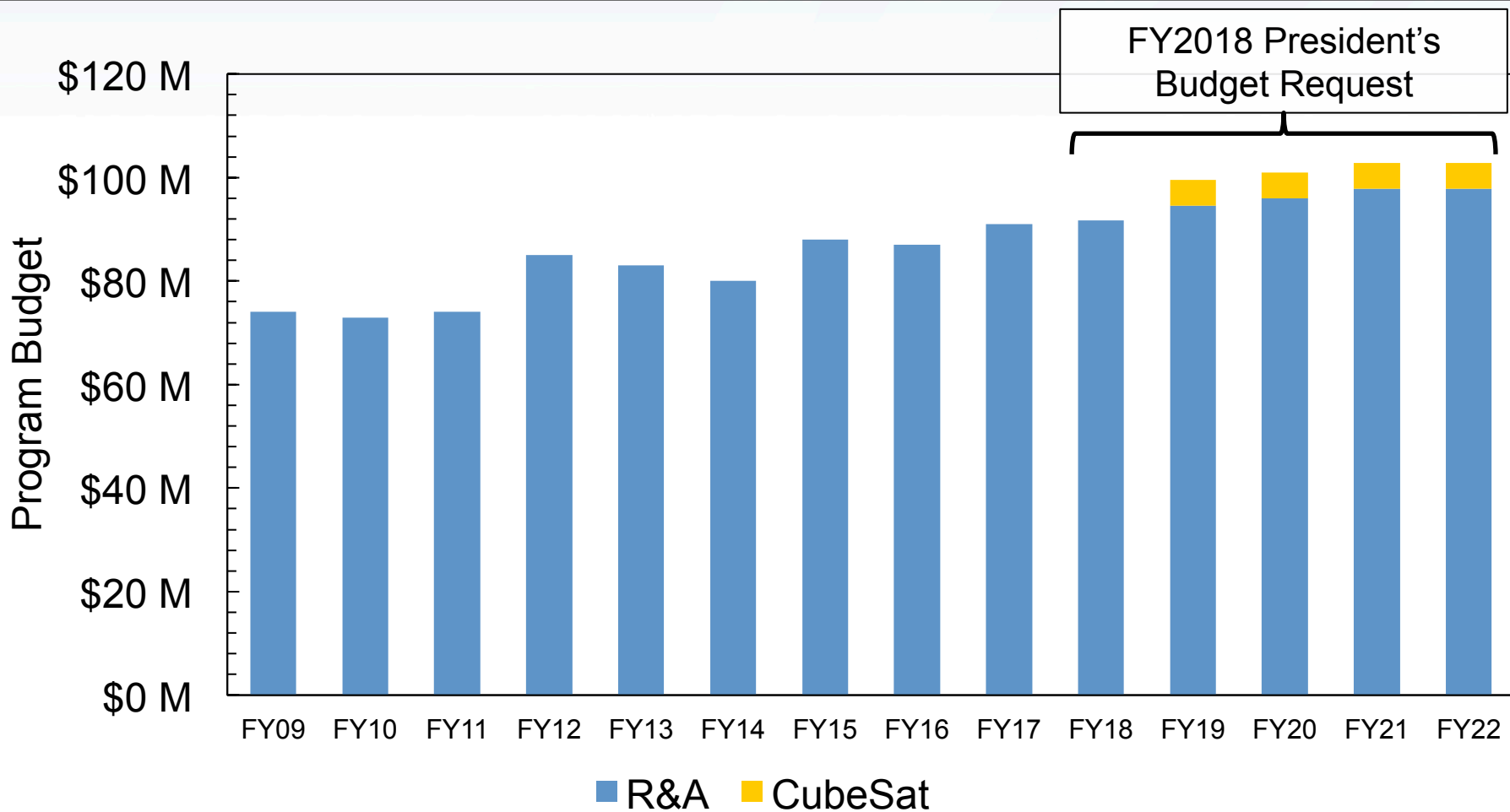
Program	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
APRA	\$44 M	\$44 M	\$43 M	\$49 M	\$48 M	\$46 M	\$49 M	\$50 M	\$54 M
ADAP	\$15 M	\$13 M	\$14 M	\$16 M	\$17 M	\$17 M	\$17 M	\$18 M	\$18 M
Theory (ATP+TCAN)	\$11 M	\$12 M	\$13 M	\$12 M	\$12 M	\$12 M	\$15 M	\$12 M	\$12 M
Exoplanets	\$3 M	\$3 M	\$3 M	\$3 M	\$4 M	\$4 M	\$4 M	\$4 M	\$4 M
Others	\$1 M	\$1 M	\$1 M	\$5 M	\$2 M	\$1 M	\$3 M	\$3 M	\$3 M
Total	\$75 M	\$73 M	\$74 M	\$85 M	\$82 M	\$80 M	\$88 M	\$87 M	\$91 M



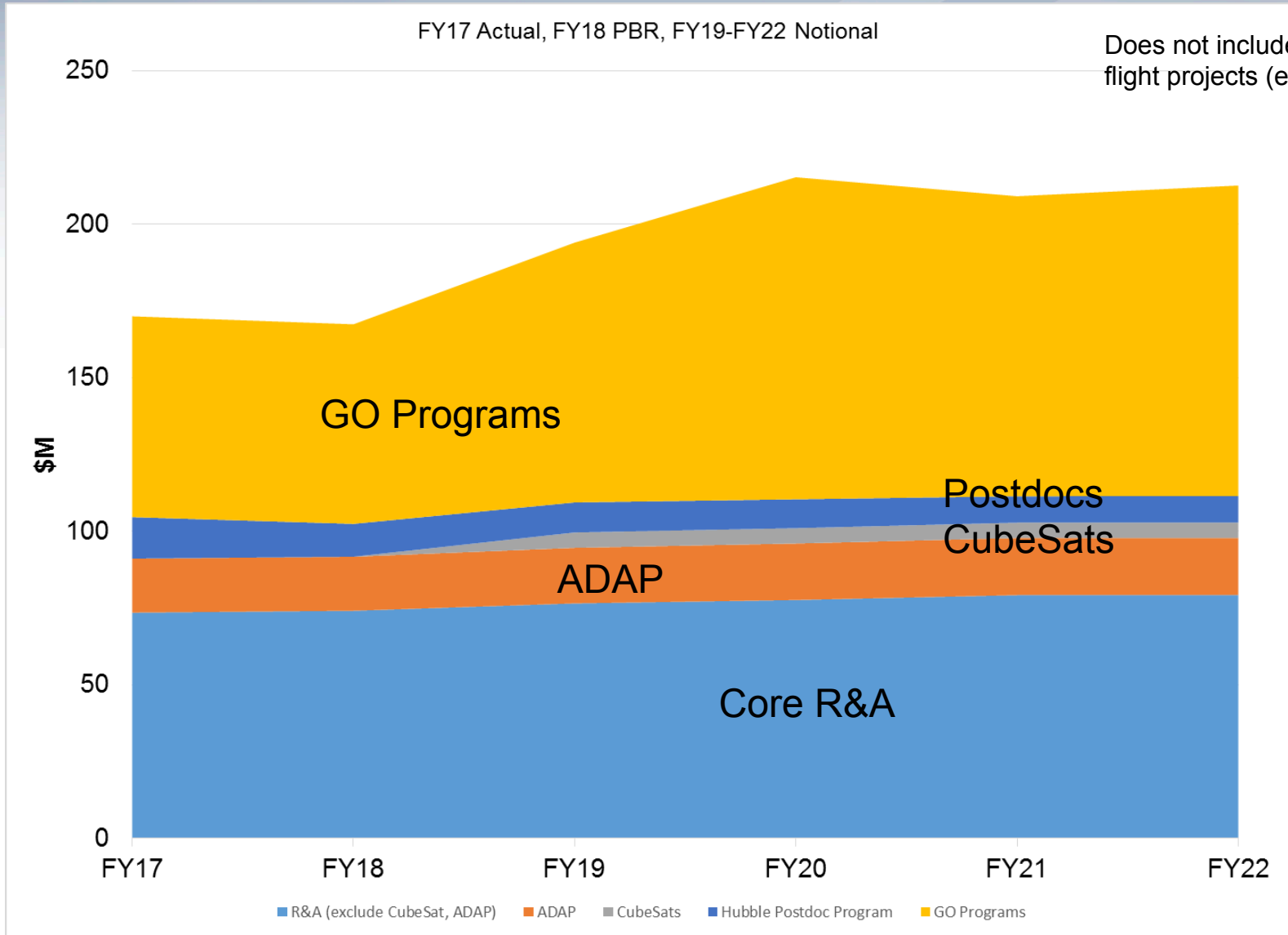
Proposed R&A Future Budget



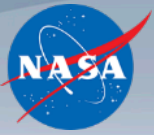
Program	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
R&A	\$74 M	\$73 M	\$74 M	\$85 M	\$82 M	\$80 M	\$88 M	\$87 M	\$91 M	\$92 M	\$95 M	\$96 M	\$98 M	\$98 M
CubeSat											\$5 M	\$5 M	\$5 M	\$5 M
Total	\$74 M	\$73 M	\$74 M	\$85 M	\$82 M	\$80 M	\$88 M	\$87 M	\$91 M	\$92 M	\$100 M	\$101 M	\$103 M	\$103 M



Total Community Support



GO programs funded from Chandra, Fermi, Hubble, Kepler/K2, NuSTAR, SOFIA, Spitzer, Swift, TESS, Webb, XARM, XMM; does not include possible extensions following the 2019 Senior Review.



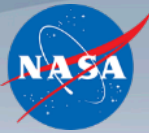
Look-Ahead

Look-ahead to R&A in 2018



- New ROSES element for LISA science and data analysis anticipated.
- New ROSES element for NICER GO program anticipated.
 - Pending the outcome of the Mission Success Progress Review, which is currently scheduled for summer 2018, NICER may solicit the astrophysics community for Guest Observer targets to be observed during an extended mission phase between January and October 2019. The proposal submission deadline for NICER Cycle 1 is expected to be in mid-September 2018.
- New Directed Work Packages due to HQ from Centers on February 1.
- Astrophysics will continue to ensure that:
 - Only work that is clearly in the national interest will be directed.
 - DWPs are strategic, science enabling, forward leaning, substantial in scope, distinctive, and uniquely or best done by a NASA Center.
 - Rolling up existing awards (e.g., APRA, ADAP) into a larger work package will only be accepted if it is demonstrated that the combined package exceeds the sum of its parts.
 - The fraction of research dollars going to NASA Centers will remain unchanged.

Look-ahead to R&A in 2018



- Continue best practices in managing our R&A programs, reviews, and awards, including:
 - Working closely with Office of the Chief Scientist to better integrate training on unconscious bias for Program Officers and reviewers.
 - Planning to integrate APAC findings on high-risk/high-impact research into our programs.
 - Further strengthening relationships with the community, in order to foster the next generation of talent.

Astrophysics Division R&A Staff



- Nasser Barghouty
- Dominic Benford
- Dan Evans
- Ingrid Farrell
- Mike Garcia
- Thomas Hams
- Hashima Hasan
- Doug Hudgins
- Stefan Immler
- Vernon Jones
- Mario Perez
- Rita Sambruna
- Kartik Sheth
- Linda Sparke
- Martin Still
- Eric Tollestrup