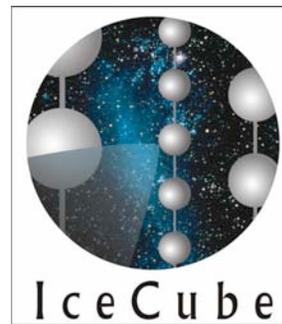
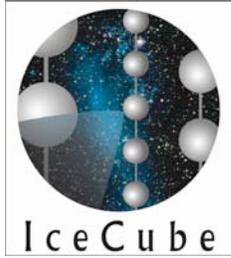


**IceCube Construction Project**  
*1st Season Experience*  
*2nd Season Goals*



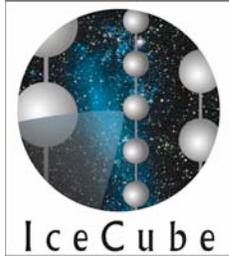
**IceCube Collaboration Meeting**  
**Berkeley**  
**March 19-23, 2005**



# Outline

- Original Goals and Status
- 1st Season Experience and Lessons
- General Strategy and 2nd Season Goals
- Conclusions

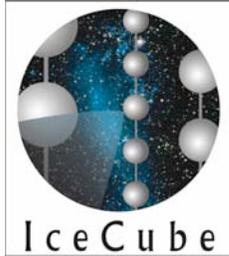




# Goals



- First Season Goals
  - Ship, assemble, and operate the Enhanced Hot Water Drill
  - Install initial instrumentation in the ice and on the surface
  - Commission and verify technical performance of the initial instrumentation
- Second Season Goals
  - Demonstrate the rate instrumentation can be installed and confirm out-year estimates (16-18 strings and 32-36 surface tanks per year)

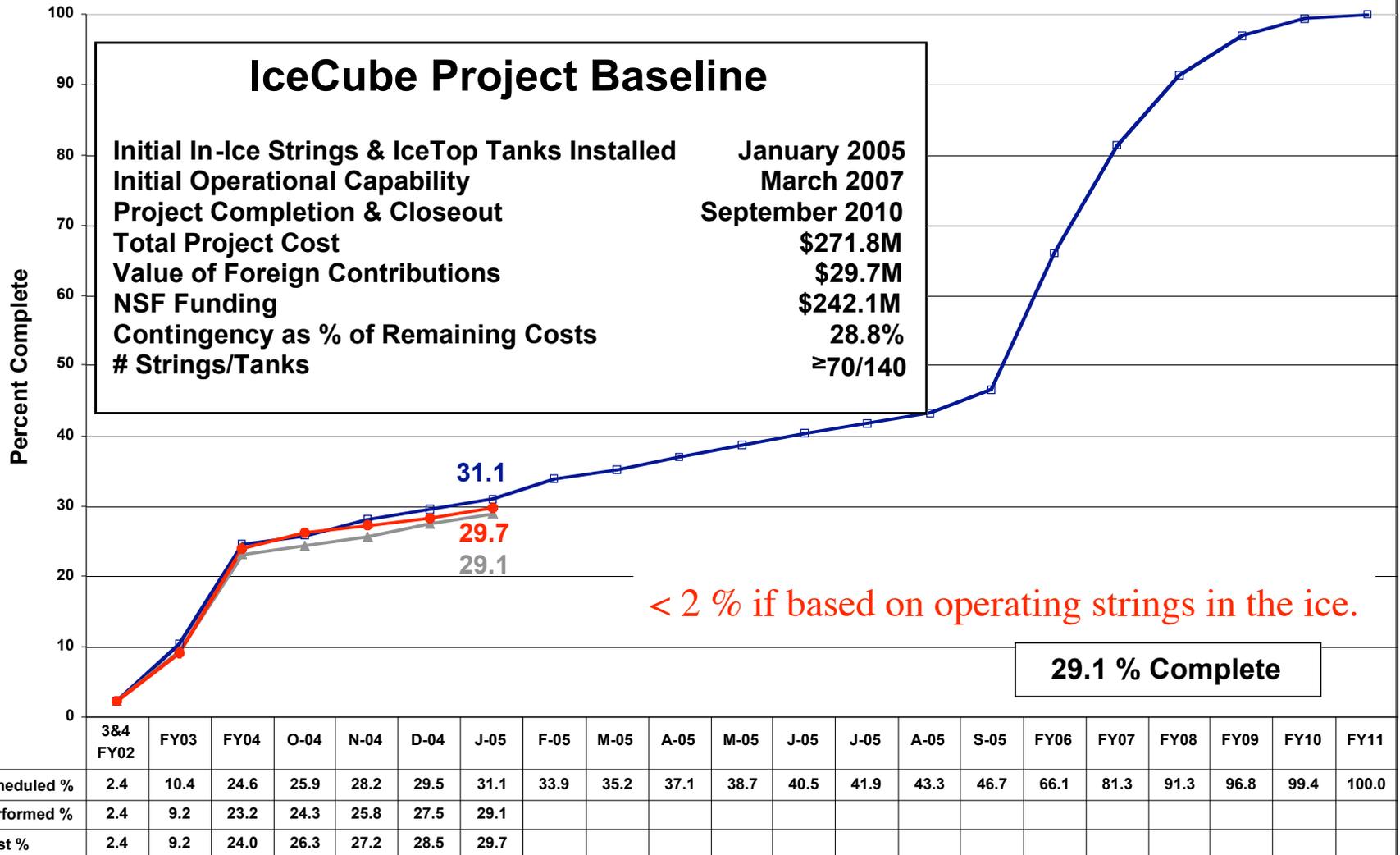


# First Season Goals



- Goals for 2004-2005 season were appropriate
  - Goal of up to four strings recognized the need to install the maximum number of strings each season and the limited time available for drilling in the first season
  - IceTop progress was excellent
- Schedule estimates were reasonably accurate
  - Cargo and population estimate were reasonable for planning purposes
  - Gained the experience necessary to develop more precise estimates for future seasons

## ICECUBE - TOTAL Cost/Schedule Performance



Fiscal Months, Quarters & Years

# Cost & Schedule Status

IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending: 1/31/2005 <sup>1</sup>											
WBS Element	Cumulative To Date (AY K\$)					At Completion (AY K\$)			Complete (%)		
	Budgeted Cost <sup>2</sup>		Actual Cost of Work Performed	Variance		Budgeted AY \$s	Latest Revised Estimate	Variance	Scheduled	Performed	Actual
	Work Scheduled	Work Performed		Schedule	Cost						
1.1 Project Support <sup>3</sup>	11,525.6	11,334.0	11,725.7	-191.6	-391.6	28,678.4	29,070.1	-391.6	40.2%	39.5%	40.9%
1.2 Implementation	12,610.0	12,590.5	13,863.9	-19.5	-1,273.4	27,757.7	29,031.1	-1,273.4	45.4%	45.4%	49.9%
1.3 Instrumentation	27,756.2	27,916.8	30,338.4	160.5	-2,421.7	90,058.5	92,480.2	-2,421.7	30.8%	31.0%	33.7%
1.4 Data Systems	6,692.9	5,431.7	5,025.6	-1,261.1	406.1	26,403.2	25,997.1	406.1	25.3%	20.6%	19.0%
1.5 Detector Commissioning & Verification	4,731.2	2,900.5	2,622.2	-1,830.7	278.3	19,584.6	19,306.3	278.3	24.2%	14.8%	13.4%
1.6 Polar Support Services	6,773.3	5,983.9	4,083.3	-789.4	1,900.6	32,135.7	30,235.1	1,900.6	21.1%	18.6%	12.7%
NSF <sup>3</sup>	405.4	405.4	405.4	0.0	0.0	1,263.0	1,263.0	0.0	32.1%	32.1%	32.1%
Sub Total	70,494.6	66,562.9	68,064.5	-3,931.7	-1,501.7	225,881.3	227,382.9	-1,501.7	31.2%	29.5%	30.1%
Management Reserve											
Total Contingency						45,889.7	44,388.1	1,501.7			
Items Outside of Approved Baseline											
IceCube Neutrino Observatory	70,494.6	66,562.9	68,064.5	-3,931.7	-1,501.7	271,771.0	271,771.0	0.0	31.2%	29.5%	30.1%

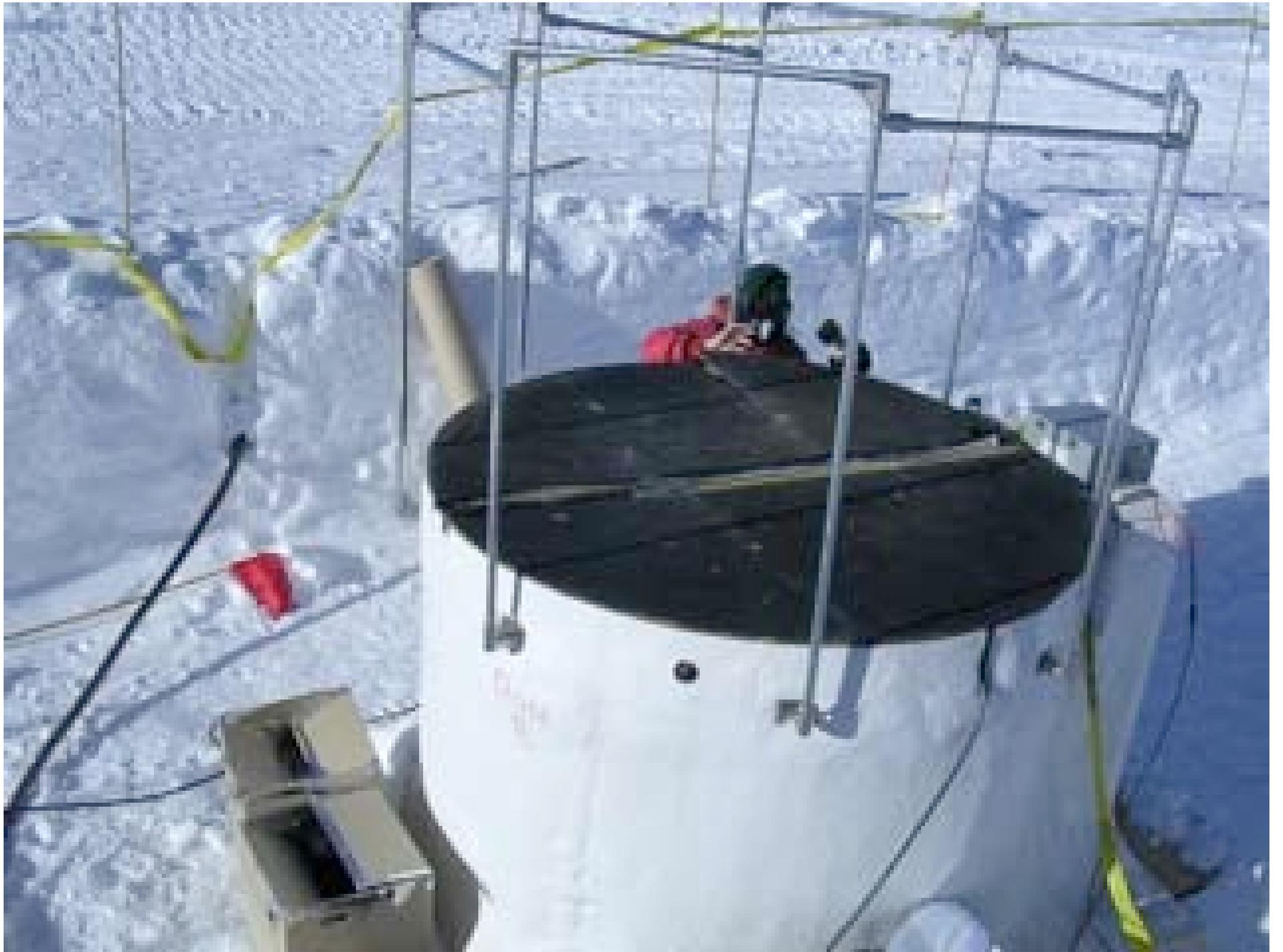
Notes: 1 Incorporates approved and currently pending baseline changes.

2 Budgeted contingency includes \$536K of currently undesignated Non-US Contributions.

3 Budgeted contingency is 26.4% of the Budgeted cost of work remaining.

28.8%  
Budgeted Contingency @ Completion as a  
percentage of the Estimate to complete

\$536.0 K Undesignated Non-US Contribution

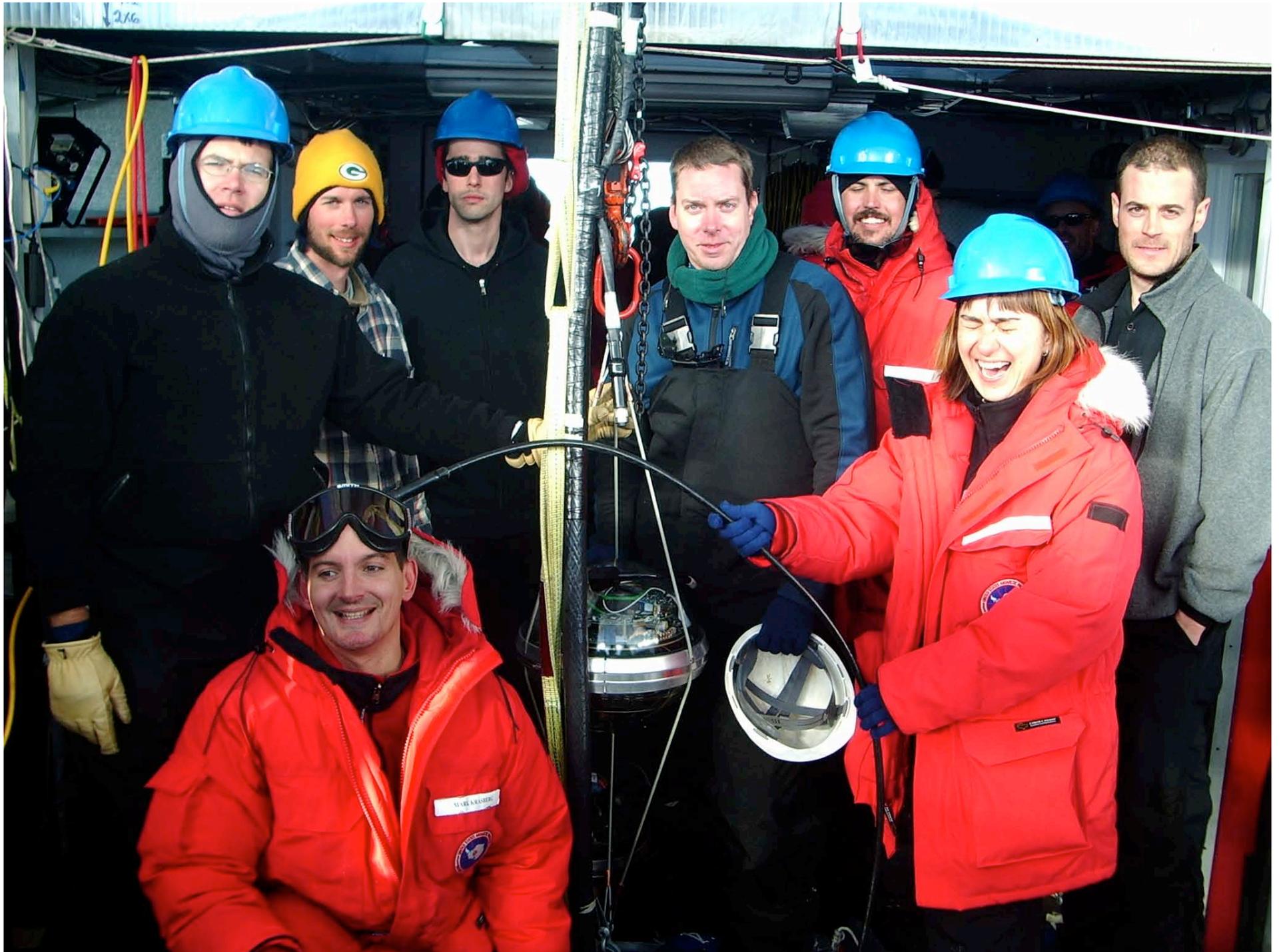










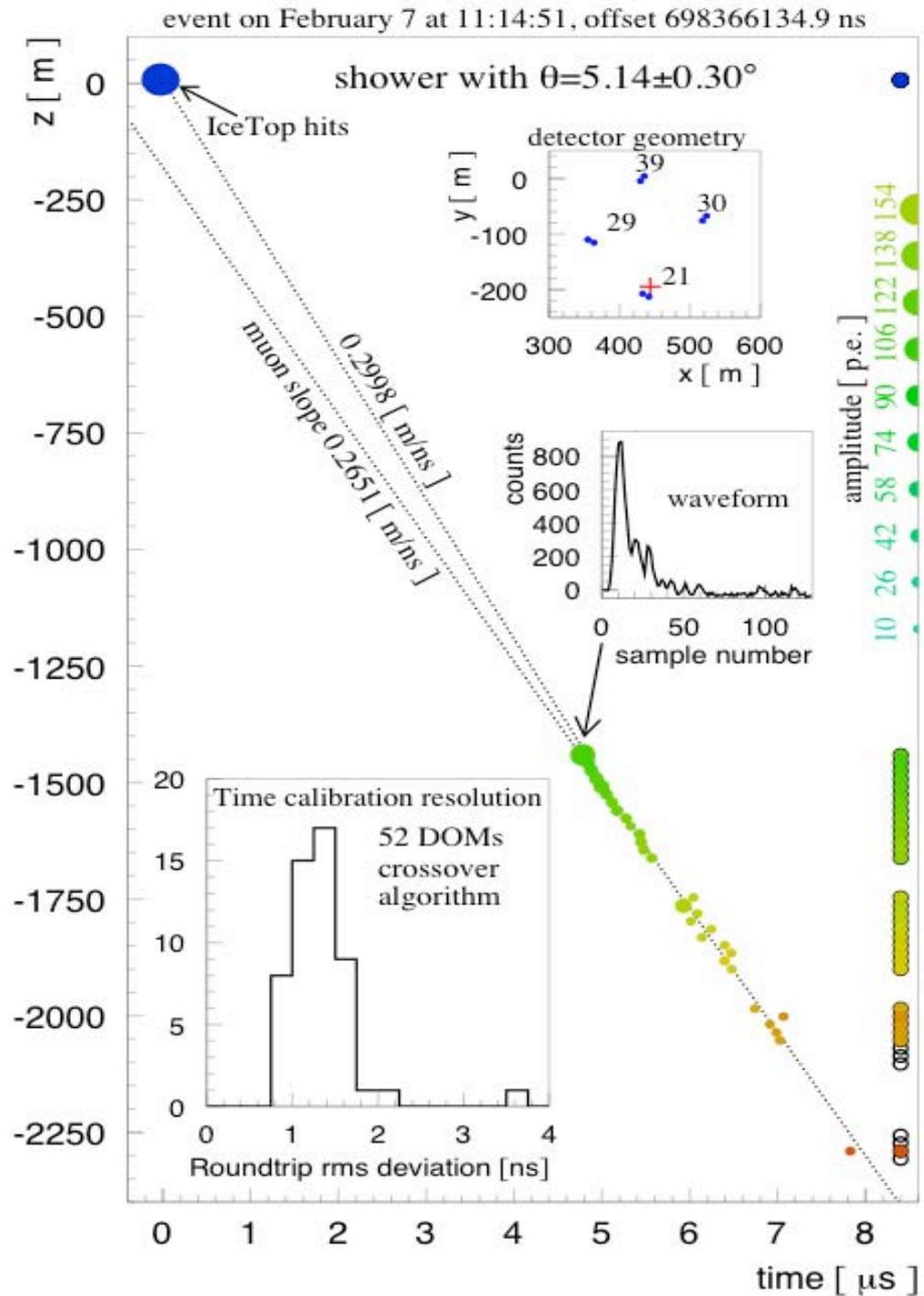


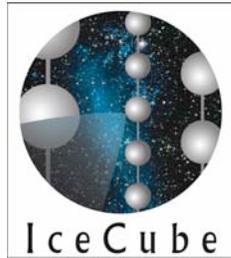






# Shower

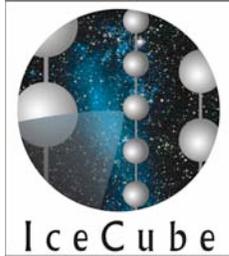




# Lessons



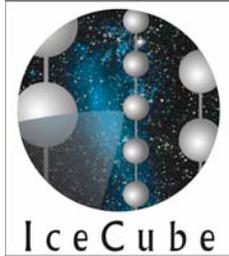
- Instrumentation production and testing is in on track
- The Enhanced Hot Water Drill is a complex system and reliability and performance improvements are required
  - Valuable experience this year
  - Significant electrical and mechanical work already underway
  - Performance issues need further study
  - Also some thinking started about improvements for 3rd season
- Experience commissioning the first string/tanks is a good reminder of the importance of preparing software for next season (10x)
- People, constructive working relationships, and commitment to work together to solve problems made the difference.



# General Strategy



- Maximizing the IceCube instrumentation installed at the Pole in each construction season
  - Installation should never be limited by the availability of instrumentation
  - Formal start of operations and analysis beginning in 2007
- Construction schedule is constrained by:
  - South Pole construction season limited to the austral summer
  - Limits on the number of flights to the Pole (cargo space)
  - Limit on the number of people that can be supported at the pole
  - Weather



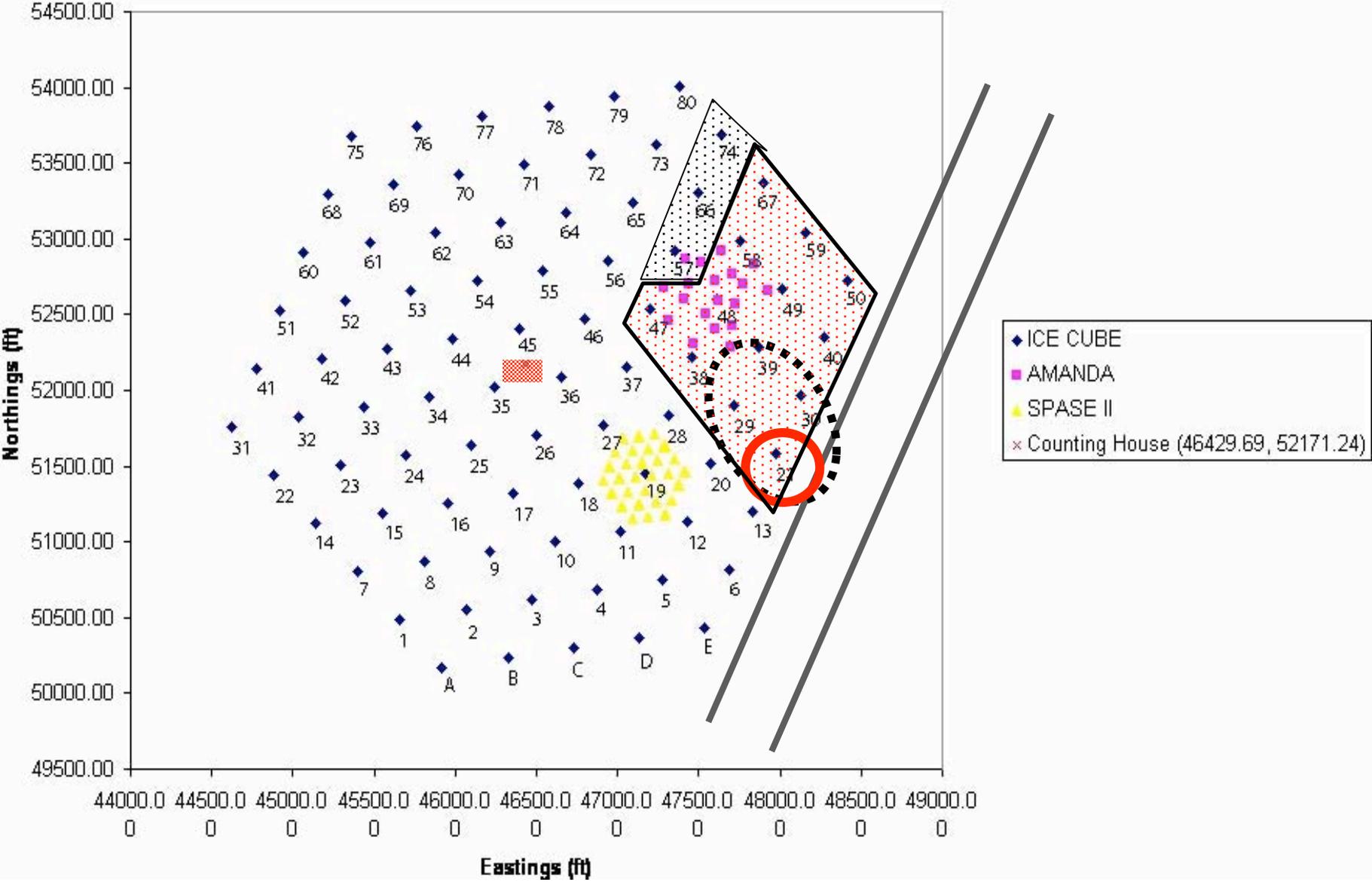
# Goals for 2005-2006 Season



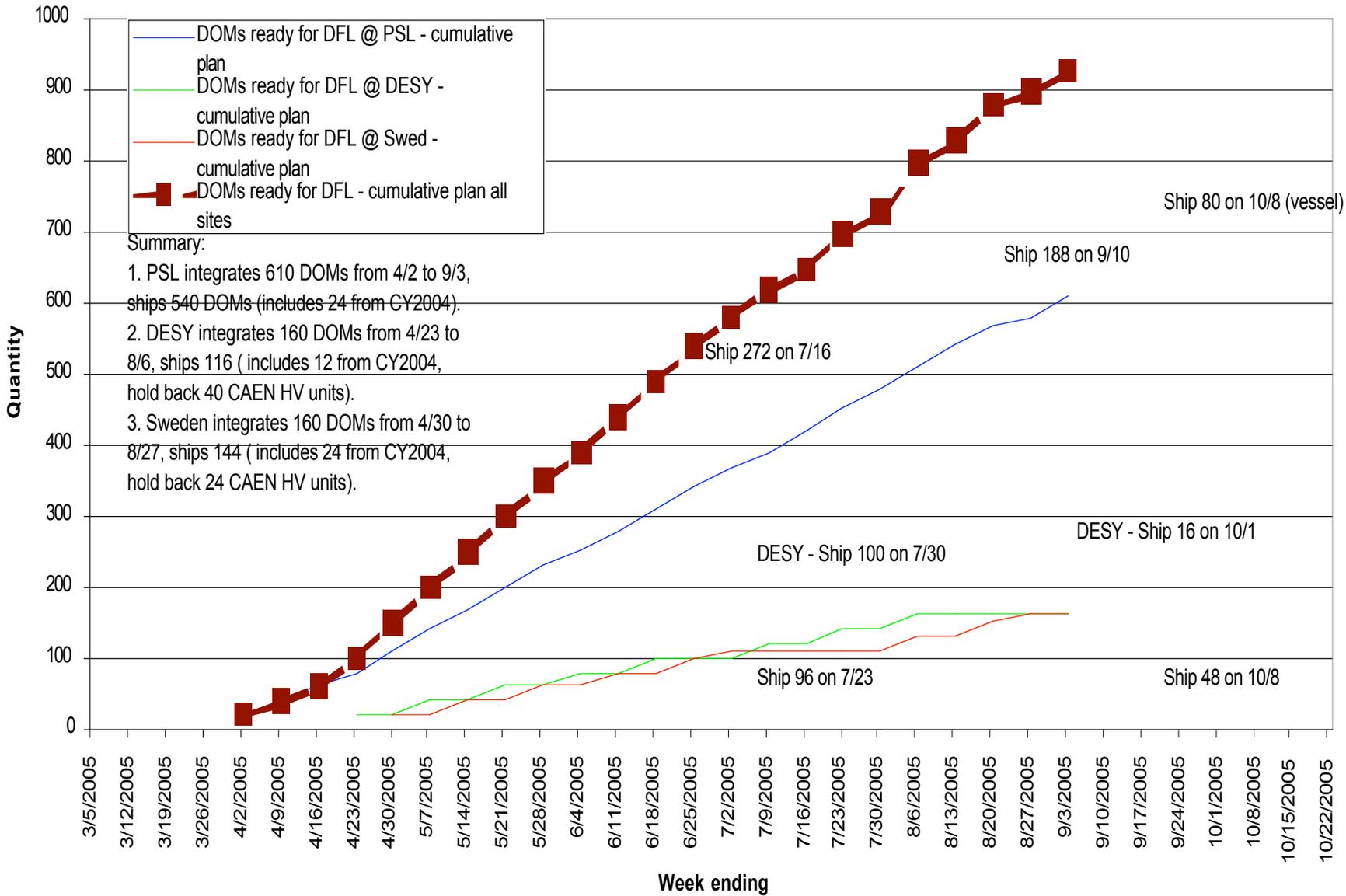
- **Strings (8 -12 strings)**
  - Plan with NSF/Raytheon for deployment of ten or more strings
  - Fabricate and ship instrumentation for twelve strings
    - Ensure instrumentation (DOMs and cables) is available at the Pole
    - Plan for winter storage at McMurdo and at the South Pole
- **IceTop (24 tanks)**
  - Install up to twelve additional surface locations
- **Commissioning**
  - Verify performance and operate instrumentation within a month

Note: Need to optimize population to reflect experience from last year including science, drilling, and use of RPSC

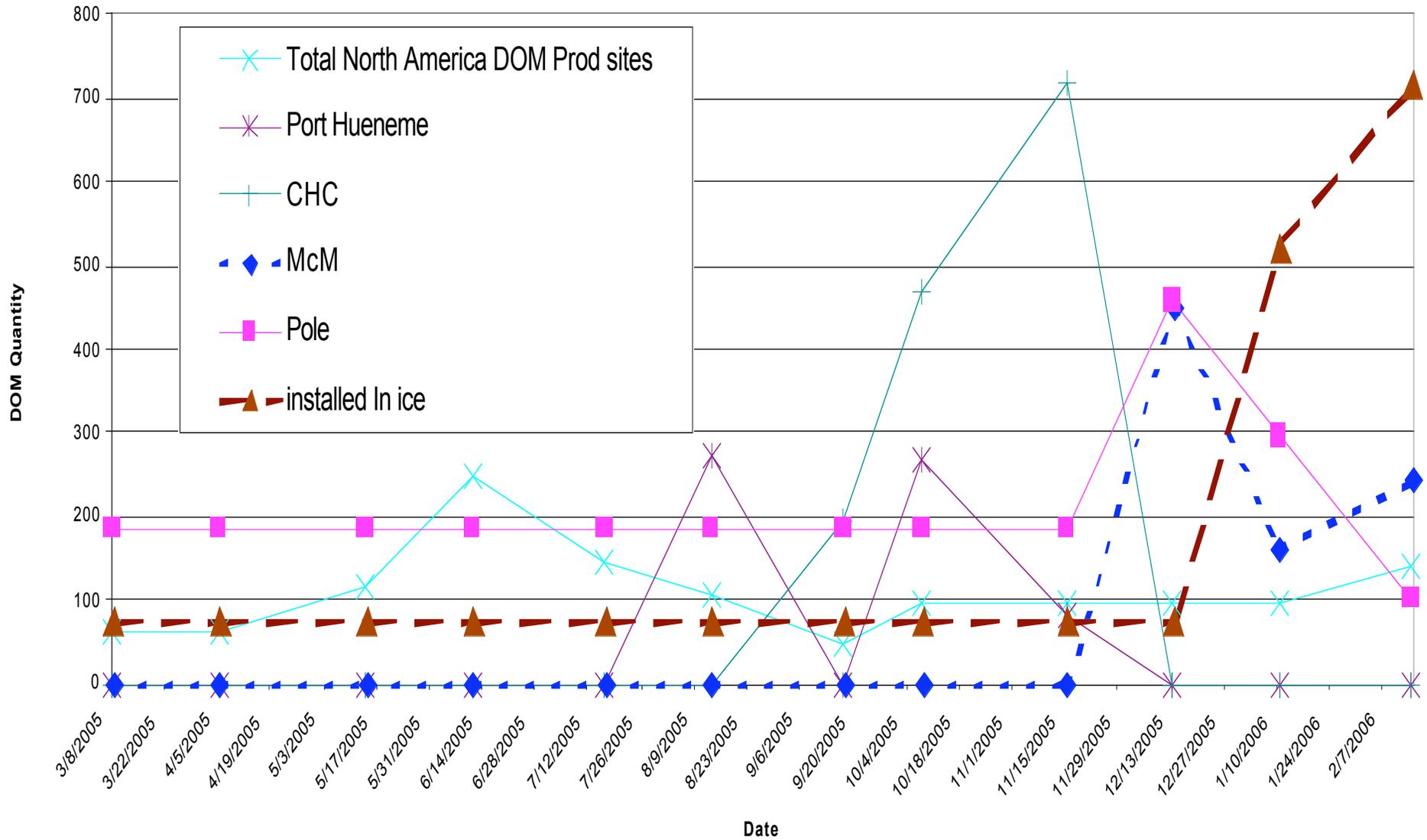
# String Locations



### IceCube DOM Production PY4 - Summary



DOM WIP snapshots PY4 - 12+ strings built, 10 strings installed at Pole



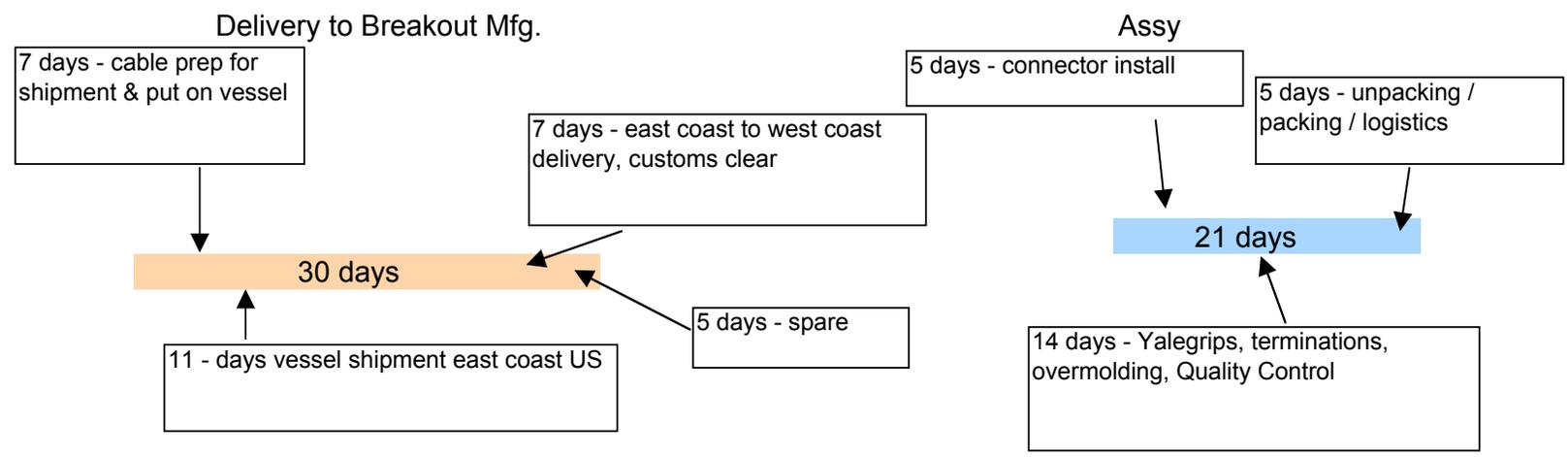
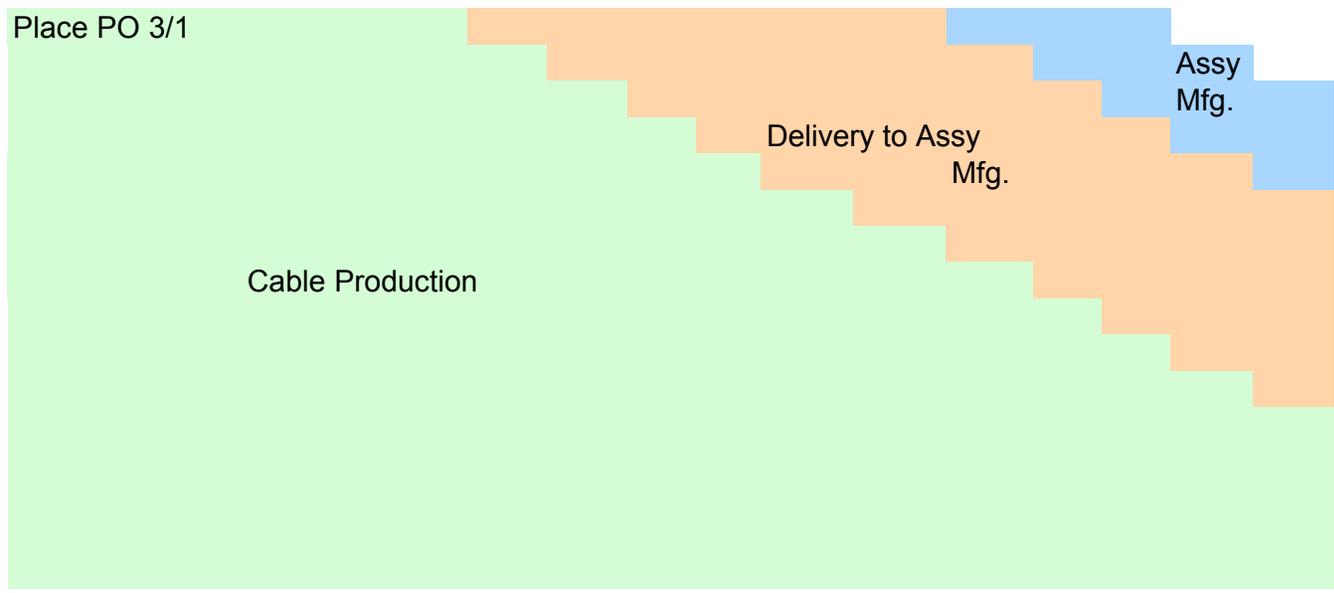
# IceCube PY04 Surface Cable Production Schedule

Month      Feb                      Mar                                      Apr                                      May                                      Jun

Day            2/21   2/28   3/7   3/14   3/21   3/28   4/4   4/11   4/18   4/25   5/2   5/9   5/16   5/23   5/30   6/6   6/13   6/20   6/27

## Cable Production

- Cable 1 (5)
- Cable 2 (6)
- Cable 3 (7)
- Cable 4 (8)
- Cable 5 (9)
- Cable 6 (10)
- Cable 7 (11)
- Cable 8 (12)
- Cable 9 (13)
- Cable 10 (14)
- Cable 11 (15)
- Cable 12 (16)
- Cable 13 (17)
- Cable 14 (18)
- Cable 15 (19)
- Cable 16 (20)

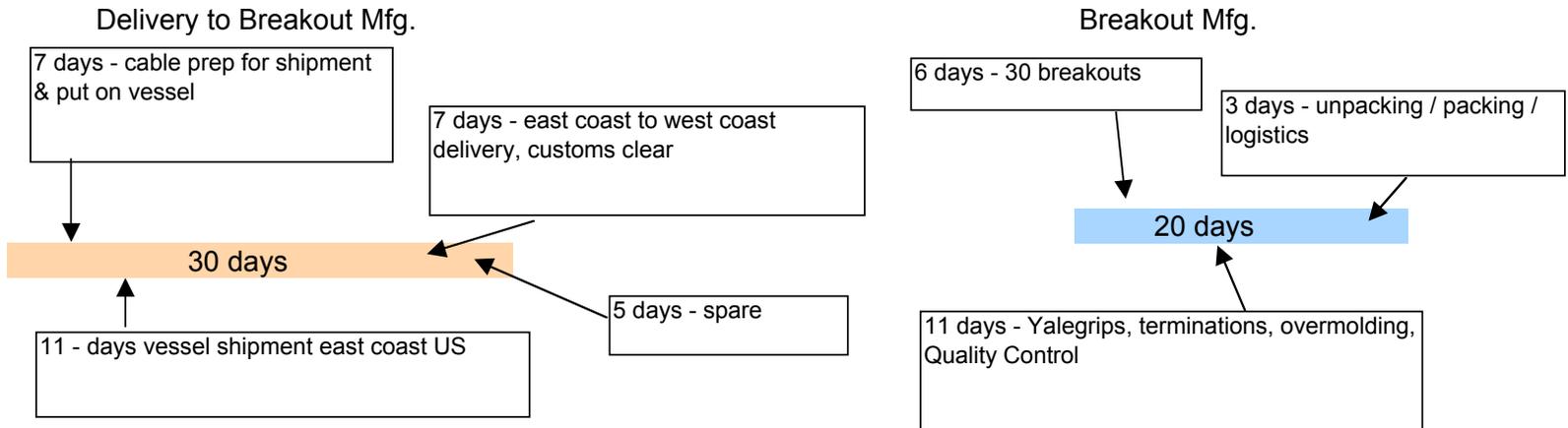
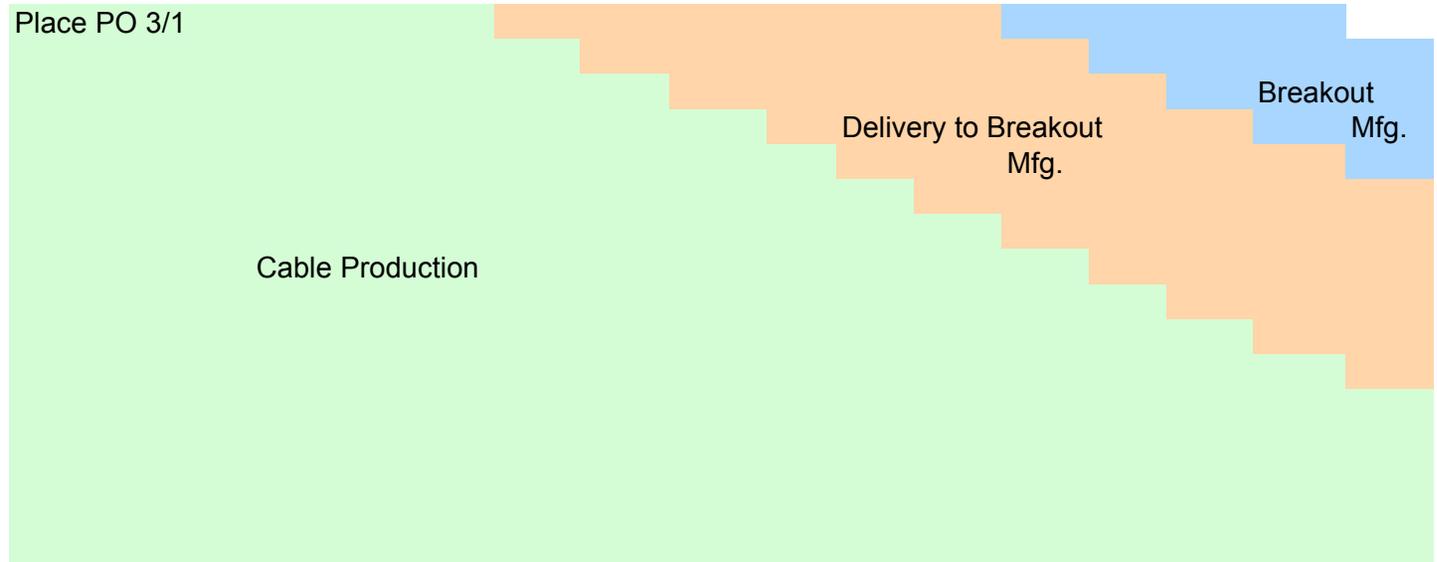


# IceCube PY04 Surface to DOM Cable Production Schedule

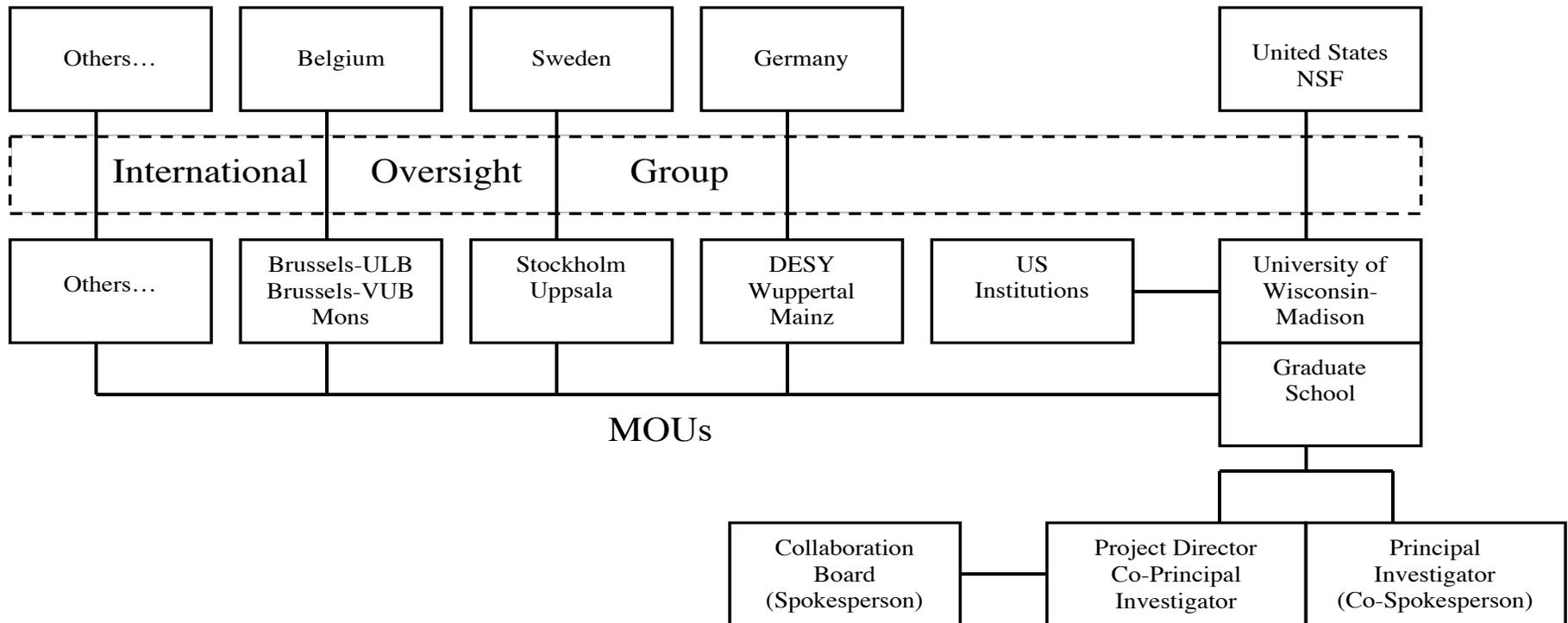
Month	Feb			Mar			Apr			May			Jun						
Day	2/21	2/28	3/7	3/14	3/21	3/28	4/4	4/11	4/18	4/25	5/2	5/9	5/16	5/23	5/30	6/6	6/13	6/20	6/27

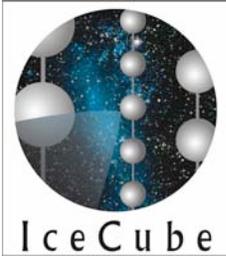
## Cable Production

- Cable 1 (6)
- Cable 2 (7)
- Cable 3 (8)
- Cable 4 (9)
- Cable 5 (10)
- Cable 6 (11)
- Cable 7 (12)
- Cable 8 (13)
- Cable 9 (14)
- Cable 10 (15)
- Cable 11 (16)
- Cable 12 (17)
- Cable 13 (18)
- Cable 14 (19)
- Cable 15 (20)
- Cable 16 (21)



# International Oversight and Finance Group



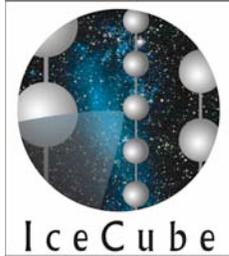


# Cost Baseline Profiles



**Total Project Cost Summary (\$ 000)**

	PY01	PY02	PY03	PY04	PY05	PY06	PY07	PY08	PY09	Total
US Funding Profile	14,432	24,313	41,744	51,201	49,871	26,450	21,779	11,332	950	242,073
Non-US Funding Profile	0	2,220	5,102	6,711	6,992	5,424	2,090	1,160	0	29,698
<b>Total Project (Estimate at Complete)</b>	<b>14,432</b>	<b>26,533</b>	<b>46,846</b>	<b>57,912</b>	<b>56,863</b>	<b>31,874</b>	<b>23,868</b>	<b>12,492</b>	<b>950</b>	<b>271,771</b>



# Conclusions



- NSF and foreign funding agencies are providing the financial resources necessary for project success and for the pursuit of a technically limited plan.
- Current progress is consistent with established goals.
- Results from our next season will strongly influence future planning (schedules, costs, and possibly scope)
- IceCube has a credible technical plan for the next season that will press the support system.

# New IceCube Offices in Madison

## Supernova Room for Strategic Planning

*Raytheon and NSF staff join IceCube staff in new space*

