#### Project Organization, Finances, and In-Kind Contributions

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NSF Mid-Term Review 29 April 2024







## Outline

- Project Organization
  - ICNO organization chart
  - Work Breakdown Structure
  - M&O management and coordination
- Financial Management and Status
  - accounts
  - M&O award and subawards
  - common fund contributions and expenses
  - in-kind contributions
  - budget and actuals
  - labor inflation and PY4/PY5 plan







# **ICNO** Organization Chart

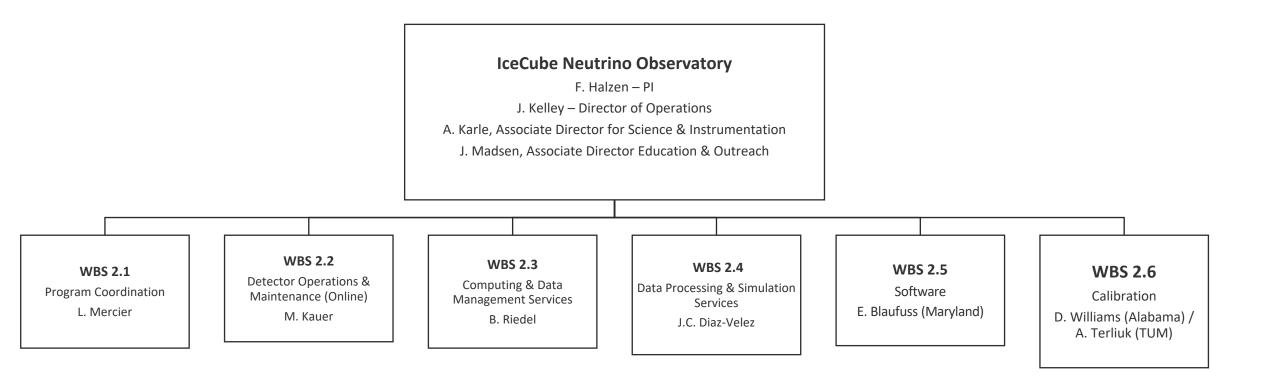
University of Wisconsin–Madison J. Mnookin, Chancellor C. Czajkowski, Interim Vice Chancellor for Research (VCR)		International Oversigh and Finance Group	t Inte	International Funding Agencies		
J. Madsen, Director       J. Kelle         C. Lowney, Assoc. Director       A. Karl         A. King-Klemperer, Communications       Sc         K. Nutting, Business IT Support       J. Mad	Observatory en, Principal Investigator ey, Director of Operations	Science Advisory Committee B. Barish, Caltech, Chair Software & Computing Advisory Panel M. Delfino, PIC, Chair	Spokesp Con Pub. Col Speaker IceCube	De Collaboration Board Derson & Executive Inmittee Chair, I. Taboada (GTech) Imm. Chair, E. O'Sullivan (Uppsala) Is Comm. Chair, A. Ishihara (Chiba) I-Gen2 Coordination Comm. Chair, Kowalski (DESY)		
Maintenar	nce & Operations	Con	oordination nmittee Chair . Riedel (UW)	Working Groups		
Detector M&O – M. Kauer (UW, Manager)         DAQ Lead       J. Braun (UW)         South Pole System &         Test System       R. Auer (UW)         Supernova DAQ       S. BenZvi (Rochester)         Processing & Filtering       E. Blaufuss (Maryland)         IceTop Operations       S. Tilav (Delaware)         IceCube Live       M. Frère (UW)         Run Coordination       W. Thompson (Harvard)         Calibration – D. Williams (Alabama) / A. Terliuk (TUM)         Data Processing & Simulation – J.C. Díaz Vélez (UW)         Offline Data Production       R. Snihur (UW)         Simulation Production       K. Meagher (UW)         Program Coordination – L. Mercier (UW)         Collaboration Simulation Production Centers:         Belgium: IIHE-Brussels; Canada: Alberta; Japan: Chiba	South Pole Logistics, R&D Suppor Quality & Safety – M. Zernick (UW) Computing & Data Mgt. – B. Riede Data Storage Sys. & Cybersecurity Data Transfer and Archive Data Management Distributed Computing Data Processing Networking and Facilities Production Software Data Archive at DESY Data Archive at LBNL Software – E. Blaufuss (Maryland) IceTray Framework/Development Simulation Software Offline Processing Software	t – M. Kauer (UW) Cu S. Barnet (UW) P. Meade (UW) M. Preston (UW) V. Brik (UW) A. Sheperd (UW) S. Barnet (UW) D. Schultz (UW) K. Leffhalm (DESY) S. Klein (LBNL)	Resource oordination Mercier (UW) TFT oordination I. Whitehorn (MSU) Real-Time Oversight Committee A. Santander (Alabama)	Analysis Coordinator – N. Kurahashi Neilson (Drexel) Deputy Analysis Coordinator – S. BenZvi (Rochester) IceCube Upgrade Coordinator – J.P. Yañez (Alberta) Technical Coordinator – M. Larson (Maryland) Collaboration Working Groups: Diversity, Equity & Inclusion Analysis Working Groups: Diffuse Neutrino Sources Beyond Standard Model Cosmic Rays Oscillation Supernova Technical Working Groups:		



April 15, 2024

# Work Breakdown Structure (WBS)



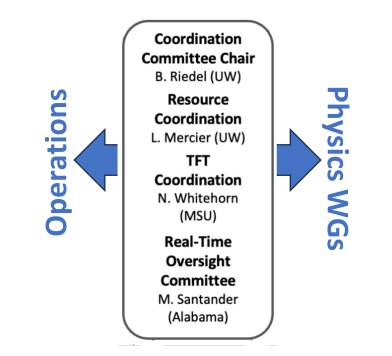






# M&O Management and Coordination

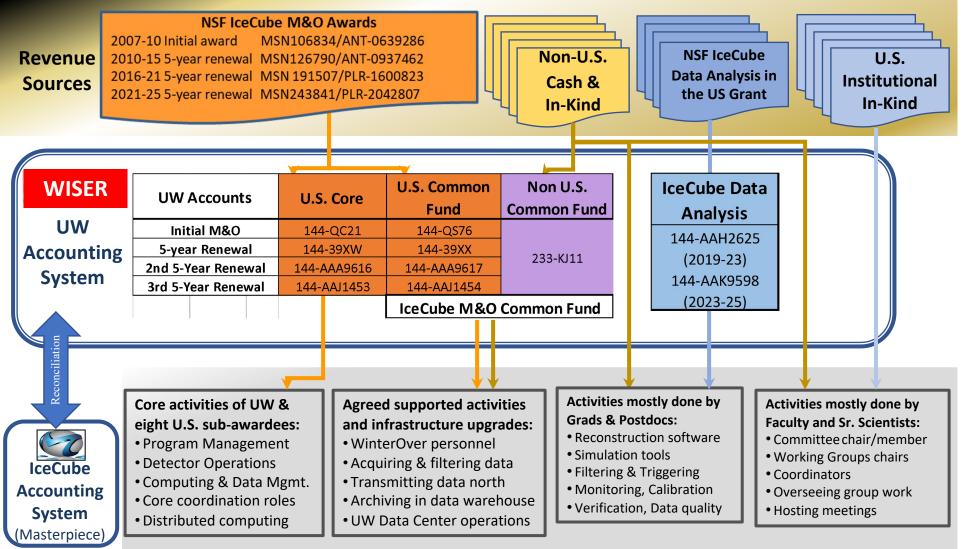
- Technical work by WBS
  - 2.2 Detector Operations: weekly operations calls
  - 2.3 Computing: daily standups, bi-weekly sprints
  - 2.4 Data Processing and Simulation: bi-weekly calls
  - 2.5 Software: bi-weekly software calls
  - 2.6 Calibration: weekly calibration calls
- Cross-WBS coordination + interface with physics working groups
  - bi-weekly IceCube Technical calls
  - monthly IceCube Coordination Committee (ICC) calls
- M&O leadership
  - weekly WIPAC M&O meetings
  - weekly calls with NSF program officers
  - bi-annual reports to NSF, collaboration (general and ICB), and annually to IOFG







## Monetary Flow and Accounts



#### Expenditures

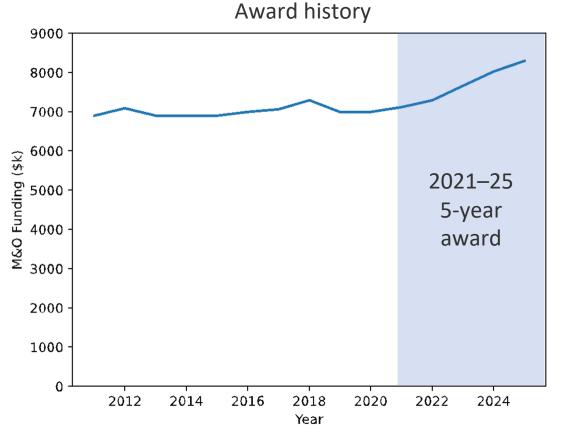


Current M&O Award (2021–25)



#### Budget summary table

NSF Funds	Budget Elements						
Request	Dudget Liements	YEAR1	YEAR2	YEAR3	YEAR4	YEAR5	TOTAL
A	Total Senior Personnel	\$308,770	\$314,944	\$343,955	\$350,833	\$357,850	\$1,676,352
В	Other Personnel	\$2,344,998	\$2,388,752	\$2,487,896	\$2,583,654	\$2,635,327	\$12,440,627
A+B	Total Salaries and Wages	\$2,653,768	\$2,703,696	\$2,831,851	\$2,934,487	\$2,993,177	\$14,116,979
С	Total Fringe	\$891,662	\$908,442	\$951,498	\$985,984	\$1,005,708	\$4,743,294
A+B+C	Total Salaries + Fringe	\$3,545,430	\$3,612,138	\$3,783,349	\$3,920,471	\$3,998,885	\$18,860,273
D	Capital Equipment	\$0	\$0	\$0	\$0	\$0	\$0
E1	Travel Domestic	\$132,217	\$136,004	\$141,702	\$146,585	\$149,467	\$705,975
E2	Travel Foreign	\$85,869	\$88,766	\$92,685	\$95,447	\$97,315	\$460,082
G1	Materials & Supplies	\$72,679	\$72,921	\$73,136	\$73,617	\$73,975	\$366,328
G3	Consultant Services	\$0	\$0	\$0	\$0	\$106,405	\$106,405
G4	Computer Services	\$30,000	\$75,000	\$75,000	\$75,000	\$75,000	\$330,000
G5	Subawards	\$1,035,147	\$1,097,785	\$1,175,968	\$1,326,791	\$1,292,235	\$5,927,926
G	Total Other Direct Cost	\$1,137,826	\$1,245,706	\$1,324,104	\$1,475,407	\$1,547,615	\$6,730,659
H (A thr G)	Total Direct Costs	\$4,901,342	\$5,082,614	\$5,341,840	\$5,637,910	\$5,793,282	\$26,756,989
I1	Labor Indirect	\$1,949,986	\$2,004,736	\$2,099,762	\$2,175,861	\$2,219,380	\$10,449,725
I2	Travel Indirect	\$119,935	\$124,752	\$130,102	\$134,335	\$136,959	\$646,083
13	Materials & Supplies Indirect	\$39,973	\$40,471	\$40,591	\$40,857	\$41,056	\$202,949
I4	Overhead Setup	\$82,500	\$0	\$0	\$0	\$0	\$82,500
15	Consultant Services Indirect	\$0	\$0	\$0	\$0	\$59,055	\$59,055
I6	Computer Services Indirect	\$16,500	\$41,625	\$41,625	\$41,625	\$41,625	\$183,000
Ι	Total Indirect Cost	\$2,208,894	\$2,211,584	\$2,312,080	\$2,392,678	\$2,498,075	\$11,623,311
J=H+I	Total Direct & Indirect	\$7,110,237	\$7,294,199	\$7,653,920	\$8,030,589	\$8,291,357	\$38,380,301



- M&O budget largely flat vs. time
- Most equipment (e.g. computing) not on budget
- Increase in PY3–PY5 assists in Upgrade integration





#### Subawards

						Dollars		
Institution	Major Responsibilities	Average FTE PY1–PY5	PY1	PY2	PY3	PY4	PY5	Total PY1-PY5
Lawrence Berkeley National Laboratory	Computing infrastructure, long-term data archival, DOM firmware support	.05 Senior Personnel .14 Other Professional	\$ 82,688	\$ 91,822	\$ 95,571	\$ 106,807	\$ 110,475	\$ 487,363
Pennsylvania State	Simulation production, DAQ firmware support	.24 Post-Doctoral Scholars .25 Other Professionals	\$ 23,098	\$ 39,055	\$ 96,850	\$ 162,966	\$ 106,943	\$ 428,912
University of Delaware	IceTop calibration, monitoring and maintenance;IceTop simulation production	.65 Senior Personnel .25 Post-Doctoral Scholars	\$ 174,104	\$ 177,554	\$ 181,075	\$ 184,663	\$ 188,328	\$ 905,724
University of Maryland at College Park Original	Overall software coordination, IceTray software framework, online filter, simulation software and production	.02 Senior Personnel 2.4 Other Professional	\$ 635,366	\$ 643,918	\$ 652,605	\$ 718,288	\$ 728,089	\$ 3,378,266
After CR PY3-PY5	same as above	.02 Senior Personnel 2.5 Other Professional	\$ 635,366	\$ 643,918	\$ 762,484	\$ 811,590	\$ 812,369	\$ 3,665,727
University of Alabama at Tuscaloosa	Detector calibration, reconstruction and analysis tools	.08 Senior Personnel	\$ 30,101	\$ 30,703	\$ 31,318	\$ 31,944	\$ 32,584	\$ 156,650
Michigan State University	Simulation production, Northern Test System (NTS) maintenance	.2 Post-Doctoral Scholars	\$ 89,792	\$ 114,733	\$ 118,549	\$ 122,123	\$ 125,817	\$ 571,014

CR in PY3 to increase Univ. of Maryland subaward (same total budget)



# **Common Fund Contributions**



- Both U.S. and non-U.S. full member institutions contribute to IceCube M&O via the common fund
  - \$13,650 / Ph.D. author / year
- U.S. Common Fund: NSF award increment divided into appropriate accounts based on current author count
- Non-U.S. Common Fund: WIPAC invoices foreign institutions annually
- Used to support "core activities that are agreed to be of common necessity for reliable operation of the IceCube detector and computing infrastructure" including:
  - winterover detector operators
  - data acquisition and filtering hardware and software at the South Pole
  - data transfer and archival hardware and software at the WIPAC data center





## Common Fund PY1–PY3

	PY1			PY2	PY3		
	PhD. Authors	Planned	PhD. Authors	Planned	PhD. Authors	Planned	
Total CF Planned	162	\$2,211,300	172	\$2,347,800	183.5	\$2,504,775	
U.S. Contribution	88	\$1,201,200	97	\$1,324,050	106	\$1,446,900	
Non-U.S. Contribution	74	\$1,010,100	75	\$1,023,750	77.5	\$1,057,875	
		Actual		Actual		Actual	
<b>Total CF Contributions</b>		\$2,136,225		\$2,327,325		\$2,445,145	
U.S. Contribution		\$1,201,200		\$1,324,050		\$1,446,900	
Non-U.S. Contribution		\$935,025		\$1,003,275		\$998,245	
Difference (Actual-Planned)		\$(75 <i>,</i> 075)		\$(20,475)		\$(59,630)	

- small fraction of Non-U.S. CF contributions are in-kind
- contributions are in line with plan (within ~few%)
- author counts continue to increase



# **In-Kind Labor Contributions**

- M&O labor contributions tracked through the MoU Dashboard
  - updates solicited bi-annually by Resource Coordinator
  - Institutional Leads update and confirm SoW
- Regular tasks include detector monitoring shifts by all institutions
  - training, organization by Run Coordinator
- Coordination boards prioritize work, set tasking
  - example: new offline filter development coordinated by ICC and TFT
  - continue work to improve feedback
     mechanisms here

/ MOL / IceCu	be M&O				IceCube M&O	IceCube Upgrade	User Guide PDF	<ul> <li>jkelley Log Ou</li> </ul>
<sup>®</sup> VIEW A SNAPSHOT			UW-Mad	ison				SAVED
	PHDS & AUTHORS	FACULTY	SCIENTISTS/PC	OST-DOCS	GRADUATE STUDEN	TS		
	28	5	23	\$	14	🗘 🖻 CONFIRME	D	
UW-MADISON'S STATEMENTS OF	WORK							
AD – Administration	CS – Computer Science	DS – Data Science	2	EN – Engineerir	19	GR – Graduate (PhD) Students	IT – Informatic	n Technology
KE – Key Personnel (Faculty)	MA – Manager	PO – Postdoctoral		SC – Scientist		WO – Winterover		

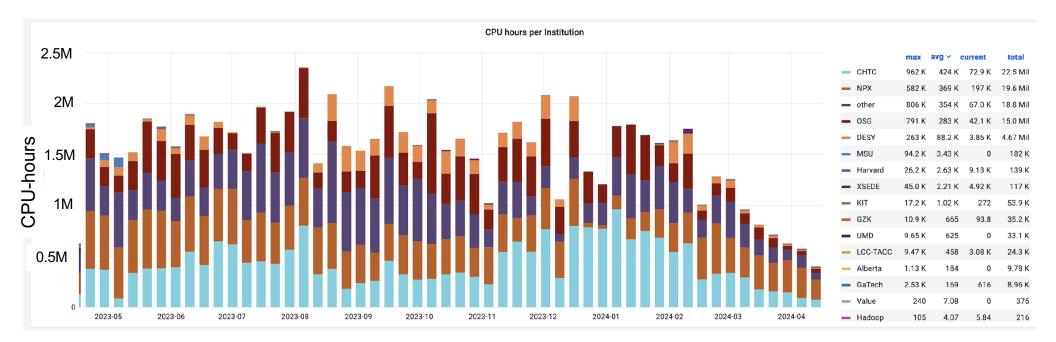
	CREATE NEW STATEMENT C	F WORK	ONFIRM ALL STATEMENTS	OF WORK	± TOTALS	SHOW PAGES	EXPORT
	WBS L2	WBS L3	¢ LABOR ¢ CAT. <sup>¢</sup>	NAME \$	TASK DESCRIPTION	♦ SOURCE OF FUNDS (U.S. ONLY)	FTE \$
	FILTER DATA						
×	2.1 Program Coordination	2.1.1 Administration	AD	Lowney, Christy	Management/Administration	NSF M&O Core	0.1
×	2.1 Program Coordination	2.1.1 Administration	AD	MERCIER, LAURA	IceCube Resource Administrator Manager	NSF M&O Core	0.5
×	2.1 Program Coordination	2.1.1 Administration	GR	UW GR	Detector monitoring shifts	NSF Base Grants	0.3
×	2.1 Program Coordination	2.1.1 Administration	KE	HALZEN, FRANCIS	Principal Investigator	NSF M&O Core	0.25
×	2.1 Program Coordination	2.1.1 Administration	KE	HALZEN, FRANCIS	Principal Investigator	US In-Kind	C
×	2.1 Program Coordination	2.1.1 Administration	KE	HANSON, KAEL	Co-PI M&O	NSF M&O Core	C
×	2.1 Program Coordination	2.1.1 Administration	KE	Halzen, Francis	РІ	NSF Base Grants	0.25
×	2.1 Program Coordination	2.1.1 Administration	KE	KARLE, ALBRECHT	Co-PI M&O, Associate Dir. Science Instr.	NSF M&O Core	0.5
×	2.1 Program Coordination	2.1.1 Administration	KE	KARLE, ALBRECHT	ExecCom member	US In-Kind	C
×	2.1 Program Coordination	2.1.1 Administration	KE	Lu Lu		NSF Base Grants	0.2
×	2.1 Program Coordination	2.1.1 Administration	KE	VANDENBROUCKE, JUSTIN	PubCom member	US In-Kind	C
×	2.1 Program Coordination	2.1.1 Administration	МА	Kelley, John	Director of Maintenance and Operations	NSF M&O Core	0.25
×	2.1 Program Coordination	2.1.1 Administration	МА	MADSEN, JIM	Interim Director of M&O	NSF M&O Core	0.17





#### In-Kind Computing and Hardware Contributions

- In-kind computing resources integrated into IceCube grid
  - tracked per site and by resource type (CPU / normalized GPU)
  - DESY, MSU, Harvard, KIT, UMD et al. contributions
- Specialized hardware contributions also support M&O
  - example: surface array scintillator panels from KIT





# **Budget and Expenditures Summary**



PY1–PY3 actual vs. budget

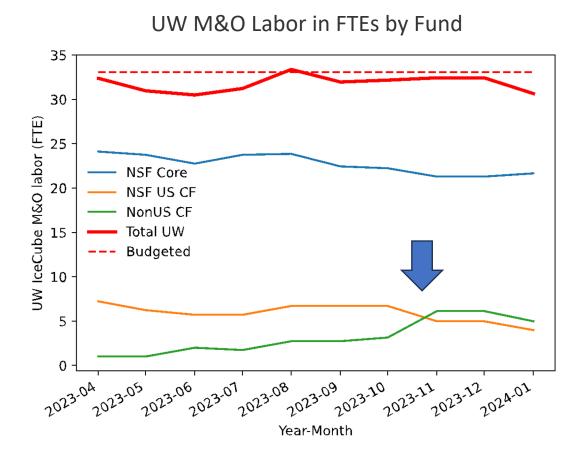
(a)	<b>(b)</b>	(c)	(d) = a - b - c
PY1–3	Actual Cost	Open	End of YEAR3 Balance
Budget	To Date	Commitments	
(Apr.'21-	through		
Mar.'24)	Mar. 2024		
\$22,058K	\$21,470K	\$658K	-\$70K

- PY1-PY3 balance is -\$70K (-0.3%)
  - open commitments are subawards yet to invoice us
  - this is basically balanced (but after labor expenses shifted)
- Inflation has increased faster than award escalation
  - e.g. 4% COLA mandated by state of Wisconsin
  - personnel departures + rehiring at market rates



# Inflation Mitigation





- M&O labor FTEs under budgeted plan
  - action is still needed due to labor inflation
- Labor rebalanced between U.S. and Non-U.S. Common Funds
  - core hardware and software maintenance
- South Pole server upgrade deferred until after Upgrade installation
  - solid logistical and financial reasons
    - ~\$800k deferred
    - focus on Upgrade pole activities
  - minimal technical risk





# Non-U.S. Common Fund Expenditures

System	Computing Infrastructure	Detector Infrastructure	Labor	Total
South Pole System + Test System	\$4K	\$17K	\$201K	\$222K
Data Warehouse + UW Data Center	\$533K	—	\$21K	\$554K
PY1 TOTAL	\$537K	\$17K	\$222K	\$776K
South Pole System + Test System	\$231K	\$3K	\$162K	\$396K
Data Warehouse + UW Data Center	\$111K	—	\$56K	\$167K
PY2 TOTAL	\$342K	\$3K	\$218K	\$563K
South Pole System + Test System	\$281K	\$40K	\$330K	\$651K
Data Warehouse + UW Data Center	\$867K		\$75K	\$942K
PY3 TOTAL	\$1,148K	\$40K	\$405K	\$1,593K

- Caught up with infrastructure upgrades post-COVID
- Shift of labor to Non-U.S. CF will continue for PY4 and PY5
  - will maintain at least \$300K/yr budget for hardware upgrades

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# Summary

- Robust M&O management at all levels
  - WBS organization tracks technical effort
  - maintain active communication with stakeholders
  - continue to work to direct and manage in-kind contributions
- Significant hardware upgrades in PY1–3
  - largely funded by Non-U.S. Common Fund
  - caught up post-COVID
- Labor inflation challenging but under control
  - some maintenance deferred but minimal technical risk
  - will need to be addressed after Upgrade construction completion





# Supplemental Slides



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## Work Breakdown Structure (WBS) to L3

