Accomplishments

- On-ice drilling and installation activities were completed at the South Pole with the installation of 19 strings over the course of the 2008/2009 field season.

- Repair work was completed on the Enhanced Hot Water Drill equipment and damaged components were shipped back from the South Pole for repair.

- A comprehensive equipment inventory list was completed containing maps and a photo-linked master spreadsheet.

- Verified the timing performance and calibrated the geometry of the 19 newly deployed strings for initial data taking of IC-59.

- Data collection in February achieved an overall 93.9% uptime and 84.3% in-ice clean run, which is lower than normal but high considering the amount of site activity and special runs/configurations during the last two weeks of the pole season.

The End-of-Summer IceCube “Night Shift” takes a break from detector commissioning activities in B2 and the ICL for a group photo at the Geographic Pole. (Photo: John Jacobsen)

Back: John Richards, Tilo Waldenmaier, Dave Glowacki, Jan Lunemann, Erik Verhagen
Middle: Anna Franckowiak, Stephanie Hickford, Joanna Kiryluk
Front: John Jacobsen, Timo Griesel
Cost and Schedule Performance – The project is 89.3% complete versus the plan of 89.2% complete, as measured using earned value techniques. Remaining contingency is $7.3M and the contingency as a percentage of remaining work is 25.5%. The contingency continues to be carefully managed to ensure the successful completion of the MREFC project.
The schedule variance at the end of January 2009 is a favorable $294K. The variance is mostly related to RPSC’s schedule performance. The earned value cost variance at the end of January 2009 is a favorable $1,435K (a decrease from the $1,577K reported at the end of last month). RPSC positive cost variance has slightly increased to a level of $838K due to lower than planned labor and On-Ice support charges in FY2008 and FY2009. The $548K favorable variance in Implementation was the result of lower training costs than planned and a labor ramp down ahead of schedule. The -$240K variance in Instrumentation is temporary pending CR approval by the end of this project year.

**Contingency Status and Plans** — Four changes were approved in January 2009 resulting in a $452k increase in the Pre-Operations budget. Contingency is now 25.5% of the cost-to-go.
<table>
<thead>
<tr>
<th>Item</th>
<th>Estimate ($K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 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.</td>
<td>$2,258K</td>
</tr>
<tr>
<td>2. Pre-Operations for additional capacity enhancements to the data storage and network systems both at the South Pole and in the Northern Hemisphere, and for extending software development efforts.</td>
<td>$500K</td>
</tr>
<tr>
<td>3. RPSC FY08 Closeout. The closeout is expected to return of RPSC authorized budget to IceCube contingency resulting from lower labor use and reduced support charges.</td>
<td>-$400K</td>
</tr>
<tr>
<td>4. 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</td>
<td>$1,350K</td>
</tr>
<tr>
<td>5. 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.</td>
<td>$1,340K</td>
</tr>
<tr>
<td>6. Project Year 7 Closeout for all WBS items excluding RPSC and the ANG. The closeout will return authorized budget to IceCube contingency due to lower drilling and travel costs and staffing ramping down ahead of plan.</td>
<td>-$300K</td>
</tr>
<tr>
<td>7. The cost to retro IceCube equipment/materials from the South Pole at the end of the project in FY2012. This is a conservative estimate.</td>
<td>$825K</td>
</tr>
<tr>
<td>8. 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.</td>
<td>$700K</td>
</tr>
<tr>
<td>9. Potential cost exposure should a full FY2011 drilling season be required resulting in the need to send UW personnel to the South Pole in FY2012 to dismantle the drill equipment/materials and prepare the equipment for retro out of South Pole.</td>
<td>$450K</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$6,723K</strong></td>
</tr>
</tbody>
</table>

### Available Contingency as of Jan 31, 2009

| **$7,321K** |

**Drill Operation and Installation** – Final repair work was completed on the Enhanced Hot Water Drill (EHWD) equipment (winterization and relocation was completed in January). All on-ice drilling and installation activities were completed and closed. A comprehensive equipment inventory with maps & photo-linked master spreadsheet was developed. A preliminary activity list was captured for off-ice schedule development. Equipment parts and spares lists were generated, and procurements begun. Damaged components of the EHWD were retrograded for repair. All drill personnel, except for two, left the South Pole by February 3rd. For the remainder of February most personnel were in transit or taking well-deserved vacation time. Drilling and deployment data analysis has begun to look at ways to improve efficiencies, troubleshoot problems encountered, and assure safety systems functioned properly.

**Detector Commissioning and Verification** – All the new strings have been verified for initial data taking by Anna Franckowiak (Humboldt/Berlin) and Stephanie Hickford (Canterbury/Christchurch). This means that, with only a few exceptions, all DOMs satisfy the timing test and their geometry is being calibrated. Higher-level verification tests have been performed on the IC59 data acquired so far, with no serious problems observed. Once more data has been taken we will run these tests rigorously and verify the new strings for physics data taking.
We had a software error on the code that runs in the north that prevented verification plots from being updated on the webpage, and as a consequence a problem with several DOMs that we could have caught fairly early on was not caught until several days later. The problem was not a serious one. We are taking steps to correct the error and prevent this from happening again.

**Calibration and Monitoring** – Phase 2 geometry constant generation commenced and will be completed in March, well ahead of schedule and well in advance of official data taking. Dawn Williams (U. Alabama) is upgrading the software to fit the geometry constants for all strings simultaneously. This will streamline the process and require less manual intervention.

Work is underway to parameterize the photonics tables (for both cascades and muons) with spline fits. This is our best shot at mitigating photonics table binning problems that give rise to depth dependences that mimic ice properties.

**Data Acquisition Hardware and Software** – The last DAQ personnel left South Pole on February 13th. As reported in the last monthly report, prior to departure they were able to run the full 59 string detector in HLC (in-ice local triggering) mode and had made successful runs of 53 strings of IceCube running in SLC mode. An attempt was made to run the full IC59 in SLC mode right before the DAQ team left Pole, however these runs failed several minutes after launch. The DAQ team is currently investigating the cause of these failures and hopes to have a solution by mid-March prior to the start of the 59 string run.

In addition to the debugging work being performed, a new release of the production DAQ (Boulevard) was deployed at Pole and is working well. It includes some fixes for flasher operations and dropped DOMs.
Data collection during February 2009 achieved an overall 93.9% uptime. The in-ice clean run uptime was 84.3%, lower than typical due to the large amount of activities and special runs/configurations during the last two weeks of the pole season and due to the incident described below were several flashers in the newly deployed strings were unintentionally left on, thus contaminating about 40 hours of physics runs with light.

**Highlights of February:**

1. Since February 1\textsuperscript{st} running with Betelnut RC4 pDAQ release: data quality is slightly affected by the increase in dropped DOMs with this release (about one out of three runs have a dropped DOM). This is being corrected.
2. Successful commissioning and running of the IC59 configuration including IceTop in hard-local-coincidence mode.
3. On February 25\textsuperscript{th} three hours of detector down-time were caused by the current experiment control program (anvil) crashing. Therefore, no alert pages were produced. Once the Live system comes on line with the IC59 run (April 1\textsuperscript{st}) this weakness should disappear.
4. Also on February 25\textsuperscript{th} a special flasher run was executed using DOMs in the new deployed strings. At the end of the operation, the flashers were left on unintentionally. This affected the overall detector rate and the filter passing rates for contained/cascade events. A protocol is being developed to ensure that no such unintended data contamination reoccurs in connection with flasher operations.
5. About 3.5% of the February running time was for commissioning and verification of newly deployed strings.
Data Handling – South Pole systems in the IceCube Laboratory (ICL) began IC-40 physics operation in April 2008. Operations continued through February with systems operating smoothly. The figure below shows the daily satellite data transfer rates.

The final IT infrastructure work in the ICL at the South Pole was completed in January and personnel are reading the system for winter-over technical support. The data warehouse upgrades continued in February. The migration to the new data/exp with improved file system performance was completed in mid February, and migration of data/sim is in progress. The HSM tape system library is still undergoing debugging to work out some technical problems.

Filtering, Software & Database – Filtering of IC40 data began on April 14, 2008 representing the full transition from IC-22 to IC-40 running. The Joint-Event Builder and Processing and Filter server (JEB/PnF) merging of IceCube-40 and Amanda TWR data streams continues at South Pole sending filtered data sets of about 35 GB/day or more over the satellite.

The major work in online filtering and software systems was:

1. Continued development of IC59 online filter and triggers.
2. Continued work for release of new PnF filter system at start of IC59 run. This will be the final major release of the PnF filter system and will include improved performance capable of running with the full IceCube array, improved monitoring and logging with integration into the IceCube Live system, and more robust process distribution framework for the reconstruction workers.
3. Icetray V3 development work moving forward. Anticipated release of this final version for end of project year is on schedule.

Items 1 and 2 are on schedule to make a start of the IC59 run on April 1, 2009.
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 in UW is going well. Processing of satellite filtered data for IC40 is going smoothly. Reprocess the first couple months of tape, which is required because the TWR calibrations were incorrect, is nearing final readiness. There are new filters for the low energy Amanda array proposed for this reprocessing, which are being vetted.

**Simulation** – IceSim montecarlo simulation program as such is fairly mature now, and the development has been somewhat limited to improved performance and fine tuning. This task is moving more to the physics groups with the focus of the central project on program maintenance and production running. February showed progress in montecarlo production across several of the distributed sites in the collaboration. A delay in L1/L2 processing of simulation data was resolved, and full production including filtering has begun. The filtering allows the simulated datasets to be reduced in size by an order of magnitude and now relieves pressure on the data warehouse, which was previously a bottleneck in simulation production.

**Education and Outreach** – IceCube staff attended the National Society of Black Physicists and National Society of Hispanic Physicists annual meeting in Nashville in February. Juan-Carlos Diaz-Velez presented a talk about IceCube Simulation activities at the meeting. This meeting is an opportunity to recruit REU students and potential graduate students to the IceCube project. On their way back from the South Pole Mark Krasberg and Gary Hill visited elementary schools in Adelaide, Australia. We are making arrangements for the IceCube winterovers to participate in a webcast from the South Pole in the *100 Hours of Astronomy* project of the *Year of Astronomy* on April 4th.

**Quality Assurance and Safety** – IceCube completed over 100 days on the Ice (the entire South Pole season) without an OSHA Reportable Injury or a Lost Time injury. An OSHA reportable injury is an injury requiring basic first aid treatment. A Lost Time injury is an injury where the injured party misses at least one full shift in recovery.

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

**Meetings and Events**

- Season Review Meeting at UW-Madison: March 25, 2009
- IceCube Maintenance & Operations and Endgame Proposals Due: April 1, 2009
- Spring Collaboration Meeting at UW-Madison: April 28 – May 2, 2009
- NSF Annual Review at NSF: May 6-8, 2009
- Science Advisory Committee Meeting at UW-Madison: May 20 – May 21, 2009