

**IceCube Neutrino Observatory
Maintenance & Operations
Common Fund Status Report**

**Adi Peles, Catherine Vakhnina,
Resource Coordinators**

Introduction

The IceCube M&O Common Fund was created in April 2007, the start of formal operations, to enable collaborating institutions to contribute to the costs of maintaining the computing hardware and software required to manage experimental data prior to processing for analysis. Each institution contributes to the Common Fund based on the total number of the institution's Ph.D. authors.

The Collaboration updates the Ph.D. author count twice a year at the collaboration meetings in conjunction with the update to the IceCube M&O Scope of Work and responsibilities in the Institutional Memorandum of Understanding. Effective April 1, 2010, the annual established rate per Ph.D. author is \$13,650.

The M&O activities identified as appropriate for support from the Common Fund are those core activities that are agreed to be of common necessity for reliable operation of the IceCube detector and computing infrastructure. The activities directly support the functions of winterover technical support at the South Pole, hardware and software systems for acquiring and filtering data at the South Pole, hardware and software systems for transmitting data via satellite and tape to the UW data center, systems for archiving the data in the central data warehouse at UW and UW Data Center Operations as listed in the Cooperative Agreement with NSF.

Section I: Initial Three Years of M&O Common Fund

Common Fund Contributions

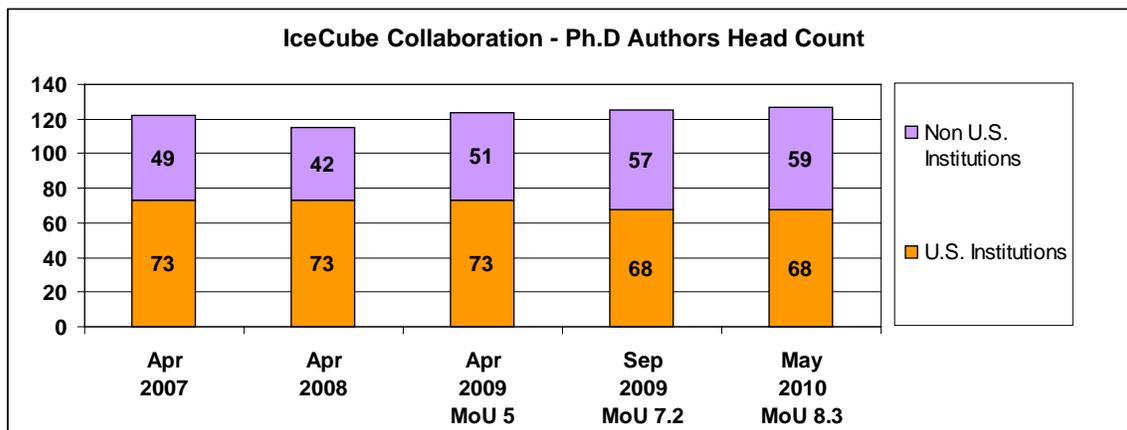
The following table summarizes the Common Fund (CF) contributions for the first three years of IceCube Maintenance and Operations:

**Table 1. Planned and Actual CF Contributions (\$000)
For the Initial Three Years of M&O – April 2007 - March 2010**

	PhD. authors Apr. '07	Year1 2007 Planned	PhD. authors Apr. '08	Year2 2008 Planned	PhD. authors Apr. '09	Year3 2009 Planned
Total CF Planned	122	\$1,110	115	\$1,046	124	\$1,128
U.S. Contribution	73	\$664	73	\$664	73	\$664
Non-U.S. Contribution	49	\$446	42	\$382	51	\$464
		Actual		Actual		Actual
Total CF Contributions		\$1,110		\$1,046		\$1,128
U.S. Cash Transfer		\$664		\$664		\$664
Non-U.S. Cash Transfer		\$360		\$343		\$426
Non-U.S. In-Kind		\$86		\$39		\$38
Balance		\$0		\$0		\$0

All expected contributions for the initial three years of IceCube M&O were fulfilled.

The following bar chart presents the Ph.D. authors head count profile over the initial three years of IceCube M&O. The total number of Ph.D. authors has increased from 122 in April 2007 to 127 in May 2010 (U.S. decreased from 73 to 68 while Non U.S. increased from 49 to 59).



**Figure 1: Ph.D. Authors Head Count Profile
for the Initial Three Years of M&O**

Section II: Years 4-9 of M&O Common Fund

Common Fund Contributions

The actual contribution during these years of IceCube operations is larger than in preceding years primarily due to the 50% increase to the Ph.D. author fee. The following table summarizes the planned vs. actual received contribution in 2010-2014.

**Table 2. Planned and Actual CF Contributions (\$000)
For Years 4-8 of M&O, April 1st, 2010 – March 31st, 2015**

	PhD. authors May '10	Year4 2010 Planned	PhD. authors Apr. '11	Year5 2011 Planned	PhD. authors Mar. '12	Year6 2012 Planned
Total CF Planned	127	\$1,728	126	\$1,720	124	\$1,693
U.S. Contribution	68	\$928	69	\$942	67	\$915
Non-U.S. Contribution	59	\$799	57	\$778	57	\$778
		Actual		Actual		Actual
Total CF Contributions		\$1,726		\$1,720		\$1,709
U.S. Cash Transfer		\$928		\$942		\$915
Non-U.S. Cash Transfer		\$744		\$730		\$794
Non-U.S. In-Kind		\$54		\$47		\$75
Difference (Actual - Planned)		\$-2		\$0		\$16

	PhD. authors Apr. '13	Year7 2013 Planned	PhD. authors Mar. '14	Year8 2014 Planned	PhD. authors Apr. '15	Year9 2015 Planned
Total CF Planned	124	\$1,693	129	\$1,777	137	\$1,868
U.S. Contribution	69	\$942	67	\$915	73	\$996
Non-U.S. Contribution	55	\$751	62	\$862	64	\$871
		Actual		Actual		Actual
Total CF Contributions		\$1,671		\$1,734		TBD
U.S. Cash Transfer		\$942		\$915		
Non-U.S. Cash Transfer		\$671		\$680		
Non-U.S. In-Kind		\$58		\$139		
Difference (Actual - Planned)		\$-21		\$-43		

Actual Common Fund contributions are \$21k less than planned in 2013, and are currently \$43K less in 2014. The following bar chart presents the Ph.D. authors head count profile since the beginning of IceCube M&O. The total number of Ph.D. authors has increased from 129 in March 2014 to 133 in September 2014, to 137 in April 2015 (U.S. increased by 7, Non U.S. increased by 2).

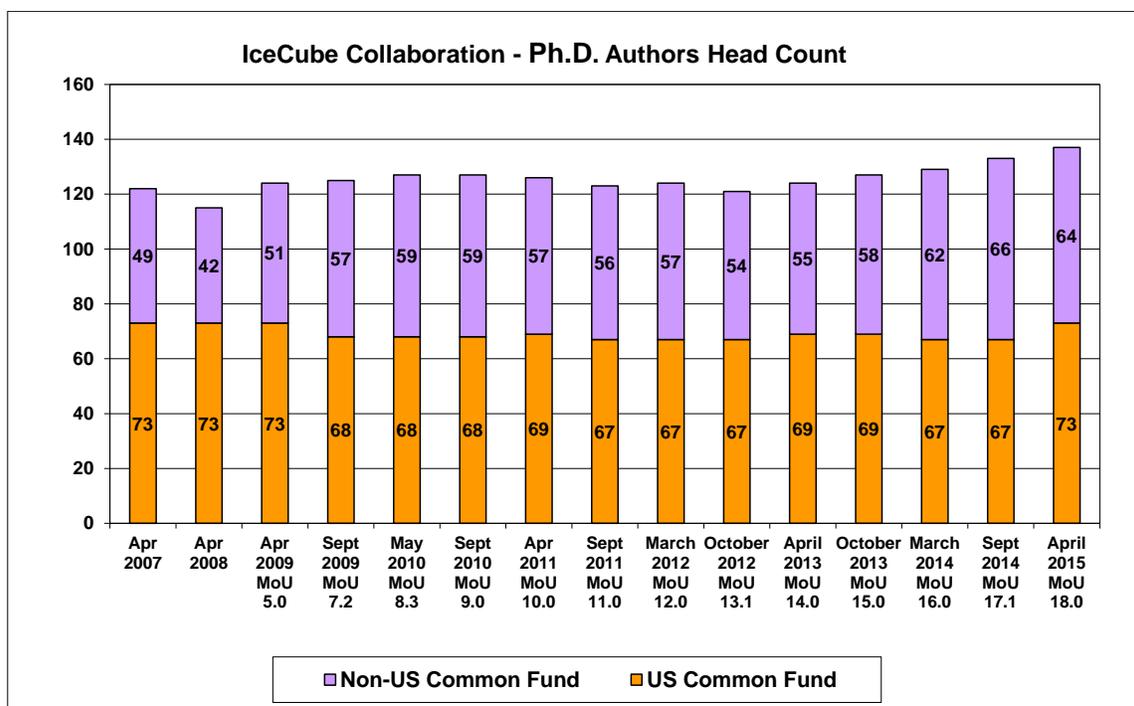


Figure 2: Ph.D. Authors Head Count Profile as of April 2015

The following table provides a more detailed breakdown of the authors head count including faculty, scientists and postdocs, and Ph.D. students based on the most recent MoU update.

Table 3. IceCube Collaboration – Authors Head Count Based on Institutional MoUs-SOW v18.0 (April 2015)

	Total Ph.D. Authors	Faculty	Scientists / Post Docs	Ph.D. Students
U.S. Institutions Subtotal	73	38	35	32
Non-U.S. Institutions Subtotal	64	37	27	81
Total U.S. & Non-U.S.	137	75	62	113

Summary of changes over the last six months:

- US Institutions: the number of Faculty increased by 3, Scientists / Post Docs increased by 3, and Students decreased by 6.
- Non-US Institutions: number of Faculty decreased by 1, Scientists / Post Docs decreased by 1, Students decreased by 4.

IceCube M&O Computing Infrastructure Upgrade - 2014/2015

The following list (Table 4) includes the major purchases for the 2014/2015 upgrades of the South Pole System (SPS), South Pole Test System (SPTS), UW Data Center, UW Data Warehouse and networking equipment that are funded by IceCube M&O Common Fund.

Table 4: Computing Infrastructure Upgrade - 2014/2015

Sub System	Item	Description	Qty	Unit	Total \$
Data Center	Servers	GPU SuperMicro 4027GR-with 8x GTX 980 + Warranty	32	ea	\$427,096
		Blade center enclosure M1000E (16 PowerEdge M620 servers)	1	ea	\$89,475
		4 years Maintenance for thr Blade center enclosure M1000E (16 PowerEdge M620 servers)	1	ea	\$14,657
		Three year Vmware maintenance contract .	1	ea	\$6,599
		10 GB Stacking Modules and 4 * 2.5" 600 GB SAS DRIVES	1	ea	\$4,092
Data Center Total					\$541,919
Data Warehouse	Disk Storage	PowerVault MD1200 with 12 4TB NL+ Warranty	832	TB	\$96,216
		Two years warranty extension for 798 TB disk system	1	ea	\$79,012
		PowerEdge R515 with 12 4TB drives + Warranty	6	ea	\$42,706
		AMS2500 Storage - Service Plan and License	12	months	\$25,390
		Supermicro SC847 server with 36 6TB disk drives + 3yr warranty	1	ea	\$22,254
		Disk expansion 2.5" 600 GB	4	ea	\$1,312
	Servers	Storage servers for the new Lustre filesystem + Maintenance	8	ea	\$61,696
		Meta-data servers for the new Lustre filesystem +	2	ea	\$16,225
		Support contract renewal for Dell PwerEdge R710 servers	6	ea	\$2,213
	Software	Commvault Software Standard Support Coverage	1	ea	\$16,034
	Tapes	Support for 5x9xNBD LTO-4 DFA - years 4-5	5	ea	\$11,464
		Onsite service years 4-5 5x9xNBD	4	ea	\$9,862
		LTO-4 and LTO-5 Tape Media	155	Tapes	\$5,895
Data Warehouse Total					\$390,279
Networking	Networking	Cisco SMARTNet Annual Maintenance	1	ea	\$29,330
		QLogic QLE2562 host network adapter - 8Gb FC x 2	8	ea	\$10,579
Networking Total					\$39,909
South Pole Systems	Labor	Winter Overs and 50% Run Coordinator	12	months	\$442,814
	DOMHubs	iBootBar IEC 20A + spares and accessories	30	ea	\$13,388
	Disk Storage	iBootBar IEC 20A + spares and accessories		ea	\$5,940
	Servers	Dell R720 Server	1	ea	\$8,991
		8 * 6GB DUAL PORT + 6* 3TB SAS 6GBPS HOTPLUG	14	ea	\$2,760
South Pole Systems Total					\$473,892
South Pole Test Systems	DOMHubs	DOMHub upgrade single-board computers (SBCs) for lab hubs	10	ea	\$11,133
South Pole Test Systems Total					\$11,133
Grand Total					\$1,457,132