

IceCube Collaboration Governance Document

Revision 6.14, May 20, 2011

Collaboration Objectives

The IceCube Collaboration (the Collaboration) is an organization of scientists who collectively participate in a research program with the IceCube Observatory at the NSF South Pole Amundsen-Scott station. IceCube consists of a surface array, IceTop, and a deep ice array IceCube. Henceforth, IceCube stands for the IceCube Observatory. The primary goal is the study of high-energy neutrinos from cosmic sources, but the program also encompasses a broader array of topics made possible by the IceCube observatory.

Definitions

The Host Institution for the IceCube project is the University of Wisconsin-Madison (UW) with the P.I. defined by the M&O grant to the Host Institution. Responsibilities are defined in the Cooperative Agreement with NSF. The Operations Phase of IceCube is specified as the period when activities are governed by the M&O Cooperative Agreement between UW and the NSF. The Memorandum of Understanding (MoU) governing institutional responsibilities for M&O consists of a single MOU between the host institution and all constituent institutions. The International Oversight and Finance Group functions are defined in the Maintenance and Operations Plan (excerpt attached in Appendix D). The organization for the operation of IceCube is shown in the organization chart of Appendix C.

Operation of the IceCube detector is organized within the IceCube Coordination Committee (ICC) chaired by the Associate Director for Science and Instrumentation. The main functions are Detector Maintenance & Operations; Computing and Data Management; Triggering & Filtering; and Data Quality, Simulation & Reconstruction Tools, as shown in the Organization chart. Some key positions in the ICC are appointments of the host institution; most positions are filled by collaboration scientists chosen for their expertise by the Chair of the ICC in consultation with the Spokesperson.

Collaboration Membership

The IceCube Collaboration consists of scientists at Collaboration Constituent Institutions. The condition for membership and for institutional recognition is that the group makes a significant contribution to IceCube. Significant contributions will include a contribution to the common fund proportional to the number of Ph.D. scientists in the group as well as contributions to detector operations and data analysis. The proposed contributions, role in the scientific program, and personnel are to be detailed in the MOU that is updated annually.

Current members of the Collaboration as of the date of revision of this document come from the institutions listed in Appendix A. (This Appendix also lists the initial institutions of IceCube.) Any scientist or group of scientists may apply to the Spokesperson of the Collaboration for membership of their institution in IceCube. Admission of new Collaboration Constituent Institutions requires approval by a two-thirds majority of the IceCube Collaboration Board of the proposed contributions, role in the research program, and terms of the initial MOU. Scientists who join member groups at Institutions that already are members of the Collaboration will automatically be accepted as members of the Collaboration.

An individual scientist or a group of scientists may be accepted as associate members of IceCube if they are sponsored by an IceCube collaborating institution to work on a specific aspect of analysis and/or service. The arrangement should be clarified in an MoU that describes the subject in which the associate will participate, the term of association and any other details.

Membership of an individual or Institution may be revoked by the Spokesperson for just cause, e.g. actions detrimental to IceCube. A two-thirds majority concurring vote is required of the Collaboration Board.

Collaboration Board

1. Functions and Responsibilities

The Collaboration Board is the policy-making entity that guides and governs the scientific activities of the Collaboration. It establishes, and as necessary amends, governance procedures and has oversight and authority over:

- science policy and goals
- membership
- data access
- publication
- representation of IceCube at topical and general conferences
- analysis teams
- education and outreach

The Collaboration Board, through the Collaboration Spokesperson, maintains contact and communication with the Director of Operations at the host institution.

It advises the Director on the detector operation for scientific investigations and maintenance, and participates in the discussion, as articulated by the Director of Operations, of the potential or possible use of the IceCube facility as a resource for new initiatives.

The Collaboration Board ratifies the Collaboration Governance document and may introduce amendments to it.

The Collaboration Board ratifies the Cooperative agreement between the NSF and Host Institution, and may suggest amendments to it.

The Collaboration Board, during the operation phase of IceCube, advises the Director of Operations on selection of personnel that hold key responsibilities for the Maintenance and Operation of the detector.

Concerns of the Collaboration members are addressed to Collaboration Board members who, when appropriate, bring those before the Collaboration Board for its consideration.

At the request of a Board member the Board may require a detailed verbal, or written, report from the Spokesperson on any action.

2. Membership

Each Collaboration Constituent Institution is represented on the Collaboration Boards by at most two members of which one is voting whereas the other is a non-voting adjunct member. The number of votes per institution depends on number of Ph.D. physicists (see for the key section 6 below).

Early Career - less than five years after the Ph D - scientists in the Collaboration are represented by two additional, at-large, members chosen collectively by Early-Career Collaboration participants. The term of service is one year, renewable. Election rules for Early Career scientists are given in Appendix B. Of the two members, one is voting whereas the other is a non-voting adjunct member. Information of who is voting should be given to the Spokesperson before each meeting of the Collaboration Board. During the IceCube operation phase, the P.I. of the M&O grant from NSF (the IceCube P.I.) and the Associate Director for Science are ex-officio members of the Collaboration Board.

3. Officers

The Collaboration Board is chaired by the Collaboration Spokesperson. The Spokesperson is an ex-officio, non-voting member of the Collaboration Board. The Spokesperson is elected by the Ph.D. members of the collaboration. The election procedure is as follows:

- The Spokesperson appoints two Collaboration members who serve as a nomination commission.
- Nominations are sought from the Collaboration at large. Each constituent Institution may offer any number of candidate nominees
- The nomination commission notifies each nominee that she/he has been proposed. Within two weeks each nominee shall inform the nomination commission if he/she is willing to be listed as a nominee. All who do so compose the final slate of viable nominees.
- The Spokesperson is chosen by majority vote of all Ph.D. physicists in the Collaboration.
- If none of the candidates gets more than 50% of the votes in the first round the choice between the two names with the most votes is decided in a second round.

Each nominee is urged to prepare a statement that contains her/his assessment of the state of IceCube, goals and plans for action to be taken during his/her tenure as Spokesperson. The text of the statement should accompany the nominee's acceptance notice to the nomination commission who will distribute it with the ballot to the Collaboration membership.

The Spokesperson may select a Deputy Spokesperson. The Board ratifies the choice. The Deputy performs the duties of the Spokesperson when necessary if the Spokesperson is unable to do so. The Deputy is an ex-officio, non-voting member of the Collaboration Board. If the Spokesperson or Deputy is a regular Collaboration Board member, a replacement is chosen by the affected Institution. The period of office of the Spokesperson and the Deputy Spokesperson is two years, renewable - but at most four consecutive years.

The Spokesperson, as Collaboration Executive

- organizes and chairs Collaboration Board meetings
- during the IceCube operations phase is the interface between the collaboration Board and the Director of Operations at the Host Institution, communicating with the Director on behalf of the Collaboration Board.
- arranges general Collaboration meetings
- speaks for the Collaboration in interaction with the scientific community
- speaks for the Collaboration in interaction with the general public
- selects members of Collaboration advisory committees subject to concurrence by Collaboration Board majority vote
- communicates with the International Oversight and Finance Group (see Appendix D) on behalf of the Collaboration Board.
- calls for and oversees formal votes on particular issues

4. Executive Committee

The Spokesperson, in consultation with the Collaboration Board and, with the P.I. and the Director of Operations, appoints and chairs an Executive Committee of the Collaboration Board. The term of the Executive members is two years. The job of the Executive Committee is to advise the Spokesperson in proposing actions to the Collaboration Board and in making interim decisions. The members of the Executive Committee should represent major groups, functions and competences within the Collaboration.

5. Meetings

As a rule, the Collaboration Board meets during general Collaboration meetings. More frequent telephone or video conferences may be called by the Spokesperson, with normally two weeks prior notice having been given Board members. A minimum of two-thirds of Collaboration Board members is required to constitute a quorum. The Spokesperson will appoint a secretary to each Collaboration Meeting for writing the minutes. The minutes will include all decisions that were taken. Minutes will be posted on the IceCube private www site within one week following the meeting, following approval by the Collaboration Board members.

6. Voting procedure

In general, matters before the Collaboration Board are settled by consensus of its members. A formal vote will be ordered by the Spokesperson, if called for by a Collaboration Board member or by the Spokesperson. Each institution has one vote weighted by a factor depending on the number of affiliated PhD physicists. The weight is equal to the square root of the number of PhD physicists, rounded to the nearest integer. The weights are fixed once per year. In case of a tie vote, the Spokesperson casts a vote. Results will be announced to the Collaboration Board by the Spokesperson. Polling is done by Email or at meetings of the Collaboration Board. All votes will be open, except where persons are concerned. The voting procedure for the Spokesperson is described in section 3.

7. Education and Outreach

The IceCube collaboration collectively and individually participates in and provides support for efforts in public outreach and education on subjects related to its science. The Spokesperson, with Collaboration Board concurrence, responds to requests for information from the media or may take the initiative providing material. The Director of Operations, with Collaboration Board concurrence, appoints a Collaboration member to lead an education program for students and teachers at all levels. The Collaboration maintains coordination and cooperation with other ongoing education initiatives. All new scientific material to be released for purposes of public outreach or education containing other than previously published data or results must have been agreed upon by the Collaboration Board.

8. Collaboration Policies and Procedures

Meetings

Collaboration meetings are held at least two times in a year. Locations are distributed among Collaboration Constituent institutions, chosen by the Spokesperson, and ratified by Board concurrence. The hosting institution is responsible for physical meeting arrangements. Agendas are set by the Spokesperson together with the hosting institution, the Analysis Coordinator, the working group leads and the operations managers (i.e. members of the ICC), with concurrence of the Collaboration Board.

Data Reduction and Analysis

Raw, unfiltered data written to tape at Pole are transported to the UW data center for archival storage unless directed otherwise by the Collaboration Board. Filtered data are transmitted daily via satellite link to the UW data center and stored on disk. Additionally, the filtered data will be copied via internet to DESY and stored on disk as a second official copy.

All current IceCube members have access to archived data. Associate membership in IceCube gives the Associate access to IceCube data and software

for the sole purpose of pursuing a particular analysis. The analysis should augment the science that can be done with IceCube alone.

The Collaboration Board consents to the appointment of Collaboration members who have been chosen jointly by the Spokesperson and Director of Operations. These include the Analysis Coordinator and Working Group conveners. The term of service for the Analysis Coordinator and Working Group conveners is two years, renewable. The Analysis Coordinator assumes responsibility for organization and management of data analysis efforts.

It is the intention of the Collaboration to place the data in the public domain as soon as it is reasonable to do so from a scientific point of view (see appendix E). The Collaboration Board shall determine rules for access to the data.

Detector operations and monitoring

The Spokesperson with Collaboration Board concurrence appoints a Collaboration member to organize and lead a group responsible for detector Monitoring, Maintenance and Calibration. The term of service is one year, renewable. Detector monitoring is a collaboration-wide shared responsibility.

9. Topical and General Conference Presentations

The Spokesperson, with concurrence of the Collaboration Board, appoints a Collaboration member to chair a Speakers Committee. The designated chairperson chooses three other members of this Speakers Committee. The term of the speakers committee is 2 years. A rapid decision channel (chair + Spokesperson) can be enabled if there is insufficient time to involve the whole committee. Invitations to present Collaboration results, or performance reviews, are submitted to the Speakers Committee. The Speakers Committee chooses the speaker.

The Speakers Committee maintains records of conference presentations. The conference organization is notified by the Spokesperson of the identity of the nominated speaker and the subject of the talk and its approval is sought.

In order to present previously unreported data and/or results approval must be obtained from the Spokesperson, with Collaboration Board concurrence. The Spokesperson has the right to hold new results in order to approve final text, figures, and tables.

Transcriptions of verbatim reports of approved presentations to be included in conference proceedings are posted on the IceCube www site not later than two weeks before the editorial deadline to allow review, comments and suggestions for revisions by the Collaboration. Such controls do not normally apply to colloquium or seminar talks at members' home or other institutions on personal invitation but the Analysis Coordinator must be made aware of any new results which differ from results already public or might be controversial. For presenting such results Analysis Coordinator approval must be obtained.

Reports in proceedings are normally bylined by a single name (the presenter's) followed by "for the IceCube Collaboration". The complete author list in alphabetic order should if possible be included. Otherwise a reference is made to the complete author list elsewhere. Deviations from this rule are possible on a case by case basis but require justification. Requests are handled by the Publication Committee. The Collaboration Board constructs the author list from compilations provided it by Constituent Institution representatives. Others who have contributed to a particular effort may be included as authors. Individual requests not to be included as authors are acceded to without prejudice.

Any Constituent Institution representative may request a variance from the default listing to allow a conference presentation authored by a subset of members and others who have contributed to a particular special (usually technical) subject. A 2/3 majority of the Collaboration Board is required for approval.

10. Publications

The Spokesperson, with concurrence of the Collaboration Board, appoints a Collaboration member to chair a Publications Committee. The designated chairperson chooses seven other members of this Publications Committee. The term of the members of the Publication Committee is 2 years, renewable. The committee oversees and coordinates submission of papers and proceedings reports in coordination with the analysis coordinator and the working group leaders as described in Appendix C.

Results are to be submitted for publication in refereed journals. Drafts of research results are prepared by the analysis teams; drafts of papers on technical matters are prepared by the cognizant individuals. The internal review procedure is described in Appendix C. Journal articles are bylined by the full author list in alphabetical order. The Collaboration Board constructs the author list from compilations provided it by Constituent Institution representatives. As a rule collaborators may become authors six months after joining the collaboration. They are normally removed from the list one year after leaving. This period may be extended in special cases of former collaborators who contributed essential effort to the construction of IceCube. Others who have contributed to a particular effort may be included as authors. Individual requests not to be included as authors are acceded to without prejudice. Any Constituent Institution representative may request a variance from the default listing to allow submission of a paper for publication authored by a subset of members and others who have contributed to a particular special (usually technical) subject. A 2/3 majority of the Collaboration Board is required for approval.

Associate members only appear on the author list for the publication(s) directly related to their analysis and agree not to publish independently results based on private IceCube software or data.

11. Ph D Research

Research topic assignments are the responsibility of the students and faculty supervisors. Discussions among faculty supervisors and Collaboration Board members are encouraged to avoid serious overlaps in subject matter and/or analysis methodology. The Spokesperson maintains a list of completed and current theses. Texts of theses are posted to the IceCube private www site and may be posted at the institution www site. Titles and author names are posted on the official IceCube www site.

12. Amendments

This document will be reviewed for proposed amendments as necessary. Any member of the collaboration may bring such proposals to the Collaboration Board's attention. Proposed amendments to this charter will be considered during regular meetings of the Collaboration Board. A 2/3 majority of the Collaboration Board is necessary to pass an amendment.

Appendix A: IceCube Institutions

(ordered alphabetically according to location)

a. Initial IceCube Institutions (application 1999 to NSF):

- i. CTSPS, Clark-Atlanta University, Atlanta, USA
- ii. Southern University and A&M College, Baton Rouge, USA
- iii. Lawrence Berkeley National Laboratory, Berkeley, USA
- iv. University of California-Berkeley, Berkeley, USA
- v. Université Libre de Bruxelles, Brussels, Belgium
- vi. University of California-Irvine, Irvine, USA
- vii. University of Kansas, Lawrence, USA
- viii. University of Wisconsin, Madison, USA
- ix. Universität Mainz, Mainz, Germany
- x. Bartol Research Institute, University of Delaware, Newark, USA
- xi. University of Pennsylvania, Philadelphia, USA
- xii. Institute for Advanced Studies, Princeton, USA
- xiii. Stockholm Universitet, Stockholm, Sweden
- xiv. Uppsala Universitet, Uppsala, Sweden
- xv. BUGH Wuppertal, Wuppertal, Germany
- xvi. DESY-Zeuthen, Zeuthen, Germany

b. IceCube Institutions as of September, 2010:

- i. III. Physikalisches Institut, RWTH Aachen University, Aachen, Germany
- ii. Dept. of Physics and Astronomy, University of Alabama, Tuscaloosa, USA
- iii. Dept. of Physics and Astronomy, University of Alaska Anchorage, Anchorage, USA
- iv. CTSPS, Clark-Atlanta University, Atlanta, USA
- v. School of Physics and Center for Relativistic Astrophysics, Georgia Institute of Technology, Atlanta, USA
- vi. Dept. of Physics, Southern University, Baton Rouge, USA
- vii. Dept. of Physics, University of California, Berkeley, USA
- viii. Lawrence Berkeley National Laboratory, Berkeley, USA
- ix. Institut für Physik, Humboldt-Universität zu Berlin, Berlin, Germany
- x. Fakultät für Physik & Astronomie, Ruhr-Universität Bochum, Bochum, Germany
- xi. Physikalisches Institut, Universität Bonn, Bonn, Germany
- xii. Dept. of Physics, University of the West Indies, Bridgetown, Barbados
- xiii. Université Libre de Bruxelles, Brussels, Belgium
- xiv. Vrije Universiteit Brussel, Brussels, Belgium
- xv. Dept. of Physics, Chiba University, Chiba, Japan
- xvi. Dept. of Physics and Astronomy, University of Canterbury, Christchurch, New Zealand
- xvii. Dept. of Physics, University of Maryland, USA
- xviii. Dept. of Physics and Center for Cosmology and Astro-Particle Physics, Ohio State University, Columbus, USA
- xix. Dept. of Physics, TU Dortmund University, Dortmund, Germany

- xx. Dept. of Physics, University of Alberta, Edmonton, Alberta, Canada
- xxi. Dept. of Subatomic and Radiation Physics, University of Gent, Gent, Belgium
- xxii. Max-Planck-Institut für Kernphysik, Heidelberg, Germany
- xxiii. Dept. of Physics and Astronomy, University of California, Irvine, USA
- xxiv. Laboratory for High Energy Physics, École Polytechnique Fédérale, Lausanne, Switzerland
- xxv. Dept. of Physics and Astronomy, University of Kansas, Lawrence, USA
- xxvi. Dept. of Physics, University of Wisconsin, Madison, USA
- xxvii. Institute of Physics, University of Mainz, Mainz, Germany
- xxviii. Université de Mons, Mons, Belgium
- xxix. Bartol Research Institute and Department of Physics and Astronomy, University of Delaware, Newark, USA
- xxx. Dept. of Physics, University of Oxford, Oxford, UK
- xxxi. Dept. of Physics, University of Wisconsin, River Falls, USA
- xxxii. Oskar Klein Centre and Dept. of Physics, Stockholm University, Stockholm, Sweden
- xxxiii. Dept. of Physics, Pennsylvania State University, University Park, USA
- xxxiv. Dept. of Physics and Astronomy, Uppsala University, Uppsala, Sweden
- xxxv. Dept. of Physics, University of Wuppertal, Wuppertal, Germany
- xxxvi. DESY, Zeuthen, Germany

Appendix B: IceCube Early Career Scientist Elections

- a. **Definition of IceCube EC Scientist:** An Early Career scientist is a member of the IceCube collaboration who has received their Ph. D. within 5 years of the most recent past January 1st, but who has not received a tenured position.
- b. **Election Oversight Committee:** The EC representatives will annually and prior to the elections appoint a committee of two members taken from the entire collaboration, excluding persons eligible and accepting nominations for EC representative in the upcoming election, to oversee the election.
- c. **Nominations for EC Representative:** The current year's representatives will solicit nominations collaboration- wide for EC representatives. These nominations will be collected by the members of the oversight committee and posted. Self-nomination is permitted.
- d. **Voting:** Each EC scientist possesses two votes. One vote is weighted with 2 points, the other is weighted with 1 point. Each vote must be assigned to a different person - i.e. a single vote caster may not vote all 3 points to a single nominee. These votes are sent to the oversight committee. One is allowed to vote for one's self. Votes are counted privately by the oversight committee. The two persons receiving the top two vote counts will be announced by this committee as the new EC scientist corepresentatives. In the event of a tie between 2nd and further places, a tie-breaking round of voting with the ballot containing just the tie holders, will be held to determine 2nd place, with a single vote per EC scientist.

Appendix C: IceCube Maintenance, Operations and Data Analysis Plan

This document sets forth the plan for the organization and implementation for M&O and Data Analysis during the operations phase of IceCube.

M&O and Physics Analysis

- Planning Documentation
- Analysis Coordination
- Internal review Process
- Talks

Planning Documentation

Planning documentation is composed of this document in its entirety, which lays out the plan for M&O and data analysis of IceCube data. This plan will be reviewed by the IceCube Director of Operations and the IceCube collaboration and once approved will be implemented. Approval and/or modification requires the data analysis plan to be accepted by:

1. IceCube PI
2. IceCube Collaboration Spokesperson
3. IceCube Director of Operations
4. IceCube Collaboration Board

This document should not conflict with the IceCube collaboration governance document. If there are any conflicts the collaboration governance document takes precedent.

Analysis Coordination

Analysis coordination has two tasks that are:

- Analysis Coordinator
- Working Groups

The analysis coordinator has authority over the working groups as laid out in this document.

Analysis Coordinator

- a) Selection of Analysis Coordinator

The procedure for selecting the Analysis Coordinator is by appointment from the Spokesperson with concurrence of the Collaboration Board.

b) Term of Analysis Coordinator

The term of the Analysis coordinator will be two years. The current Analysis Coordinator may be nominated to remain as Analysis Coordinator.

c) Responsibilities of Analysis Coordinator

The responsibilities of the analysis coordinator are the overall organization and oversight of the working groups and physics analysis of the IceCube data. Specifically the Analysis Coordinator will:

1. Have oversight of the physics analysis
2. Aid in defining the physics working groups
3. Aid in selection of working group leaders
4. Have input on internal review processes for publications and talks
5. Have input on the distribution of talks
6. Have oversight of analysis documentation

Working Groups

a) Preliminary list of working groups

Working groups are organized a) according to event topologies and the related filter and reconstruction methods and b) according to physics topics. Topology-driven groups can be, for instance:

1. Muons
2. Cascades
3. Hybrid events
4. ...

with the physics topics such as AGN, GRB, WIMPs etc... as subcategories in each working group with the same physics topic across groups. A possible grouping according to physics topics would be:

1. Diffuse cosmic and atmospheric neutrinos
2. Point Source Searches
3. GRB neutrinos
4. neutrinos from WIMP annihilation
5. Cosmic ray studies
6. Exotic particles like magnetic monopoles or Q-balls
7. MeV neutrinos from Supernova bursts
8. Extremely High Energy Phenomena (EHE)

with detector and reconstruction methods as tools to be developed across different working groups. Definition of groups will be kept dynamically, with the list above representing the 2010 status.

b) Selection of Working Groups & Group Leaders

The Analysis Coordinator will coordinate and implement the analysis effort for the IceCube detector in order for it to accomplish its scientific mission. The analysis coordinator, with input from the entire collaboration, will determine the physics benchmarks and processes and organize physics working groups to ensure that these processes are measured. The Analysis Coordinator together with the Spokesperson will select the working group leaders with input from the IceCube collaboration and IceCube Director of Operations. The term of office of a working group leader is 2 years, renewable.

c) Responsibilities at Working Group Level

The physics working group leaders have direct responsibility for organizing the individual data analyses of the IceCube detector. They will:

1. Organize their physics working group
2. Define & verify standard datasets for their particular physics processes
3. Verify the operation and performance of the IceCube detector, primarily as it pertains to their physics processes of interest
4. Document the physics analysis and approved results with memos
5. Document analysis tools with memos
6. Place memos on Docushare for collaboration access and maintain the Docushare areas related to their working group
7. In addition to memos on Docushare, maintain a (possibly separate) web page that describes the status of the WGs activities
8. Approve standard results from their group to be submitted to the collaboration board for publication and presentation.
9. Request a paper committee for journal publication of approved results

The people within a physics working group should generally be organized by the working group leader, with a mailing list established. However, all physics working group activity is open to the entire collaboration at any time. Regular meeting times and activities should be established whenever possible to encourage all who are interested to be able to plan on participation. The working groups are encouraged to schedule regular biweekly teleconferences and/or videoconferences.

Internal Review Process

Internal review is the process by which the IceCube collaboration will assure uniform and high standards for the publication and communication of physics results to the community. There are two levels of approval for results:

1. Approval as preliminary result for communication at conferences and talks
2. Approval of final results for publication in refereed journals

a) Approval of preliminary results for talks

For approval of preliminary results to be disseminated to the community at scientific talks and conferences the following must happen:

1. Approval by physics working group.
2. Presentation at two consecutive weekly analysis calls where approval is sought from the collaboration.
3. Decision by the Analysis Coordinator.

Normally, a memo with supporting information should be disseminated to the collaboration no less than two weeks before the Collaboration Board decision.

Upon approval, the result becomes an official preliminary result that is available for use in talks and conferences by any collaboration member. The result will be placed in a common collaboration area on the IceCube web pages by the physics working group.

b) Publication of papers

The publication of a result in a paper is initiated within a physics working group. The results to be published must be approved by the collaboration as described above. Once a draft exists, the working group leader(s) will contact the chair of the publication committee to jointly appoint a referee panel consisting of two working group internal experts and a collaboration member from outside the working group. The panel will be led by a publication committee member. The task of the referee panel will be to review the draft and see to it that any remaining physics issues are resolved. The referee panel oversees and approves the steps listed below leading to journal submission.

1. A first draft of the paper is sent to the collaboration. Two weeks are allowed for comments which should be mainly of a substantive nature, but can also be editorial. The paper, comments, and answers to comments should all be posted on the web.
2. When the referee panel is satisfied that questions and comments have been satisfactorily addressed, a second draft will be presented to the collaboration. These comments should be editorial in nature. The paper, comments, and answers to comments should all be posted on the web.

3. The referee panel decides when a final draft of the paper is presented to the collaboration for approval.
4. The publication committee considers the paper for submission. The decision to submit is made by the Spokesperson and the chair of the publication committee.

c) Unusual physics topics or topics of a general nature

In the event of an analysis that does not fall within a physics working group, the analysis coordinator will contact the chair of the publication committee to jointly appoint a referee panel.

A topic of a general nature or a physics topic which should be dealt with in publication but is not being addressed can be brought before the Collaboration Board by the Spokesperson, the chair of the publication committee and/or the analysis coordinator. The Collaboration Board appoints an individual (or individuals) responsible for producing a draft paper and if necessary for performing the analysis.

d) Circumstances requiring express analysis

If a case arises that would require an express analysis of IceCube data in order to increase the impact in a timely way (e.g. A strong flaring object such as occurred for the “naked-eye” GRB) the Analysis Coordinator and/or Spokesperson have the authority to circumvent the normal time periods for review. The Analysis coordinator and Spokesperson can at their discretion ask for concurrence from the executive committee and/or ICB.

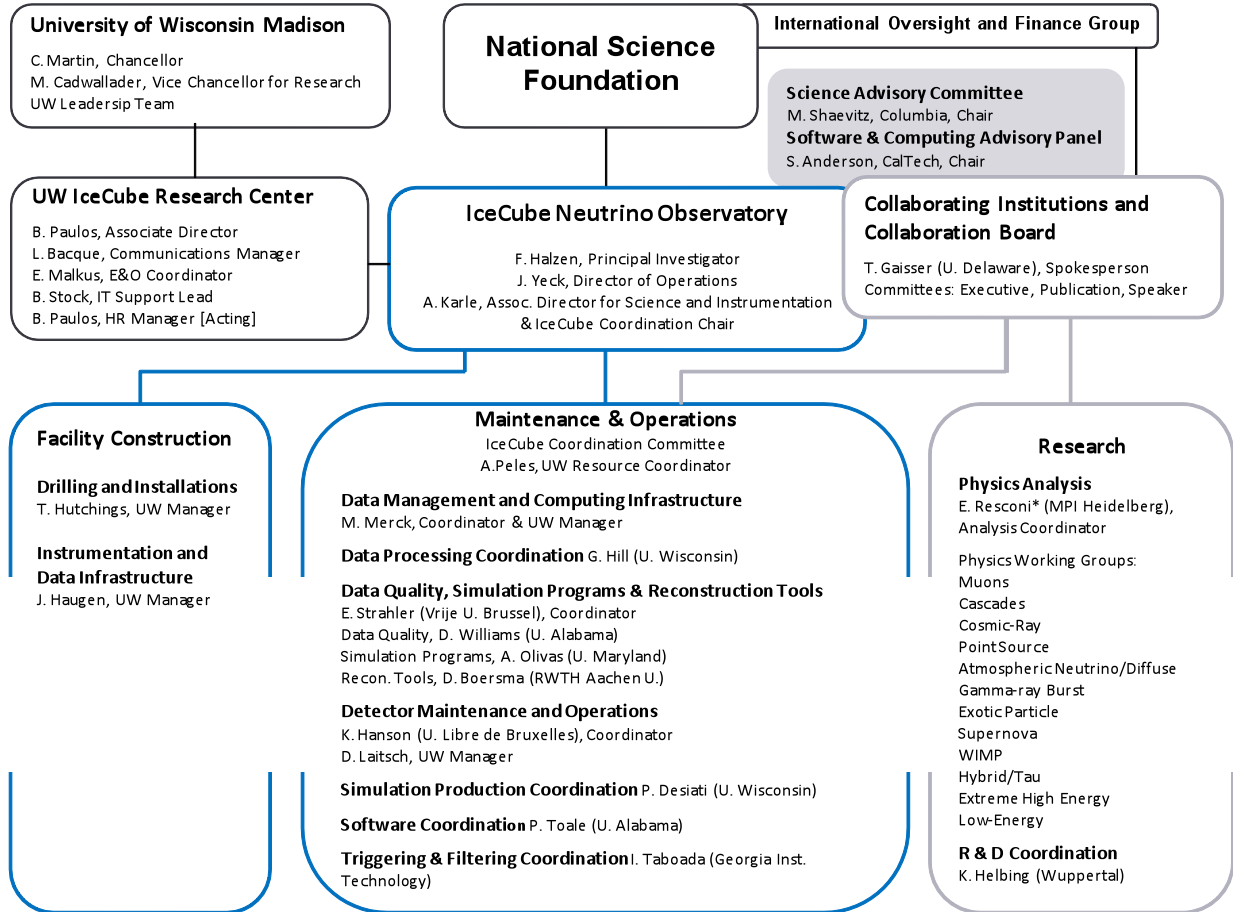
Non-IceCube publications by IceCube members

Collaboration members co-authoring non-IceCube publications which at any level relate to IceCube (for instance relying on internal discussions within IceCube, using IceCube infrastructure (hardware or software), or relying heavily on published IceCube results) should notify the IceCube Publication Committee prior to the submission of any manuscript to archive or journal. The Publication Committee may decide to forward such information to the full collaboration.

Talks

The policy on talks and presentations, and on the speakers committee is set forth in section 9.

IceCube M&O Organization



*Member of the IceCube Coordination Committee

February 9, 2011

Appendix D: International Oversight and Finance Group - IOFG

The International Oversight and Finance Group (IOFG) is a committee created in 2004 to provide oversight and financial support for the IceCube Neutrino Observatory (including Construction phase, Maintenance & Operations and Research phases). The Group organizes annual oversight reviews of the operations and meets annually to discuss detector performance and physics. The Group also sets policies for receiving periodic progress reports on all aspects of the detector operation and by all the performers in the collaboration, and for conducting external reviews when appropriate.

Membership

A representative of the National Science Foundation chairs the IOFG. Membership is comprised of representatives of the funding agencies in the partner countries supporting the construction and operation of IceCube Neutrino Observatory, currently comprised of funding agencies from Belgium, Germany, Sweden, and the United States. The Group is informed by the Spokesperson of the Collaboration, the Director of Operations, the Principal Investigator and others as appropriate.

Decisions

The Group is committed to operate through discussion and consensus. The Executive Agent (the NSF) will make final decisions on matters before the group related to the operation of IceCube.

Issues that may come before the Group include:

- Approval of a formal charter for the Group.
- Review of Memoranda of Understanding (MOU) between the various institutions.
- Concurrence on the Maintenance and Operations Plan.
- Funding issues.
- Concurrence on the Collaboration's plans for new membership in the collaboration.
- Data sharing and data management policies.
- Coordination regarding press releases and education and outreach activities.
- Input on seasonal flight and personnel logistics planning.
- Other matters related to successful operation of the IceCube Neutrino Observatory for science.

Appendix E: Dissemination and Sharing of IceCube Research Results and Data

This Appendix defines the IceCube Neutrino Observatory (ICNO) strategy for providing access to research results and data. NSF policies and guidance promote efforts by grantees to produce timely publication of results and to make data and software available to other researchers. In addition, the Parties to the Antarctic Treaty agree that, to the greatest extent feasible and practicable, scientific observations and results from Antarctica shall be exchanged and made freely available.

The NSF supports a wide range of approaches to the release of science data from large facilities. For example, within the astrophysical community there are two different models: the particle physics model where data are exclusively available to members of the collaboration and the astronomy model where data are readily available to other scientists and public. The Large Hadron Collider experiments follow the particle physics model and the Atacama Large Millimeter/submillimeter Array (ALMA) follows the astronomy model. The Pierre Auger Cosmic Ray Observatory and NASA's Wilkinson Microwave Anisotropy Probe (WMAP) follow an intermediate model where data releases are periodic, often tied to scientific publications, and represent different degrees of data processing.

Currently, the IceCube Collaboration follows the intermediate data release model, but will, together with the IceCube Science Advisory Committee, periodically review the efficacy of the IceCube Data Sharing Policy and may initiate changes in the policy (with appropriate consultation with NSF and foreign funding agencies) that might become needed.

There are three pathways to access the IceCube data:

- 1) IceCube Collaboration Membership;
- 2) Associate Membership; and,
- 3) Direct Access to IceCube Public Data Pages.

The IceCube Collaboration consists of scientists at the respective Constituent Institutions operating under the Governance Document; the condition for "Collaboration Membership" and respective institutional recognition is that the particular group makes significant contributions to IceCube maintenance and operation. These groups have full and immediate access to all ICNO data – raw, processed, and value added. Scientists outside the IceCube Collaboration who have a concept for a particular analysis can apply for Associate Membership for the purposes of performing a particular analysis or class of analyses within the Collaboration. These members have limited access to ICNO data – mostly to the partially processed data for a defined period.

Direct Access to the IceCube Neutrino Observatory Data

The ICNO raw data are securely stored and backed up, consistent with the overall NSF Data Policy requirements. Extracting science from these data requires the use of elaborate hardware and software tools developed by the Collaboration members. Like any other particle physics detector, data directly relevant to a scientific issue are obtained after a series of calibrations, data quality tests and analyses that typically require coordinated efforts of several members of the Collaboration.

In order to be responsive to both the scientific community's need for usable scientific data and to the NSF requirement for public access to data, IceCube plans to release data in two ways described below. The first dataset is meant to comply with the NSF requirement for public access to data. The second dataset is a value-added dataset meant to be first used by the IceCube scientific community. It provides in-depth information that is intended to lead to scientific publications by the Collaboration.

1. Release of IceCube primary event data transferred to the University of Wisconsin from the South Pole over communication satellites.

The IceCube Public Data Web site <http://icecube.umd.edu/PublicData/I3OpenDataFormat.html> provides access to the IceCube Observatory primary data for the general scientific community and the public without requiring any internal or proprietary software. This Web site provides information on how to access all primary IceCube data sent over the satellite (both "neutrino events" and "non-neutrino events"). There are basically two types of data sent north from South Pole that represent the entire dataset for all IceCube analysis. The type of data for each is described here:

Data Summary

This dataset is comprised of a brief summary of every event recorded by the IceCube detector; it stores a summary record of the UTC time, the number of Digital Optical Modules (DOMs) hit, and reconstructed muon direction. This dataset is used, for example, in cosmic-ray anisotropy and Moon shadow studies. The dataset size is approximately 2TB (terabytes) per year.

Event Data

This dataset is comprised of full information (see below) for events that are identified as possible "neutrino events" based on software triggers. For each of these events, a record is sent north without event reconstruction, consisting of the run number, trigger information (i.e., time and type), and the array of the sensors with photoelectron signals. The muon-generated Cherenkov emission photons strike the surface of photomultipliers in the DOM creating photoelectron signals. The signal's amplitude ("charge" q), position of the DOM that was struck (in the IceCube x,y,z coordinate reference frame), and the photon's arrival time (t , in the IceCube time reference frame) are recorded in the DOM's data output as the following quantities:

Run/Event header with trigger information, event date and time (as defined by the IceCube data format)

Array of DOM signals with calibrated position, time, and charge (x,y,z,t,q)

This dataset size will be anywhere between 10 and 40 TB per year.

Starting in 2011, the ICNO data described above and recorded by the entire 86-string detector will be grouped together by year (usually beginning in April as austral summer ends) and made available through the Public Data Web site annually following the data quality assessment. It will typically take six to nine months to fully verify data quality following the end of a year-long data collection run. Instructions on how to obtain these datasets are provided through the Public Data Web site. Along with the full datasets, some selected neutrino event samples and test datasets could also be provided.

The IceCube Public Data Web site requires from the users only some basic knowledge of the programming and visualization language Python (a free, widely available programming and visualization language with open source license; see <http://www.python.org>). Therefore, the required effort by potential users to understand and visualize the ICNO data is minimal because the public Web-based documents and tutorials provide enough information about the IceCube primary data structure. This means that the ICNO calibrated data stream can be decoded in any language (e.g., C/C++, FORTRAN, IDL, etc.) using any available computer architecture (e.g., 32-bit or 64-bit computers). The Web site provides short scripts written in Python that allow the users to easily understand the primary data format for reading events with properly recorded timing and location and visualize these events as needed. The ICNO Public Data Web site will be undergoing improvements as needed or as required by feedback from this community of users.

This dataset represents a release of all primary ICNO data transmitted north for analysis and should satisfy the NSF requirement for public release of data (for both “neutrino events” and “non-neutrino events”) at a level far exceeding the particle physics or most astronomy models.

2. Release of value-added IceCube data consisting primarily of Reconstructed Events.

An example would be the "neutrino event" data used for a publication on searches for a point source, but may consist of other supporting information for published results as a service to the general scientific community.

The IceCube Collaboration will be processing data for scientific analysis on an annual basis following conclusion of each year-long data run. This processing will result in a dataset that represents reconstructed events identified as "neutrino events". This data set will generally consist of the following quantities:

- Event Time (Modified Julian Day)
- Direction (Right Ascension, Declination)
- Directional Error
- Degrees of Freedom in Fit
- Energy Estimator

Flags Indicating Event Types (e.g., track like, cascade like, etc.)

Beginning two years after the first full data run is complete (to allow time for IceCube analyses as outlined below), these data will be released annually as an event catalog for the preceding year. The catalog of an earlier year might be revised in later years to update information and include better reconstruction algorithms and filtering processes. In this case, an updated set of data will be offered to the scientific community as the new version of a particular catalog. Based on feedback from the community, more information could be added into later releases to accommodate all types of community requests.

Note that the events not selected as “neutrino events” (for example, “cosmic ray muon background events”) are also valid data that could be used for other analyses, such as studying the symmetry or asymmetry of the cosmic ray distribution between the Northern and Southern hemispheres, etc. These events are represented by the above quantities, except the “Flags Indicating Event Types” are set for “cosmic ray muon” or some other appropriate event type. This “non-neutrino events” dataset is subject to a number of specific scientific analyses that are additional to the primary IceCube goal to detect and analyze cosmogenic neutrinos coming from far and energetic sources.

The IceCube scientific working groups will analyze year-long datasets for various physics parameters and conduct specific data analyses. It is expected that ten to fifteen scientific publications will be prepared using the annual data set and completed/published on a time scale of about two years (see below for additional information on the timing of data and publication releases). The intention of the IceCube collaboration is to make the ICNO data utilized for science analyses available upon publication of results. For example, when the initial searches for point sources, neutrinos from transient sources, and diffuse astrophysical neutrinos are published, the relevant event information associated with those analyses will be made available in an easy to read format. Partial event reconstruction information may be made available earlier than the intended publication.

During the operations phase of IceCube it is anticipated that IceCube neutrino data (Category 2 above) will be released within two years (or up to three years with NSF approval of extenuating circumstances) after the completed run in which the data are acquired.

The IceCube Collaboration created a data release webpage that serves as the entry point for future data releases to the scientific community, <http://www.icecube.wisc.edu/science/data>. Initially, this Web page contains release of the 2000-2006 AMANDA data. The URL to IceCube data release Web page is an explicit reference in the corresponding journal publication and will remain the same during the IceCube operations [Abbasi et al. (IceCube Collaboration) Phys. Rev., D79:062001, 2009. e-Print: arXiv: 0809.1646].

Important requirements for the data release in Category 2 are:

(1) The IceCube Collaboration’s analyses are completed in accordance with the

Collaboration's internal approval processes, which include adhering to the principles of blind analyses where practical;

(2) The calibrations and reconstructed event information are of high quality and it is unlikely this information will need to be changed or corrected.

Long-Term Data Management Plans

Once IceCube is in steady state operation, the ICNO will continue releasing the data on annual cycles from the data runs beginning in April.

The sequence from data taking to publication can be summarized as follows:

- Data Taking Run (~12 months)
- Annual compilation of data (starting point of the activities below)
- Release of primary event data (Category 1) without rejection of cosmic ray muons via the Public Data Web site (typically 6-9 months after completion of the year-long data taking run)
- Data Processing for the IceCube Event Reconstructions:
 - "neutrino events"
 - other "non-neutrino" events, including cosmic ray muon types
- Data Analyses for Specific Science Goals
- Preparation of the Final Data Sets
- Perform Final Physics Analyses and Un-Blind Results
- Publish Results with the Data used for specific publications
- Release of value-added IceCube data consisting primarily of Reconstructed Events (Category 2) for both the "neutrino events" and other types (within 24 months, or up to 36 months for extenuated circumstances)