

IceCube Project Monthly Report – May 2009

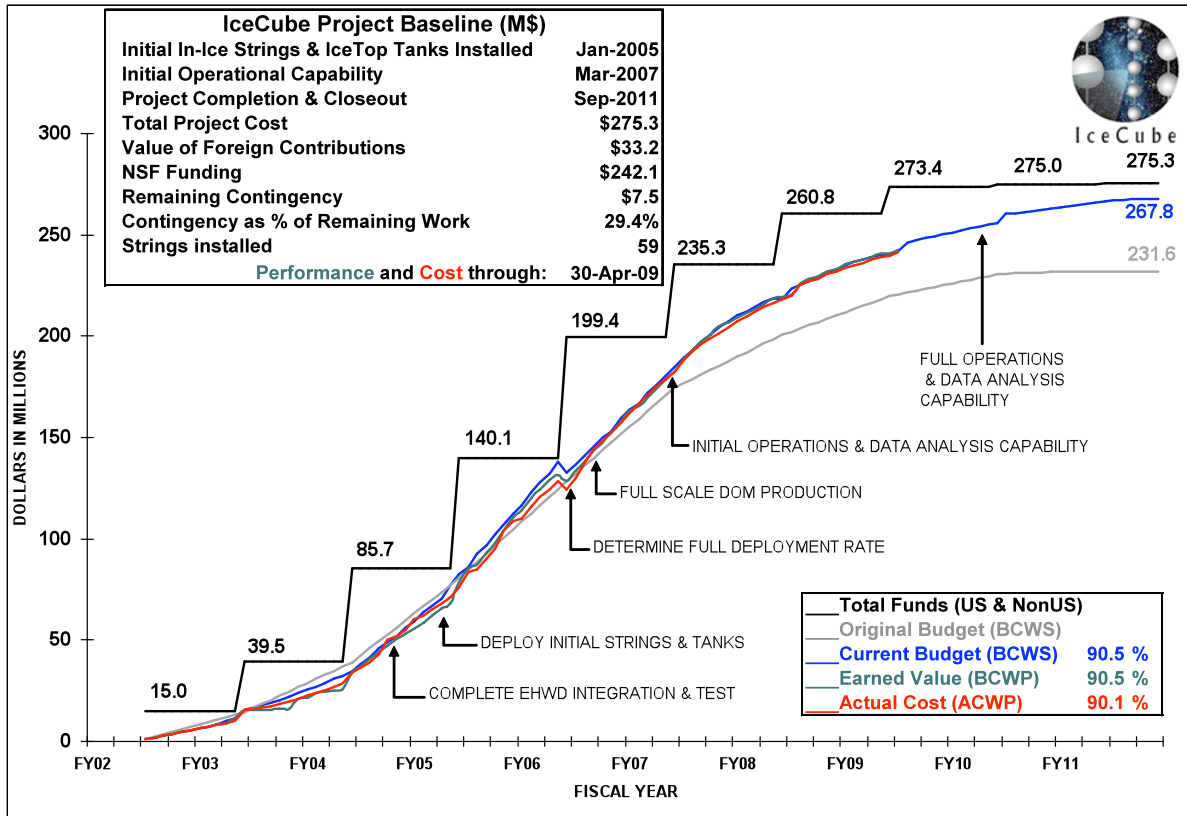
Accomplishments

- The IceCube 59 string run (IC59) began on May 20, 2009. The new run includes many improvements to the data acquisition software. The transition from IC40 to IC59 went smoothly with no significant loss of detector uptime.
- AMANDA operations concluded on May 11, 2009.
- The IceSim Monte Carlo simulation program is mature and the task of improving performance is moving to the physics groups.
- Seasonal driller positions including alternates are now filled and the on-ice drill roster for 2009/2010 is complete. The drill test-bed in Madison was commissioned for training later this summer.
- The final batch of 180 Digital Optical Module (DOM) Readout cards (DOR cards) was shipped from Germany. This completes the DOR production.
- The overall detector uptime in May was 95.9% and the clean in-ice uptime was 87.5%.
- The closeout of the previous project year resulted in about \$0.5M returned to contingency.



The moon illuminates the walk back from the IceCube Laboratory back to the South Pole Station. Picture courtesy of P. Cullis.

Cost and Schedule Performance – The project is 90.5% complete. Remaining contingency is \$7.5M and the contingency as a percentage of remaining work is 29.4%. The contingency continues to be carefully managed to ensure the successful completion of the MREFC project.

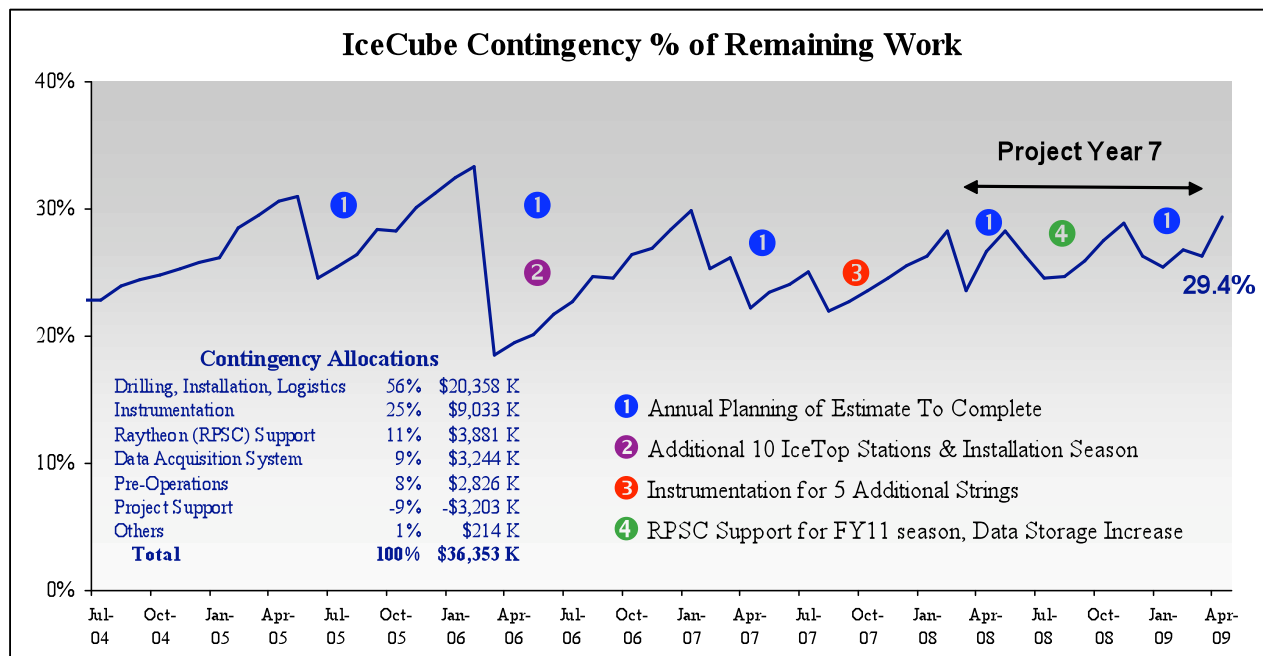


IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending: 4/30/2009										Note 1		
Cumulative (AY K\$)								At Completion Note 4	Complete (%)			
OBS Structure L2	Budgeted Cost ²		Actual Cost of Work Performed	Variance		Risk Contingency		Budgeted AY \$s	Sched	Perf	Actl Cost	
	Scheduled	Work Performed		Schedule	Cost	Assigned	% Remain Work					
Project Support	24,509.2	24,509.2	24,512.2	0.0	-3.1	102.6	3.9%	27,165.7	90.2%	90.2%	90.2%	
Implementation	38,799.3	38,799.3	38,807.0	0.0	-7.7	1,132.2	14.2%	46,758.6	83.0%	83.0%	83.0%	
Instrumentation	70,726.4	70,726.4	70,649.8	0.0	76.6	94.0	7.0%	72,073.3	98.1%	98.1%	98.0%	
Data Acquisition	33,593.3	33,593.3	33,585.4	0.0	7.9	25.7	20.9%	33,716.4	99.6%	99.6%	99.6%	
Data Systems	24,816.5	24,816.5	24,772.2	0.0	44.3	38.8	2.1%	26,707.9	92.9%	92.9%	92.8%	
Detector Comm. & Verification	19,651.9	19,651.9	19,633.9	0.0	18.0	78.4	8.1%	20,624.8	95.3%	95.3%	95.2%	
Pre Operations	2,385.9	2,385.9	2,328.8	0.0	57.1	0.0	0.0%	2,826.1	84.4%	84.4%	82.4%	
Subtotal	214,482.5	214,482.5	214,289.3	0.0	193.1	1,471.7	9.6%	229,872.7	93.3%	93.3%	93.2%	
RPSC SUPPORT	26,821.0	26,913.7	25,978.7	92.8	935.1	529.5	5.4%	36,672.2	73.1%	73.4%	70.8%	
NSF	979.6	979.6	979.6	0.0	0.0	17.0	6.0%	1,263.0	77.6%	77.6%	77.6%	
Total	242,283.1	242,375.8	241,247.6	92.8	1,128.2	2,018.2	7.9%	267,807.9	90.5%	90.5%	90.1%	
CONTINGENCY								7,485.6				
IceCube Total	242,283.1	242,375.8	241,247.6	92.8	1,128.2	2,018.2	6.1%	275,293.5	90.5%	90.5%	90.1%	

Notes: 1 Incorporates approved baseline changes.
2 Total Budget at Completion includes 3,522 K non-US contributions over the amount in the post Hartill III baseline.
3 Budgeted contingency is: 29.4% of the Budgeted cost of work remaining.
4 The BAC (Budget At Completion), reflects PY8-10 detailed Baseline Review.
5 Contingency is assigned based on the Remaining Work, a bottom-up risk assessment, management judgement, and cost

The schedule variance at the end of April 2009 is a favorable \$92.8K due to RPSC's schedule performance during the FY08/09 Pole Season. The cost variance at the end of April 2009 is a favorable \$1,128K. RPSC positive cost variance of \$935K (last month was \$992K), is due to lower than planned labor and on-ice support charges in FY2008 and 2009.

Contingency Status and Plans — during the month of April 2009, the total Remaining Contingency increased from \$7.0M to \$7.5M as a result of Baseline Change Request IC0147 - PY7 Closeout and a return of \$540K unused PY7 budget to contingency.



No.	Description	Approval Date	Total Baseline	Allocated Budget	Allocated Budget Change	Remaining Contingency	Budgeted Cost of Work Remaining	Contingency % of Remaining Work
NA	Status as of February 2009		275,293	267,973	0	7,321	27,356	26.8%
CR142	Add NPX SE effort to 1.9.3.2	04/01/09	275,293	268,271	298	7,022		
NA	Status as of March 2009		275,293	268,271	0	7,022	26,650	26.4%
CR145	UCB Fringe Rate Correction	04/23/09	275,293	268,321	50	6,972		
CR146	PSU Additional Effort in PY7	04/23/09	275,293	268,348	27	6,945	25,432	
CR147	PY7 Closeout	05/21/09	275,293	267,808	-540	7,486	25,432	
NA	Status as of April 2009		275,293	267,808	0	7,486	25,432	29.4%

During the month of April 2009, the Contingency % of the cost-to-go has been increased by 3% from 26.4% to 29.4%.

<i>Risk Assessment & Potential Contingency Adjustments</i>	
Item	Estimate (\$K)
Contingency likely to be required to mitigate technical, cost and schedule risks associated with the approved scope of work. Risk assessments are made at WBS-Level 4 to determine the value of the risk exposure as a percent of the cost of work remaining.	\$2,018
Pre-Operations for additional capacity to the data storage and network systems both at the South Pole and in the Northern Hemisphere, and for extending software development efforts.	\$1,000
RPSC FY08-FY11 Baseline Re-Plan including the FY08 Closeout and FY10 Fuel cost savings	-\$650
Cost of the limited amount of remaining instrumentation for an 86-string detector, 80 strings from the original proposal plus the six deep core strings financed by European partners. The additional instrumentation is 5 surface-to-DOM cables and ~100 DOMs	\$1,350
RPSC estimate of base cost to support the installation of six strings during the 2010/11 drilling season. The current RPSC baseline already includes support for 80 strings.	\$1,340
The cost to retro IceCube equipment/materials from the South Pole at the end of the project in FY2012. This is a conservative estimate based on RPSC's Rev 8 Budget.	\$1,050
Potential cost to retain experienced key personnel in PY9 to ensure the success of the last drilling and installation season and the timely completion of the construction project.	\$700
Potential additional Fuel Cost exposure during the last season of drilling (FY2011)	\$450
Total	\$7,258
Available Contingency as of Apr 30, 2009	\$7,486K

Drill Operation and Installation – At the South Pole monitoring of hose heating and the do-not-freeze modules, which includes the DCC and TOS Units, continues. All systems continue to function with no problems.

Seasonal driller and alternate positions have been filled and the on-ice drill roster completed. Driller and Deployer training is scheduled for July 25th through August 8th in Madison. During training, all drillers and deployers will undergo extensive safety training. The test-bed at the Physical Sciences Laboratory, located at the UW-Madison, has been de-winterized and commissioned for training.

Procurements and repairs for equipment such as the Enhanced Hot Water Drill and snowmobiles are underway or have been completed.

Detector Commissioning and Verification – We had some startup issues running verification algorithms on IceCube 59 (IC59) data. The main problem was the inability of the Processing and Filtering (PnF) disk to serve the verification client quickly enough, so we are currently running on 1-in-5 files. This issue is being addressed by Erik Blaufuss at the University of Maryland, and Steve Barnett and others in the IT group in Madison. We have added the average

waveform for each DOM to the verification-monitoring web page. There is no test yet performed on this information, but that is under study. Long-term studies of IC40 data have not yet begun but will be soon.

Ice shear flasher data has been taken and is still being analyzed. Plans are being made for a complete set of ice property measurements for the deepest ice.

Data Acquisition Hardware and Software – The final batch of 180 DOR cards have been shipped from Germany. This completes the DOR production and provides sufficient hardware for 86 strings plus sparing of 10%. When the DOR cards arrive in Madison, they will be integrated into DOMHubs which will ship to South Pole in late September.

On May 20th, 2009 at 03:42 UTC the IC59 string run period began with run # 113823. The new run includes many improvements on the data collection mode of the array and includes the following:

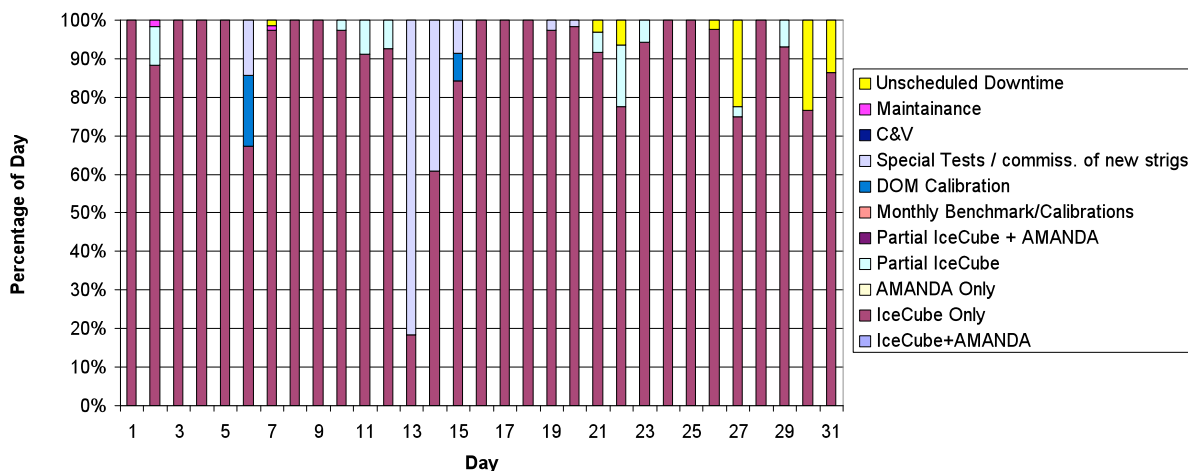
- Inclusion of the DeepCore strings and special triggers dedicated to low-energy physics
- The soft local coincidence (SLC) mode of IceCube where isolated hits are no longer completely suppressed. The waveforms are dropped, but the hit comes to the surface with a time and rough amplitude measure and can be built into events. These hits are currently not used for triggering and are not used in the online event filtering, however it is foreseen that they will be used at high levels of the analysis to reject background and generally improve the quality of event reconstruction.

The new DAQ code release is called Cancun and has been running with only a slightly degraded stability due to higher data volumes in the DAQ components and an elevated rate of hardware failures. The data volume out of the DAQ is now approximately 14 MB/sec for the main physics stream, which is more than double that of the IC40 run. The DAQ group is developing methods to reduce this raw data rate to alleviate loading of downstream processing facilities.

IceCube Maintenance and Operations

Detector Up Time	95.9%
IceCube Clean Run Up-Time not including AMANDA Array	87.5%
Unscheduled Downtime	2.34%
Events from DAQ	3.76 billion

IceCube Detector Operation for May 2009

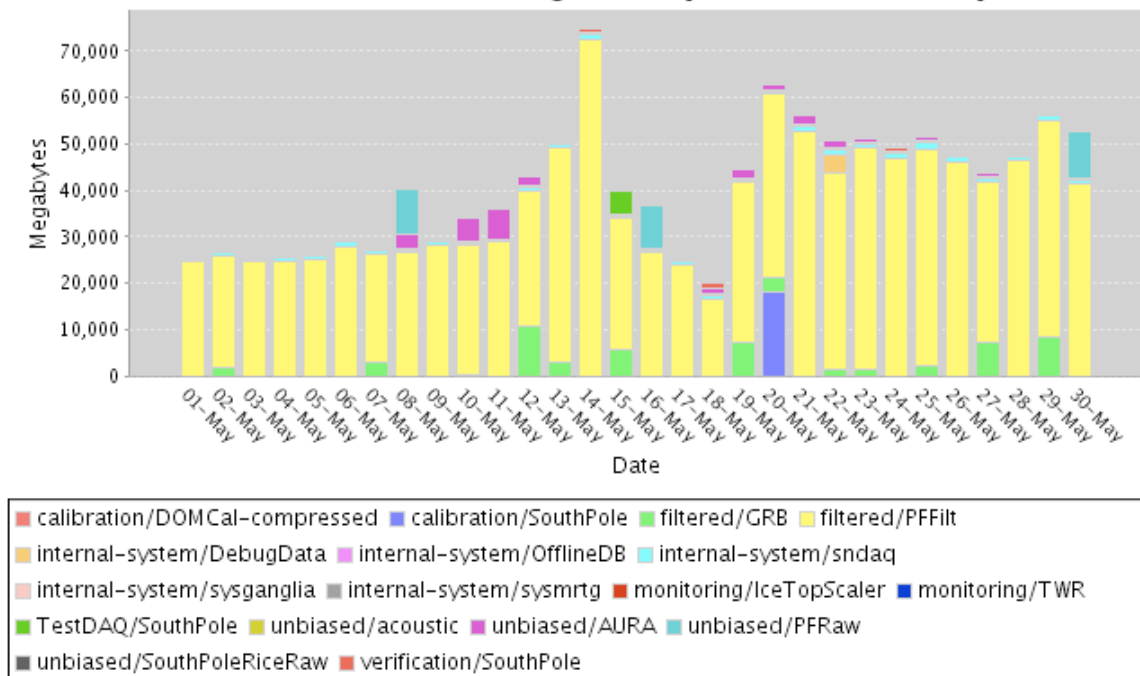


The IceCube detector ran and took data without major issues during May 2009. The overall detector uptime was 95.9% and the clean in-ice uptime was 87.5%. On May 20th we transitioned from IC40 to IC59 physics data-taking. The transition went smoothly. However, since the transition there has been a pair of instances of significant unscheduled downtime (see graph). In both occasions operators did not get automatic notification of the stop of data flow. Planned fixes and improvements to the Live experiment control software and other levels of system monitoring and alert reporting should address the problem in June. Most of the lost clean time was dedicated to long test runs of the soft local coincidence data collection in preparation for IC59 physics running. Another milestone this month was the turning off of the AMANDA array in preparation for decommissioning.

Data Handling – South Pole systems in the IceCube Laboratory (ICL) began IC59 physics operation last month on May 20th. The transition from IC40 to IC59 went smoothly with no significant loss of detector livetime. The figure below shows the daily satellite data transfer rates. Notice the higher average satellite transfer rate after the transition to IC59 on May 20, 2009.

The data warehouse upgrades were completed in March and April. The migration to the new data/exp and data/sim with improved file system performance are working well and production data processing and production simulation are running smoothly.

TDRSS Transfers Starting 01 May 2009 For 30 Days



Online & Offline Filtering, Software & Database – The major milestone for last month was the start of Online Filtering for IC59 that began on May 20, 2009 representing the full transition from IC40 to IC59 running. The major work in online filtering and software systems was:

1. Final development and deployment of IC59 online filter and triggers.
2. IceTray V3 development work is moving forward. This includes work to separate some core software for sharing with the KM3Net collaboration, which has adopted the IceTray framework for the data analysis system.

Offline Level 2 filtering and high level reconstruction of the IC40 data continued to make progress last month. Continued mass production of high level reconstructions at the IceCube datacenter at UW is going well.

Simulation – The IceSim Monte Carlo simulation program is mature now, and development has been focused on improved performance and fine tuning. This task is moving to the physics groups with the focus of the central project on program maintenance and production running.

Education and Outreach – We assembled a collection of images of the IceCube Neutrino Telescope that were created using a program called SketchUp. The images are available in a variety of formats suitable for either print or projection. The basic file can easily be changed to accommodate different views or additions. We presented these images and instructions for using SketchUp at the May collaboration meeting.

An annual review of IceCube E&O activities prepared for the May NSF Review is located here

<https://docushare.icecube.wisc.edu/dsweb/Get/Document-49477/Update> of E&O.doc

Preparations are underway for a variety of summer programs. The PolarTrec/Knowles Science Teaching Fellows will spend some time at UW River Falls and then travel to Madison to view deployer training. One of the teachers will be trained and will go to the South Pole next season. UW River Falls has also received a supplemental award from the NSF to participate along with U. Delaware in an international project to have undergraduates join a voyage in November on a Swedish ship that will bring IceTop tanks to the South Pole via Argentina. DESY is providing QuarkNet cosmic ray detectors for the voyage.

Quality Assurance and Safety – There is nothing to report.

The monthly reports are posted at [IceCube Monthly Reports](#).

Meetings and Events

NSF IOFG Meeting in Brussels

June 24, 2009

Driller Training at UW-Madison

July 25 – August 7, 2009

Collaboration Meeting at Humboldt University

September 21 –25, 2009

Joint Software Meeting with Antares/KM3Net

September 25 – 27, 2009