

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

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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

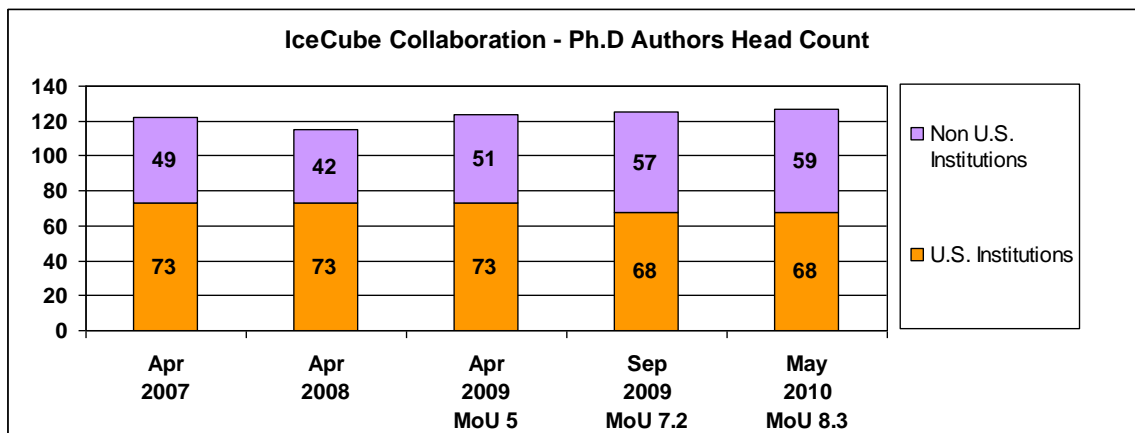
The following table summarizes the Common Fund (CF) contributions for the first three years of IceCube Maintenance and Operations:

**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 4-7 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 2010-2013.

**Table 2. Planned and Actual CF Contributions (\$000)
For Years 4-7 of M&O, April 1st, 2010 – March 31st, 2014**

	PhD. authors May '10	Year4 2010 Planned	PhD. authors Apr. '11	Year5 2011 Planned	PhD. authors Mar. '12	Year6 2012 Planned	PhD. authors Apr. '13	Year7 2013 Planned
Total CF Planned	127	\$1,734	126	\$1,720	124	\$1,693	124	\$1,693
U.S. Contribution	68	\$928	69	\$942	67	\$915	69	\$942
Non-U.S. Contribution	59	\$805	57	\$778	57	\$778	55	\$751
		Actual		Actual		Actual		Actual
Total CF Contributions		\$1,726		\$1,723		\$1,690		\$1,565
U.S. Cash Transfer		\$928		\$942		\$915		\$942
Non-U.S. Cash Transfer		\$744		\$733		\$776		\$592
Non-U.S. In-Kind		\$54		\$47		\$75		\$58
Difference (Actual - Planned)		\$-8		\$3		\$-3		\$-101

Actual Common Fund contributions in 2013 are currently \$101k less than planned. The final 2013 contributions are underway, and it is anticipated that all of the planned contributions will be fulfilled. 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 121 in October 2012 to 124 in April 2013, to 127 in October 2013 (U.S. increased by 2, Non U.S. increased by 4).

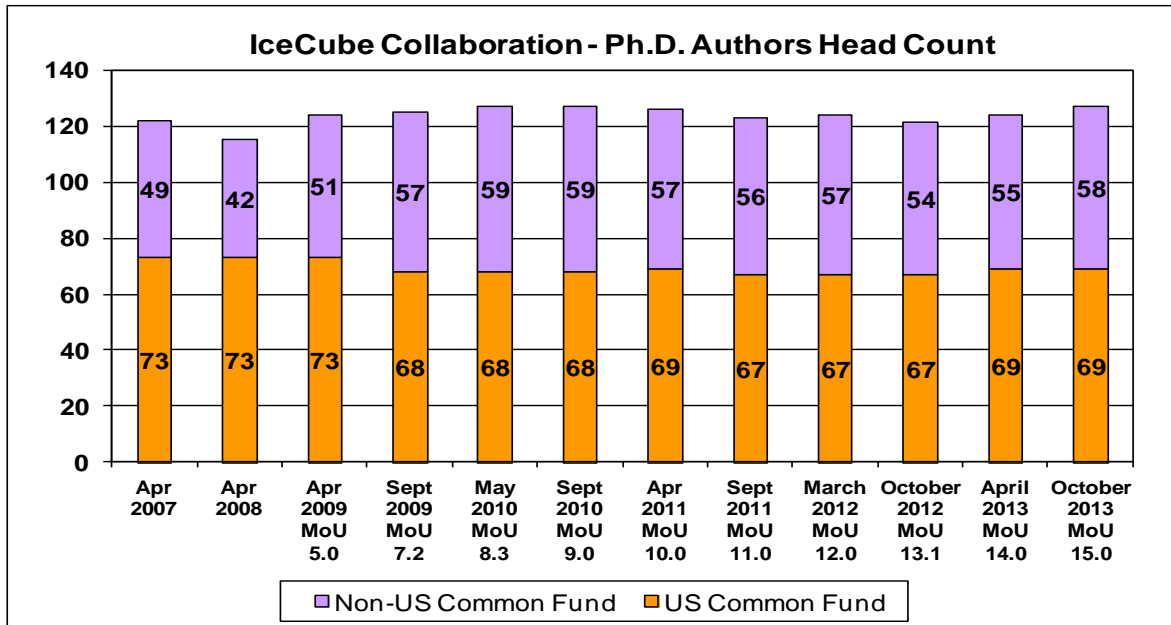


Figure 2: Ph.D. Authors Head Count Profile as of October 2013

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 v15.0 (October 2013)**

	Total Ph.D. Authors	Faculty	Scientists / Post Docs	Ph.D. Students
U.S. Institutions Subtotal	69	34	35	30
Non-U.S. Institutions Subtotal	58	33	25	75
Total U.S. & Non-U.S.	127	67	60	105

Summary of changes over the last six months:

- US Institutions: the number of Faculty decreased by 1, Scientists / Post Docs increased by 1, and Students increased by 4.
- Non-US Institutions: number of Faculty increased by 1, Scientists / Post Docs increased by 2, Students increased by 2.

IceCube M&O Computing Infrastructure Upgrade - 2012/2013

The following list (Table 4) includes the major purchases for the 2012/2013 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 - 2012/2013

System Upgrade	Item	Description	Quantity	Total
South Pole System	Tape	LTO4 cartridges	600 units	\$14,024
	Servers	Server upgrade	51 units	\$327,556
		Server upgrade maintenance	51 units	\$14,553
	Networking	Catalyst Network Modules & SFP	3 units	\$6,571
	DOMHubs	Disk Storage	840 GB	\$5,000
		Hard Drives and Carriers	105 2TB	\$23,766
		Power Supply and DIN rail	30 spare units	\$12,920
		Single board computers	120 SBC's	\$60,000
	Misc	Firewall upgrade	2 units	\$6,372
		UPS (incl. network cards)	40 units	\$39,799
		Workstations	9 units	\$7,167
		Spare parts for South Pole System	77 Disks	\$24,651
		Remote console KVM	2 units	\$13,993
South Pole System				\$556,371
South Pole Test System	Servers	Server upgrade	22 units	\$143,126
		Server upgrade maintenance	22 units	\$6,534
	Networking	UPS (inc network cards)	3 units	\$5,382
South Pole Test System				\$155,043
Data Warehouse	Disk	Cyberinfrastructure disk increase	30TB	\$7,564
		Disk upgrade and expansion	1292 TB	\$379,961
		Disk upgrade and expansion maintenance	1292 TB	\$66,516
		Hard Drives for Near-Line storage system	430 TB	\$21,928
	Tape	LTO5 cartridges	80 units	\$4,752
		Maintenance LTO4 drives	5 units	\$19,193
	Misc	Google search appliance upgrade		\$38,000
Data Warehouse				\$537,915
Networking Equipment	Networking	Networking hardware/software maintenance		\$30,172
		Network adapters	8 units	\$3,752
Networking Equipment				\$33,924
UW Data Center	Servers	Miscellaneous Servers	1 unit Dell R720	\$6,493
		VMWare Maintenance		\$10,445
		Servers	18 Servers	\$168,212
	Software	Data Agent For Linux Server	6 Linux data agents	\$2,820
		CommVault Software maintenance		\$29,272
	Misc	UPS / batteries	7 units	\$12,559
UW Data Center				\$229,802
GRAND TOTAL				\$1,513,054