Astro Teilchen

Wie die

Astro Teilchen

Physik Nach Zeuthen kam

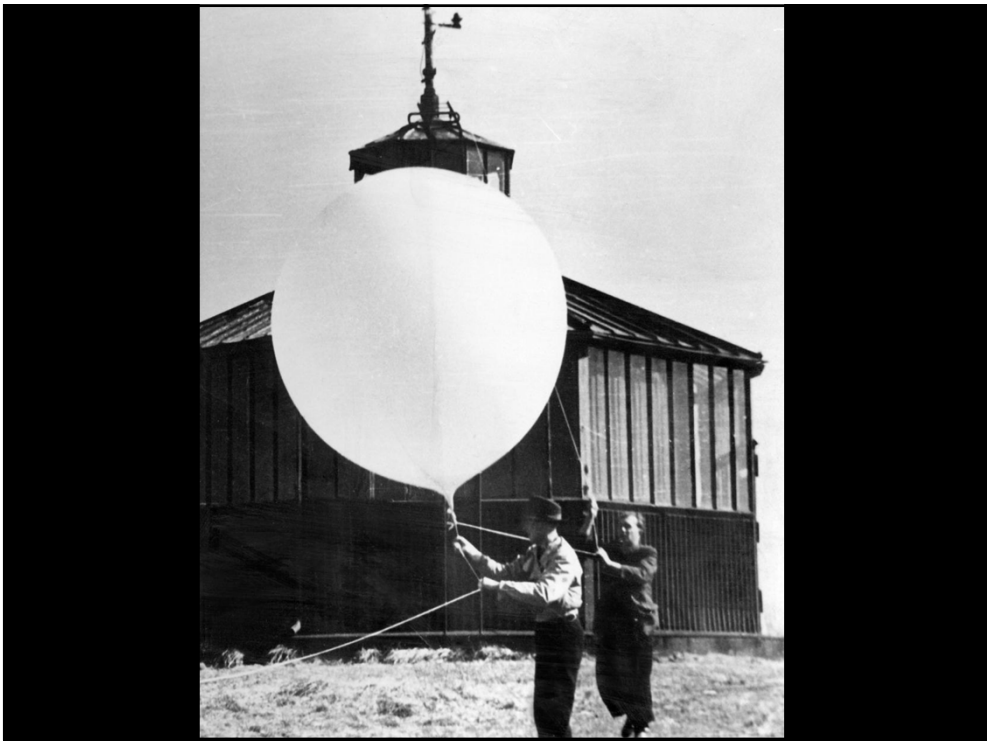
Wie die

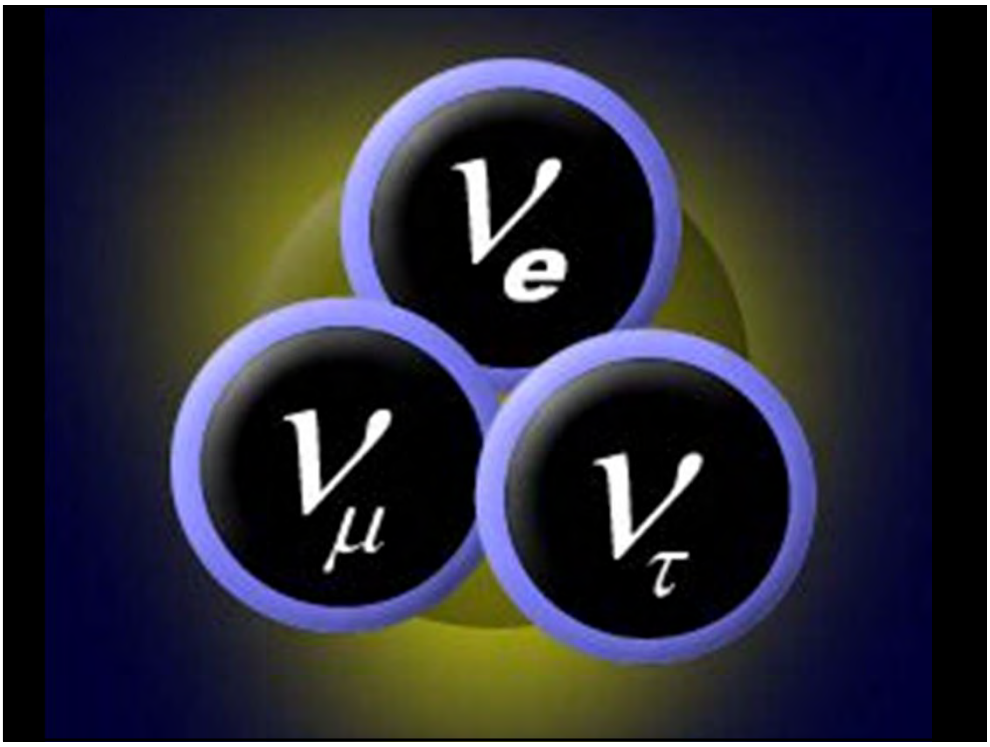
Astro Teilchen

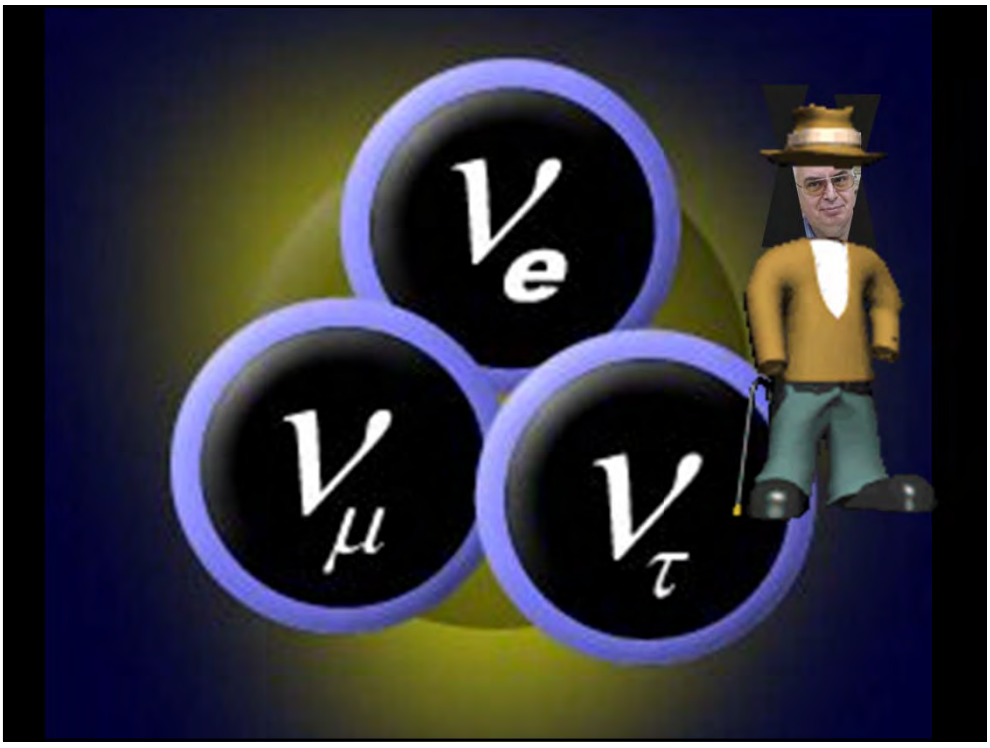
Physik Nach Zeuthen kam

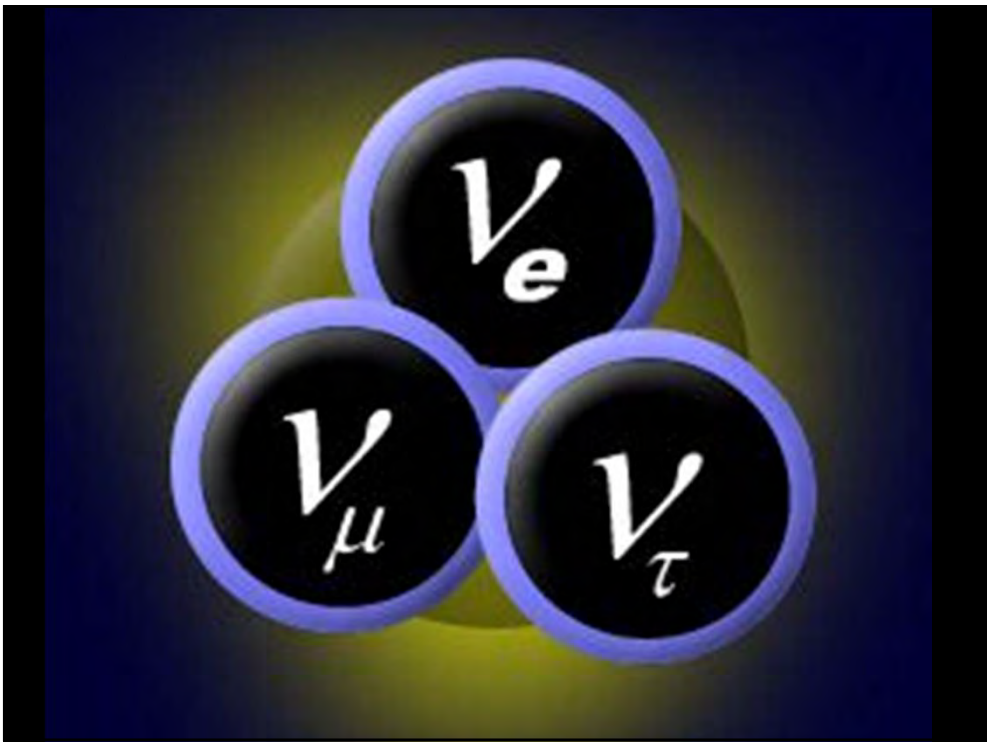
Wie die Astroteilchenphysik nach Zeuthen kam

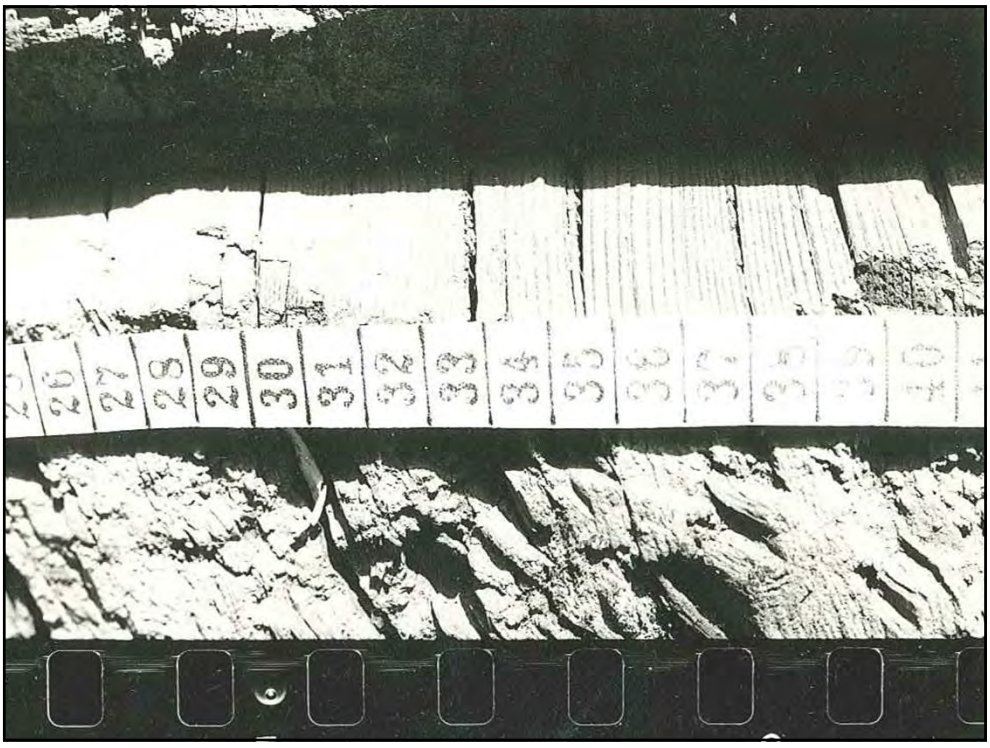
Christian Spiering, DESY 20.12.2011




ν_e
ν_μ
ν_τ


ν_e
ν_μ
ν_τ


ν_e
ν_μ
ν_τ



TERRA RESEARCH

Search for solar periodicities in Miocene tree ring widths

J. Kurths[1], Ch. Spiering[2], W. Müller-Stoll[3] and U. Striegler[4]

[1]*Max-Planck-Gesellschaft, Arbeitsgruppe Nichtlineare Dynamik an der Universität Potsdam, O-1571 Potsdam, Am Neuen Palais, Germany;* [2]*DESY-Institute of High Energy Physics O-1615 Zeuthen, Platanenallee 6, Germany;* [3]*O-1570 Potsdam, Am Drachenberg 1, Germany;* [4]*District Museum Cottbus O-7500 Cottbus, Branitz Castle, Germany*

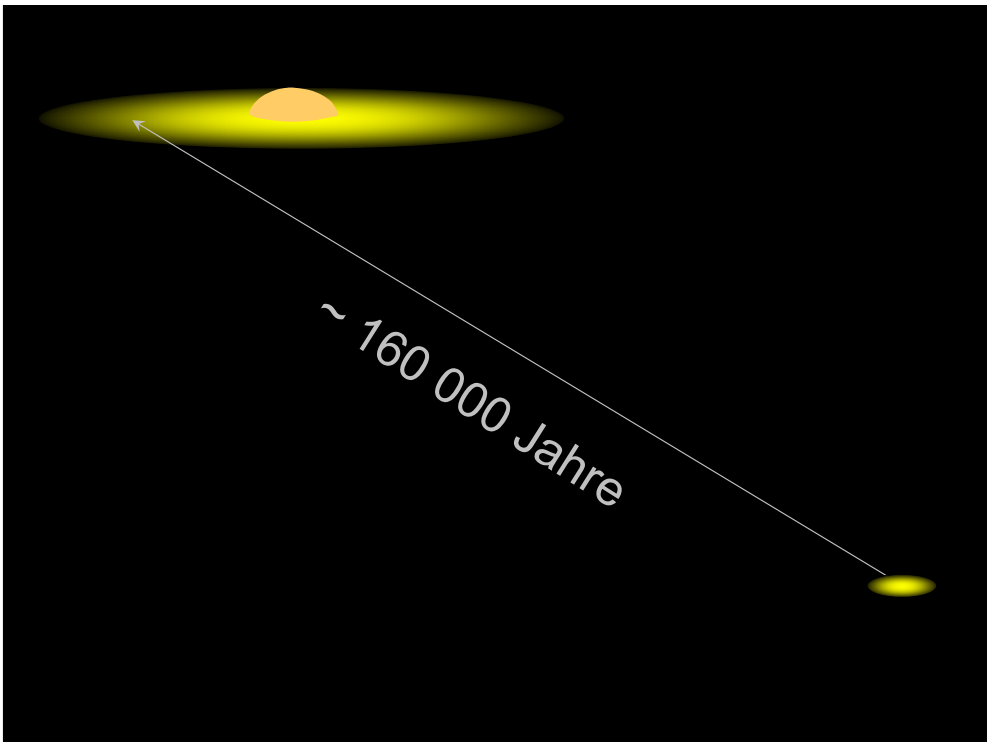
ABSTRACT

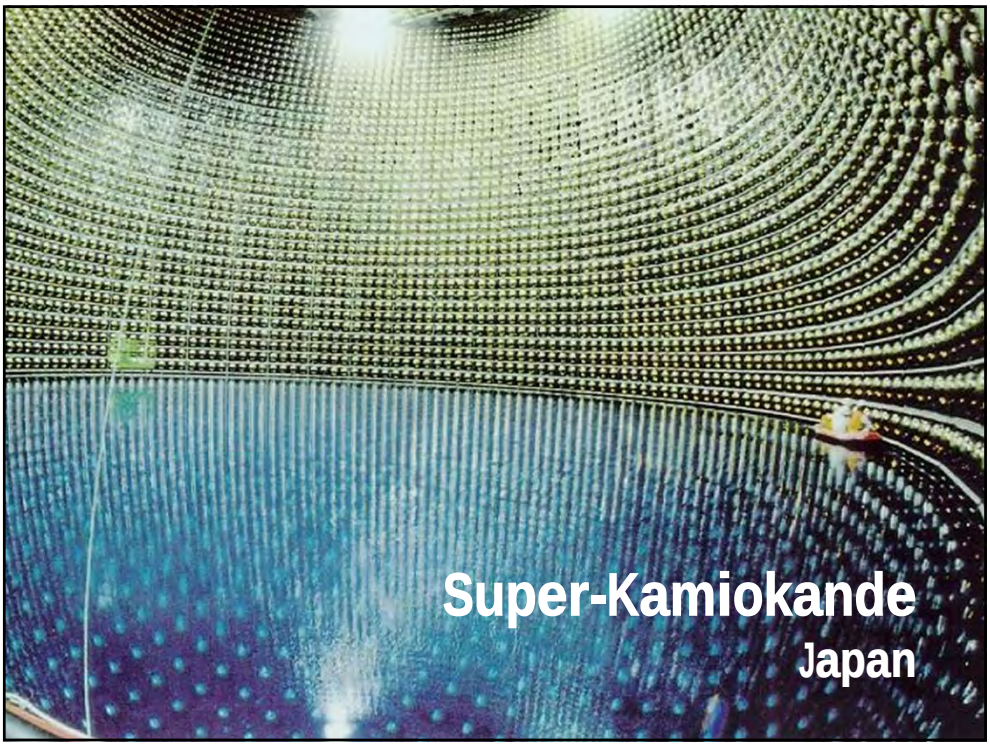
We have analysed ring-width records of two Miocene coniferous trees with an absolute age of 15–20 million years. Such data may reflect solar periodicities from the prehistoric past. Evidence for a main period of ~12.5 years has been found. This is near the present basic solar activity period of ~11 years. Other periodic components appear at 220, 150 and 53 years, respectively, which may also be related to solar variations.

Terra Nova, **5**, 359-363, 1993.

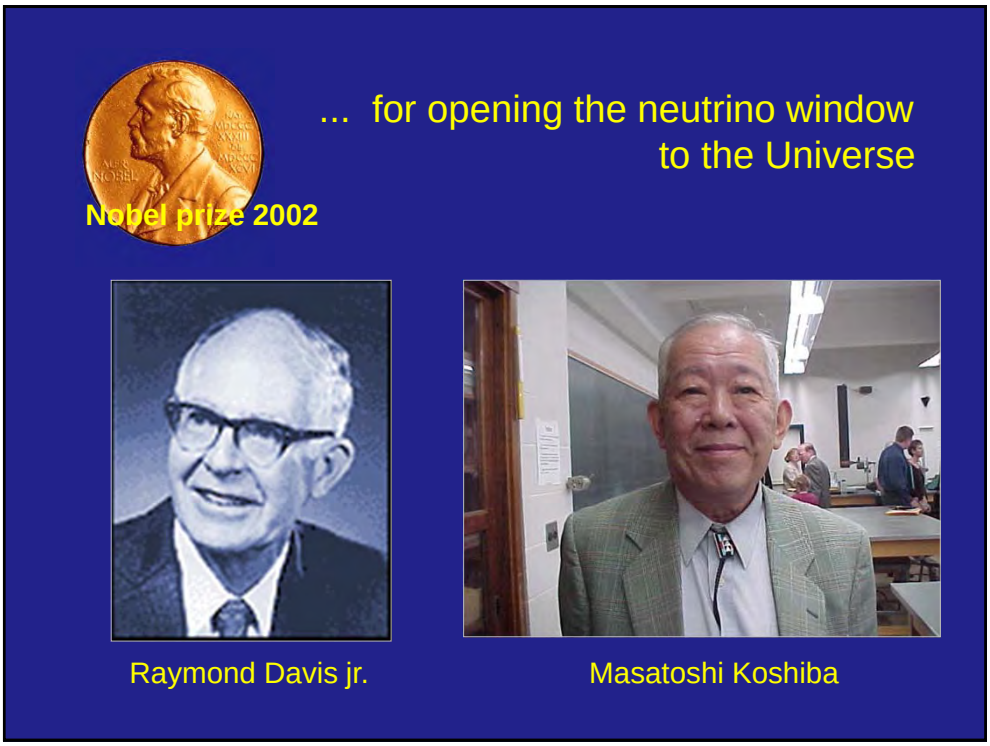
lute age of 15–20 Myr. The tree trunks were found in lignite mines. Since modern mining techniques make it rather unlikely that tree stumps could be detected and saved in lignite mines, specimens such as those evaluated in this work are rarely found nowadays.

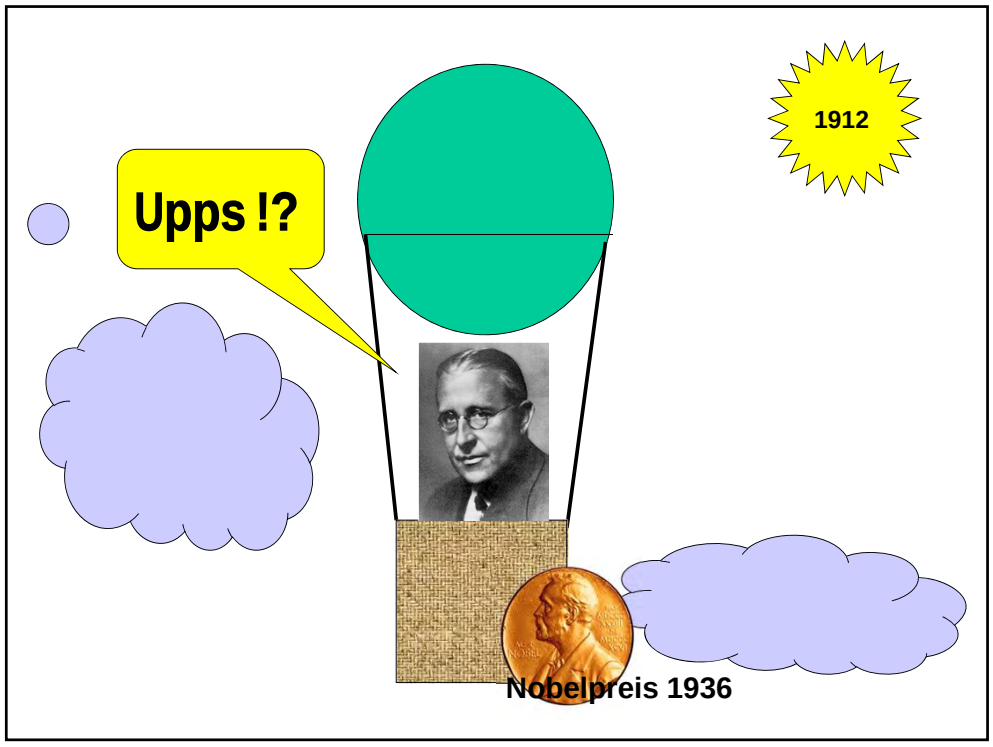
The paper is organized as follows: In section 2, we introduce the data samples and comment on the excavation sites as well as the climate during the growing periods. The statistical analysis of the ring-width sequences is per-

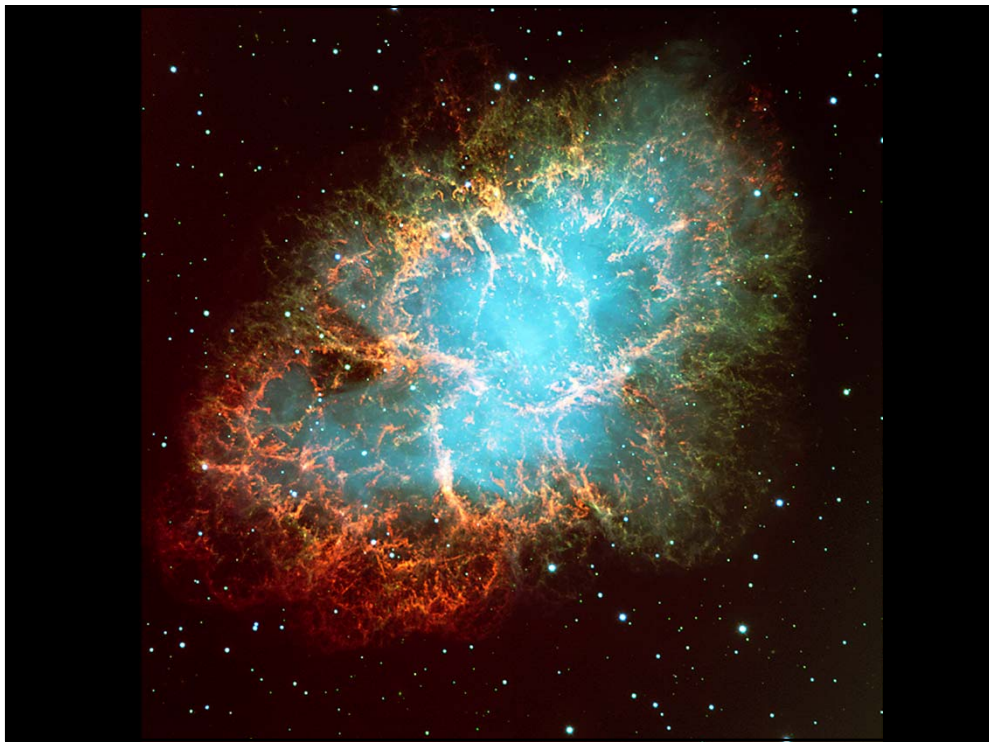

~ 160 000 Jahre

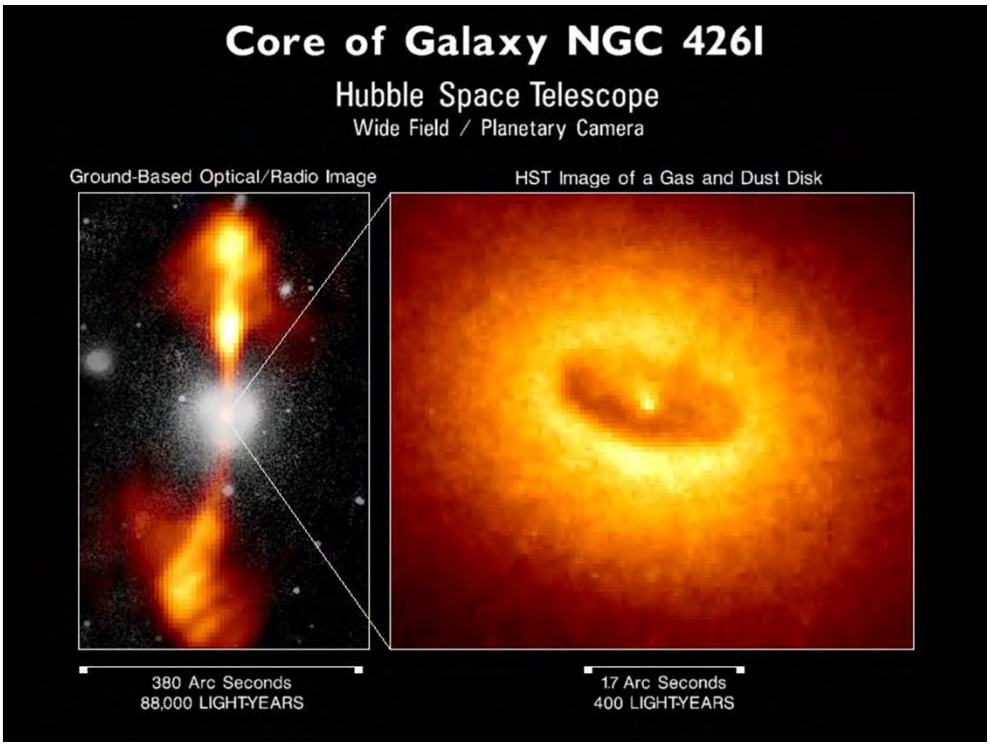

Super-Kamiokande
Japan

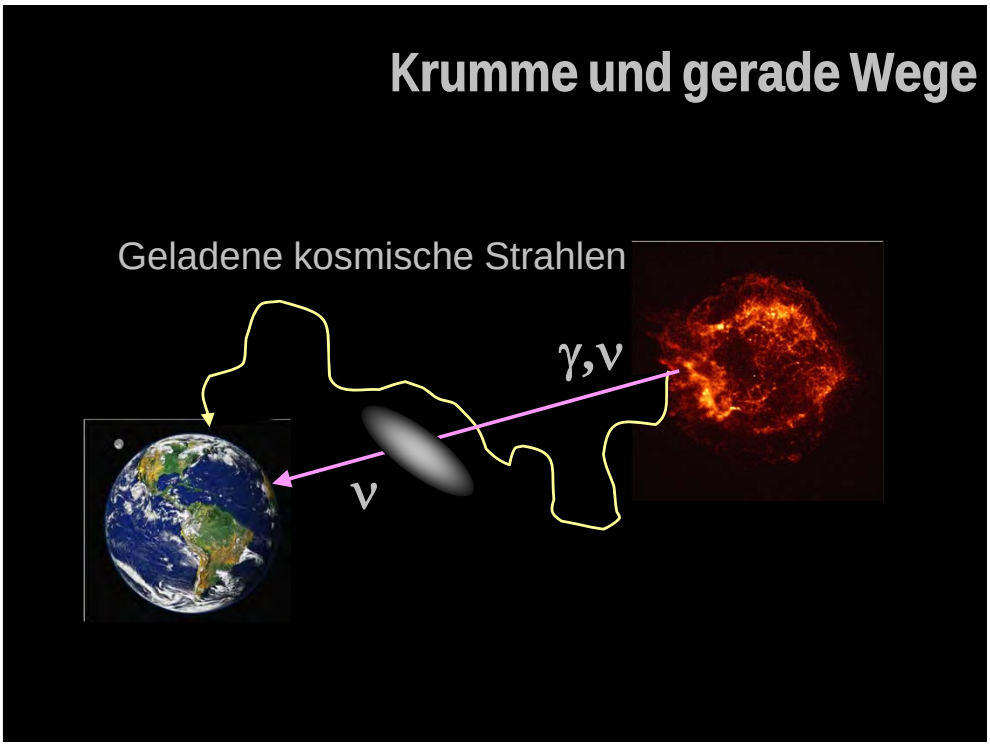

Temperatur im frischen Neutron-Stern:
35-45 Millarden Grad
Neutrino-Masse < 20 eV
....
Super-Kamiokande
Japan

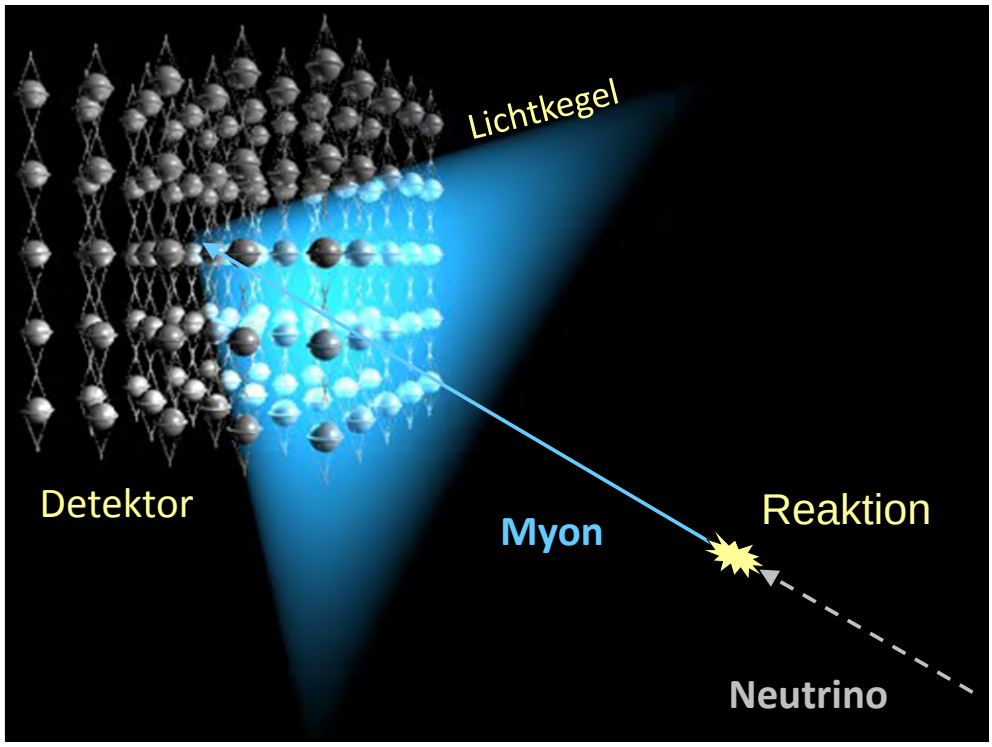

... for opening the neutrino window to the Universe
Nobel prize 2002
Raymond Davis jr.
Masatoshi Koshiba

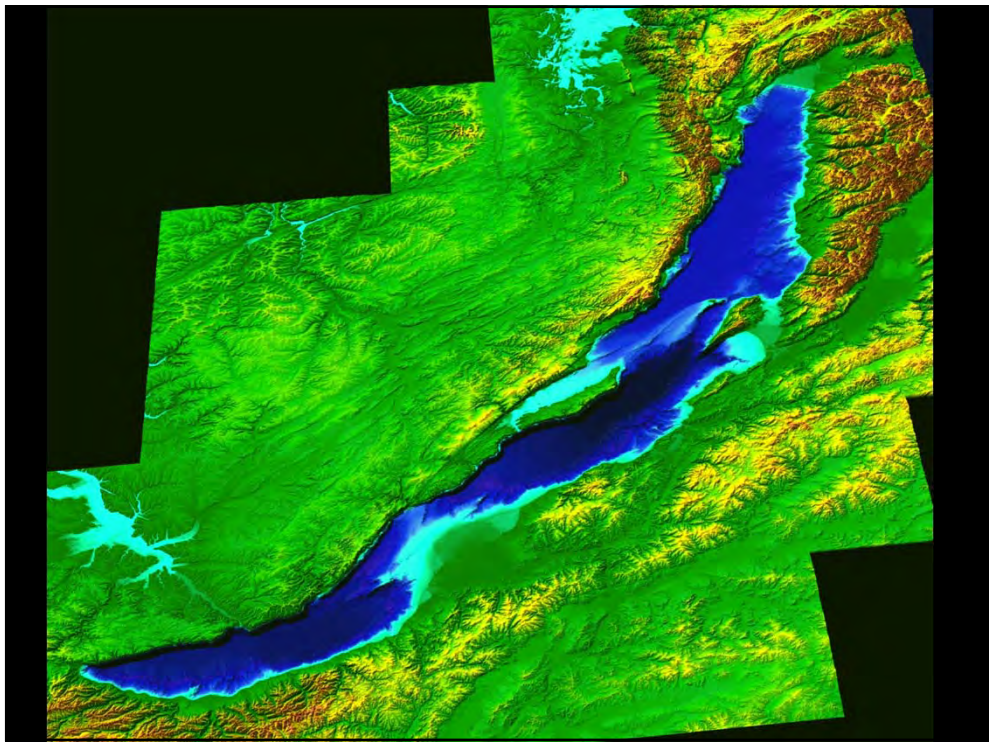

1912
Upps !?
Nobelpreis 1936




Core of Galaxy NGC 4261
Hubble Space Telescope
Wide Field / Planetary Camera
Ground-Based Optical/Radio Image
HST Image of a Gas and Dust Disk
380 Arc Seconds
88,000 LIGHT-YEARS
1.7 Arc Seconds
400 LIGHT-YEARS


Krumme und gerade Wege
Geladene kosmische Strahlen
γ,ν
ν


Lichtkegel
Detektor
Myon
Reaktion
Neutrino

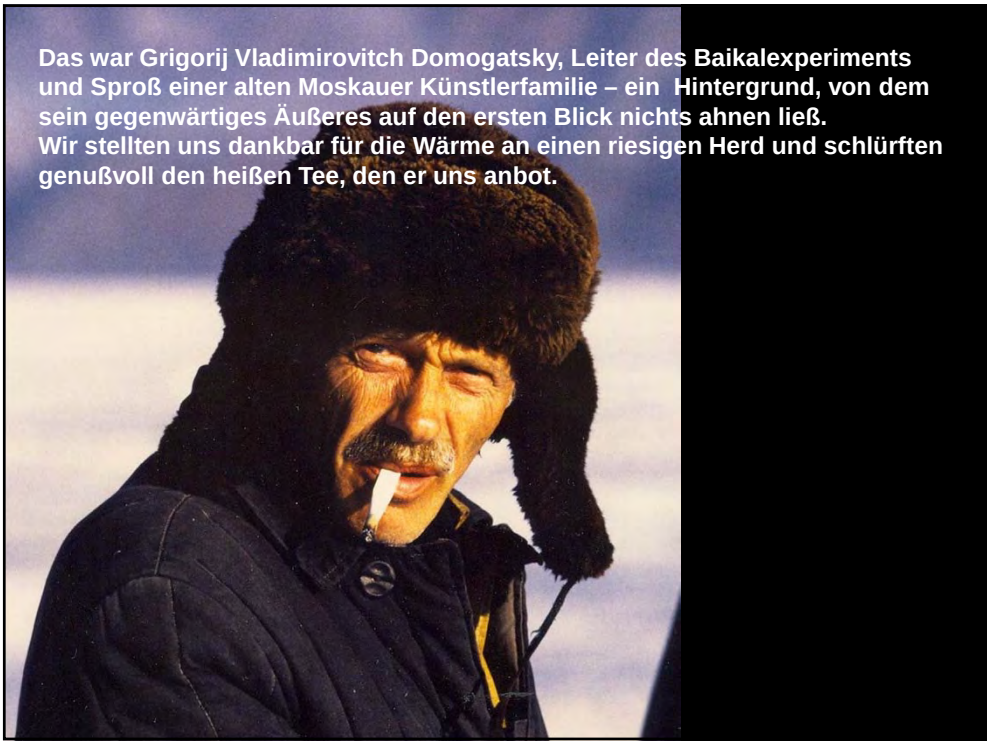



März 1988

An einem großen Tisch saßen einige martialisch aussehende Gestalten in Wattejacken und dicken Filzstiefeln, tranken Tee und rauchten was das Zeug hielt. Bei unserem Eintritt erhob sich einer von ihnen, nahm die Papyrossy aus dem Mund und hieß uns willkommen.

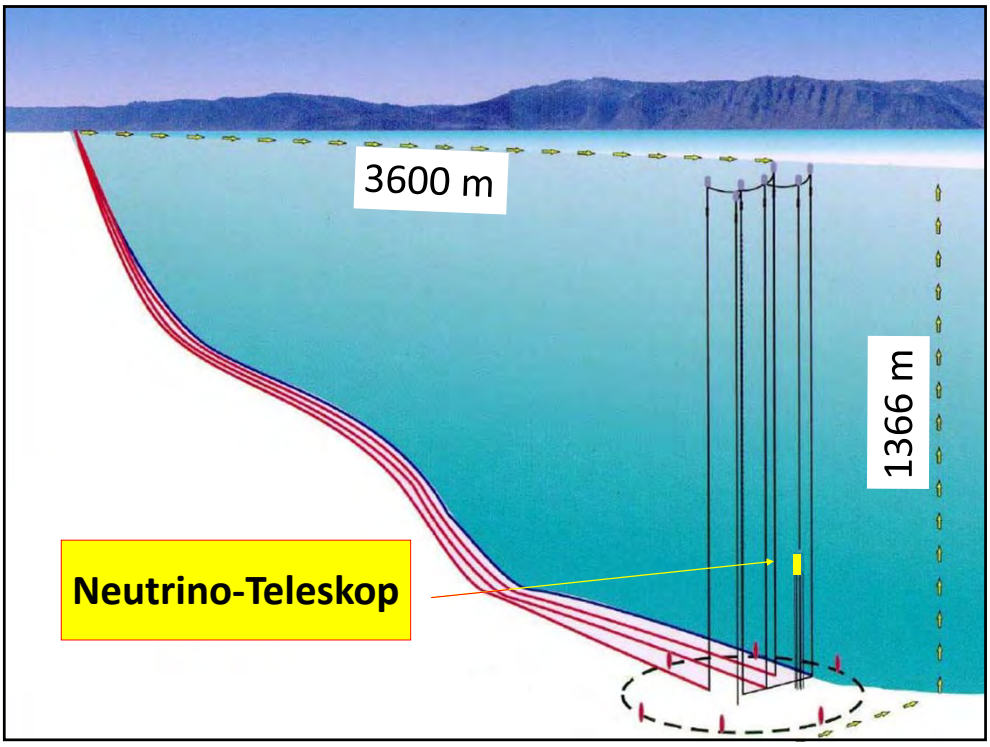
Aus: „Neutrinojagd im tiefsten See der Welt“

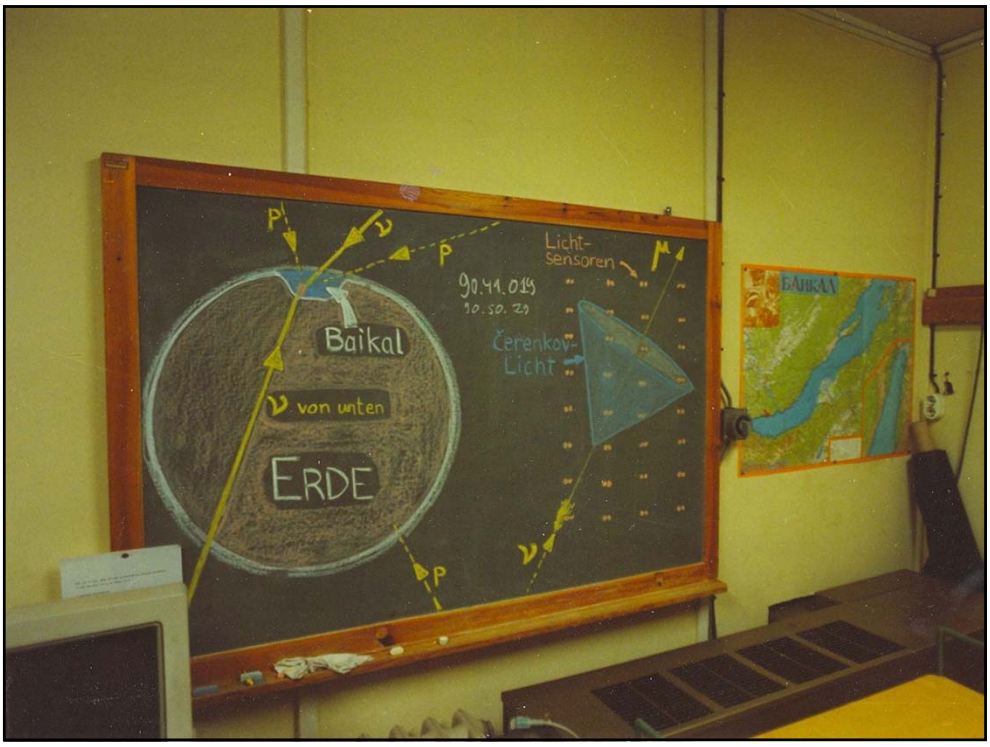
C.S. 2000

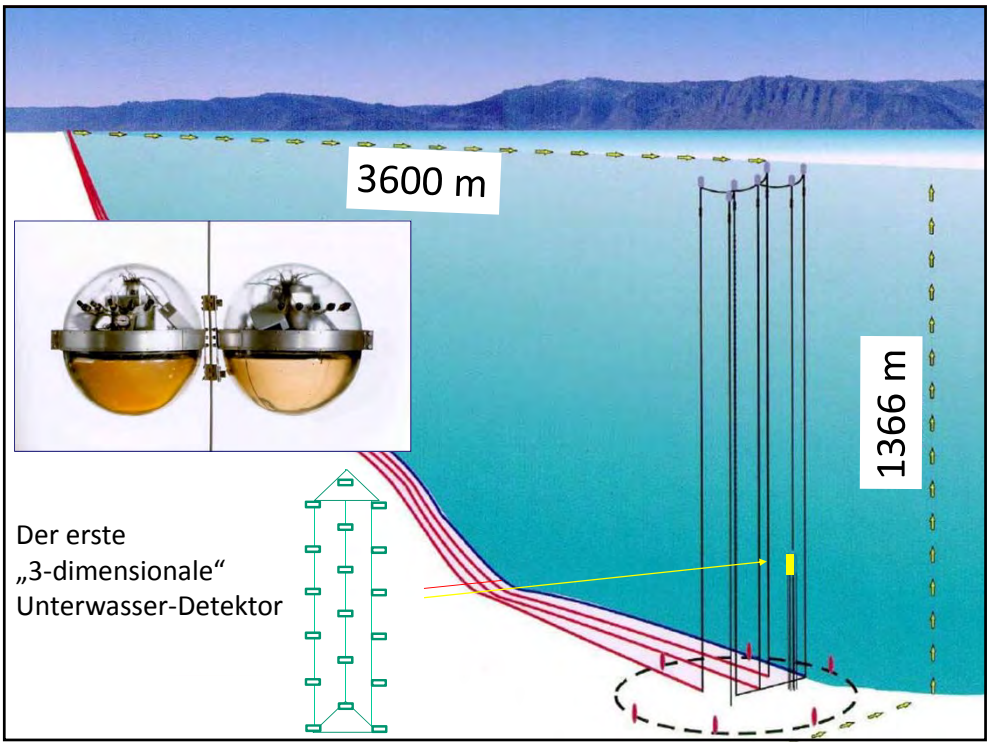


Das war Grigorij Vladimirovitch Domogatsky, Leiter des Baikalexperiments und Sproß einer alten Moskauer Künstlerfamilie – ein Hintergrund, von dem sein gegenwärtiges Äußeres auf den ersten Blick nichts ahnen ließ.
Wir stellten uns dankbar für die Wärme an einen riesigen Herd und schlürften genußvoll den heißen Tee, den er uns anbot.

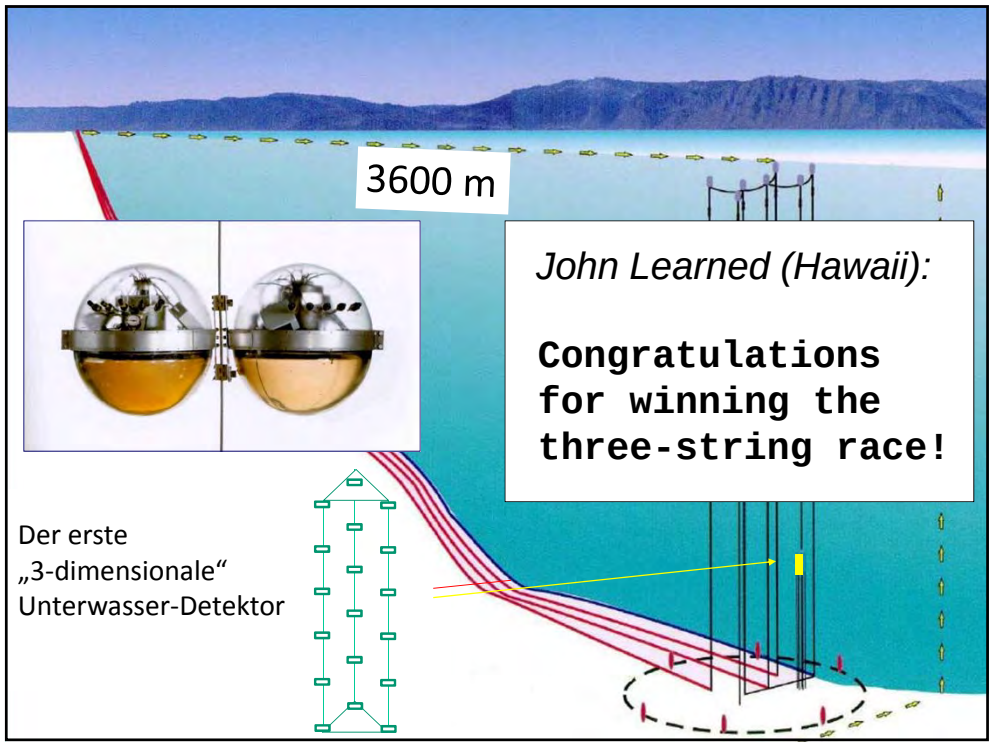

1988

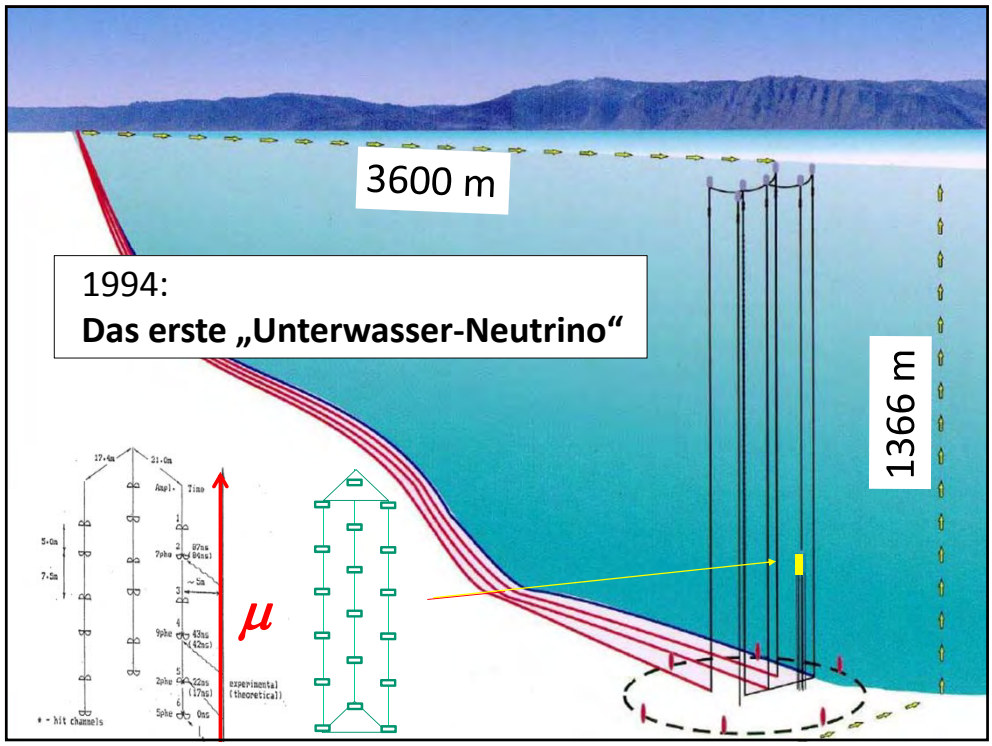

3600 m
1366 m
Neutrino-Teleskop


P
ν
P
Licht-
sensoren
μ
Baikal
Čerenkov-
Licht
ν von unten
ERDE
P
ν
BAIKAL



Der erste
„3-dimensionale“
Unterwasser-Detektor


3600 m
John Learned (Hawaii):
Congratulations for winning the three-string race!
Der erste „3-dimensionale“ Unterwasser-Detektor

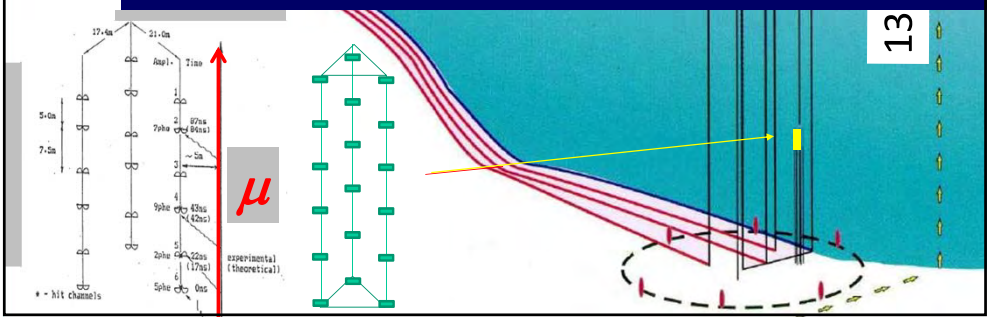

3600 m
1994:
Das erste „Unterwasser-Neutrino“
1366 m
μ

Telegram G.V. Domogatsky an C. Spiering:

Lieber Christian,

zunächst das Interessanteste: Bei der Analyse der Daten von 1994 trotzt ein Ereignis kategorisch allen Tests, und es sieht sehr nach einem Neutrino aus.

Natürlich möchte ich nicht entscheiden, ob wir dieses Ereignis als das erste klare Neutrino in einem Unterwasserdetektor deklarieren. Aber ein sehr neutrino-*ähnliches* Ereignis kann man es wohl nennen, und es scheint mir sehr wünschenswert, genau das in zwei oder drei Wochen einer genügend breiten Öffentlichkeit mitzuteilen.



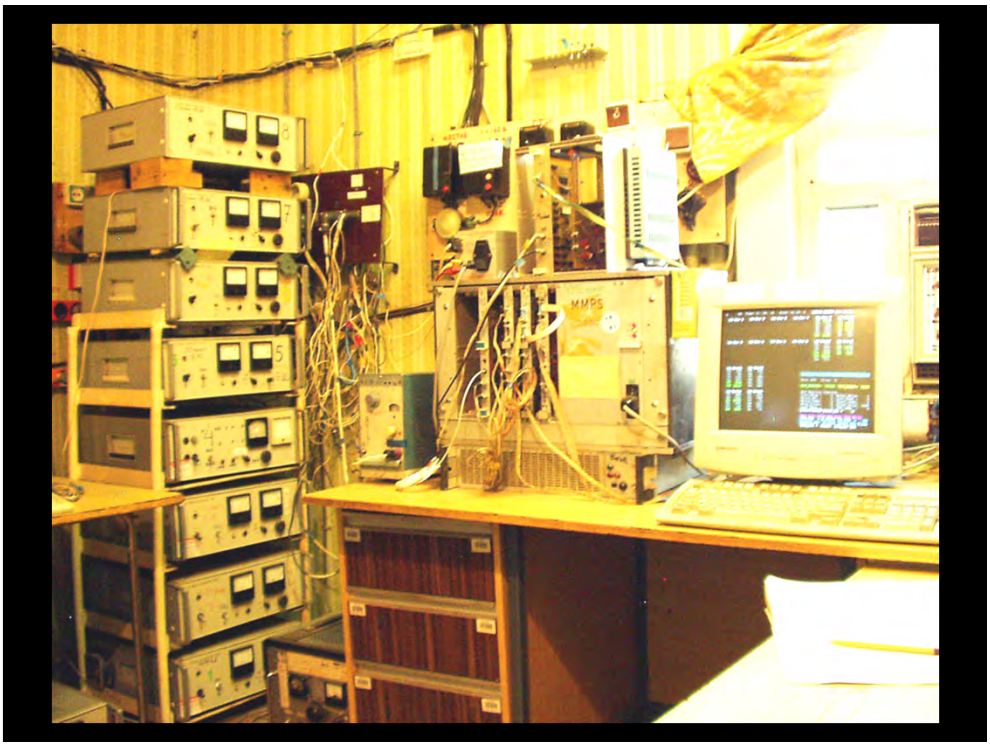
DESY-Beiträge:

- Transputer- und Monitorsystem in der Uferstation

Ralf Wischnewski in der Uferstation

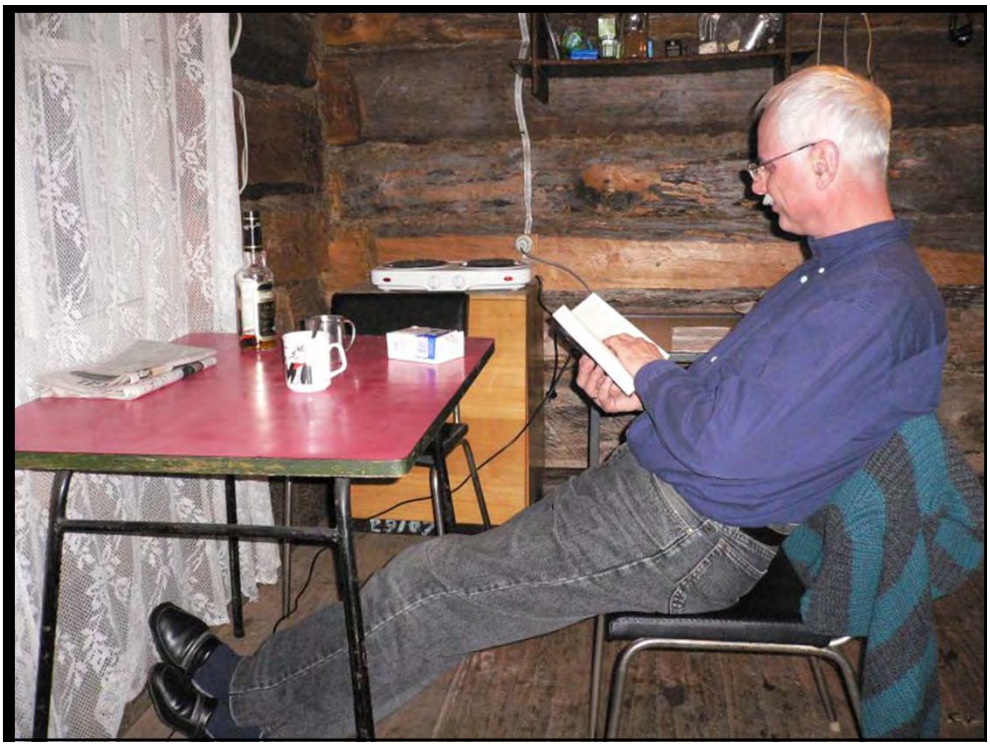
- Laser calibration system
- Monopol -Trigger

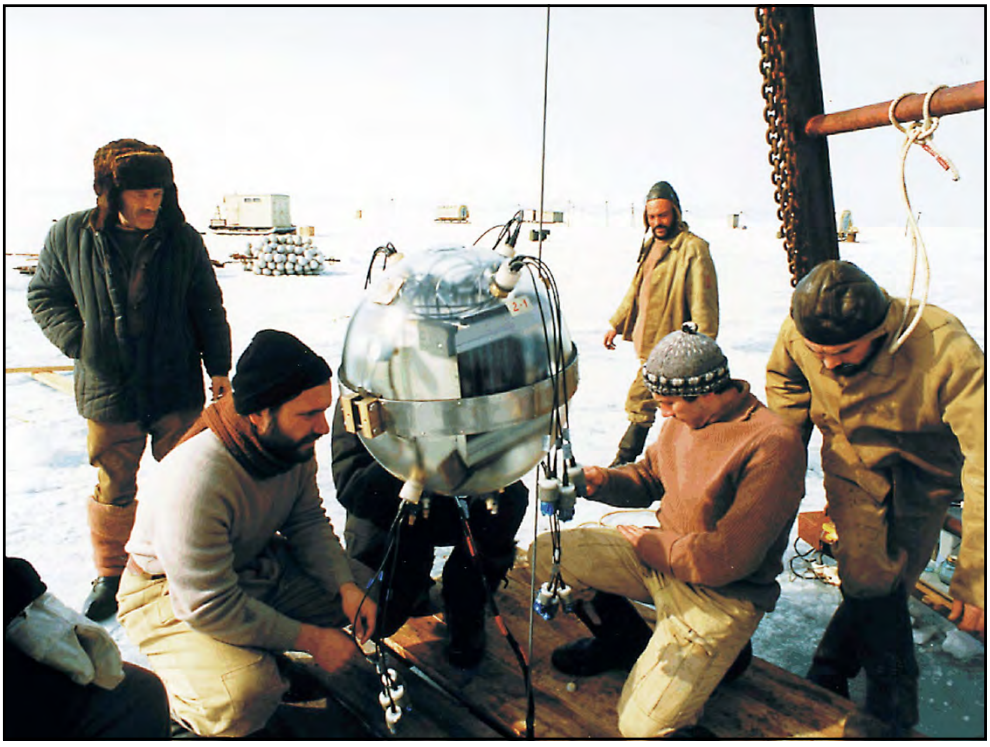
← Thomas Mikolajski mit dem Unterwasser -Laser

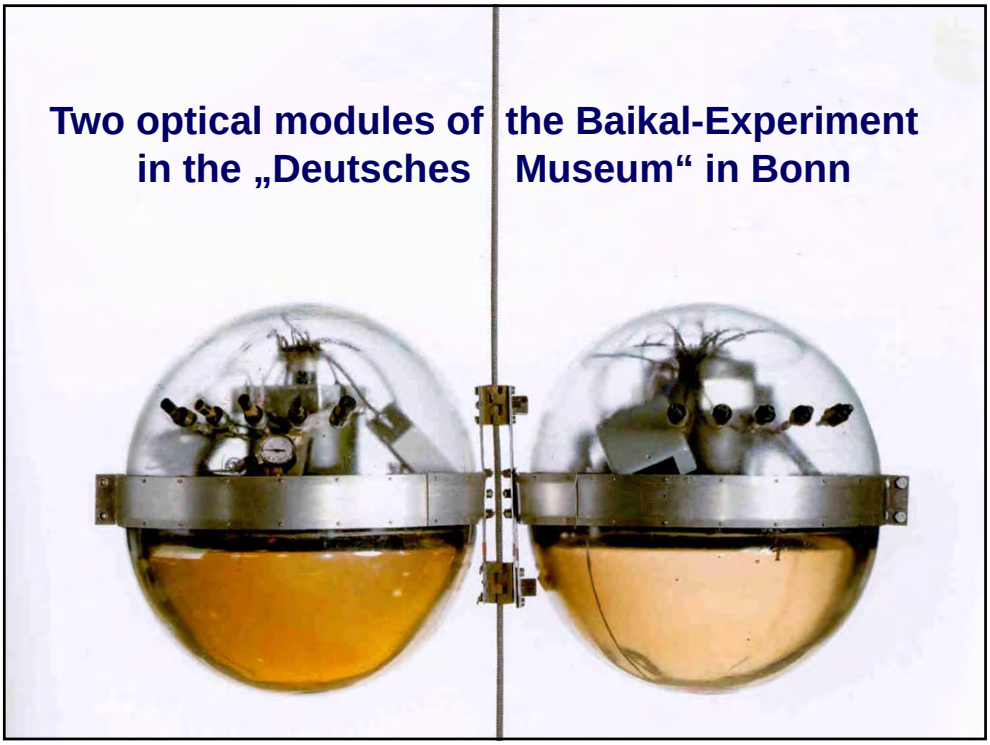



Thorsten Thon feiert seinen 50. Geburstag:
Der Monopol-Trigger


JAMES COOK
acer






Two optical modules of the Baikal-Experiment
in the „Deutsches Museum“ in Bonn


НЕ БРОСАТЬ!!
ОВЕН
DESY - IHH


60 kg Butter
40 kg Margarine
25 l Öl
200 kg Zucker
200 kg Reis
20 kg Kaffee
10 kg Tee
300 Tafeln Schokolade
50 kg Käse
300 kg Wurst und Fleischkonserven
Vitamine und Medikamente


... Энтузиасты, усердие в работе которых – по сравнению с их зарплатами – вызывает определенные сомнения в их вменяемости ...
„Enthusiasten, deren Arbeitseifer - gemessen an ihren Gehältern – gewisse Zweifel an ihrer Zurechnungsfähigkeit aufkommen läßt"
Sergei Klimushin
in „Охота за нейтрином в самом глубоком озере мира"

TO Ch. SPIERING FROM
G.V. DOMOGATSKY

DEAR CHRISTIAN,

НАШ С ВАМИ ДЕФИЦИТ ВРЕМЕНИ ПРИВОДИТ НЕИЗБЕЖНО К ДЕФИЦИТУ ОБЩЕНИЯ.

1. ДЛЯ ИНФОРМАЦИИ. МЫ ЖИВЫ. ПОДРОБНОСТИ - С РАЛЬФОМ.

1. Zur Information. Wir leben noch. Einzelheiten – über Ralf.

ЭКОС

НОВОСТИ НАУКИ

Нейтрино на дне Байкала

Международный эксперимент идет не только в России, но и во многих странах мира

Vladimir Gubarev, PRAWDA

— Значит, идет соревнование?

— Я бы сказал резче — гонка.— Шпиринг улыбается.— Кто выиграет, станет ясно через год-полтора. Пока мы шли чуть впереди. В этом году еще способны конкурировать с другими полигонами. А что будет в недалеком будущем, пока мне сказать трудно.

...К сожалению, у немецкого ученого есть все основания для пессимизма. И не только в отношении фундаментальных работ по нейтрино.

Возвращались в Берлин ночью. В машине звучал Бах. Мы слушали великую музыку и молчали. Было грустно и больно.

НЕКОС

ПОВОСТИ НАУКИ

Занят на неделе

Нейтрино на дне Байкала

Международный эксперимент идет не только в России, но и во многих странах мира

Vladimir Gubarev, PRAWDA

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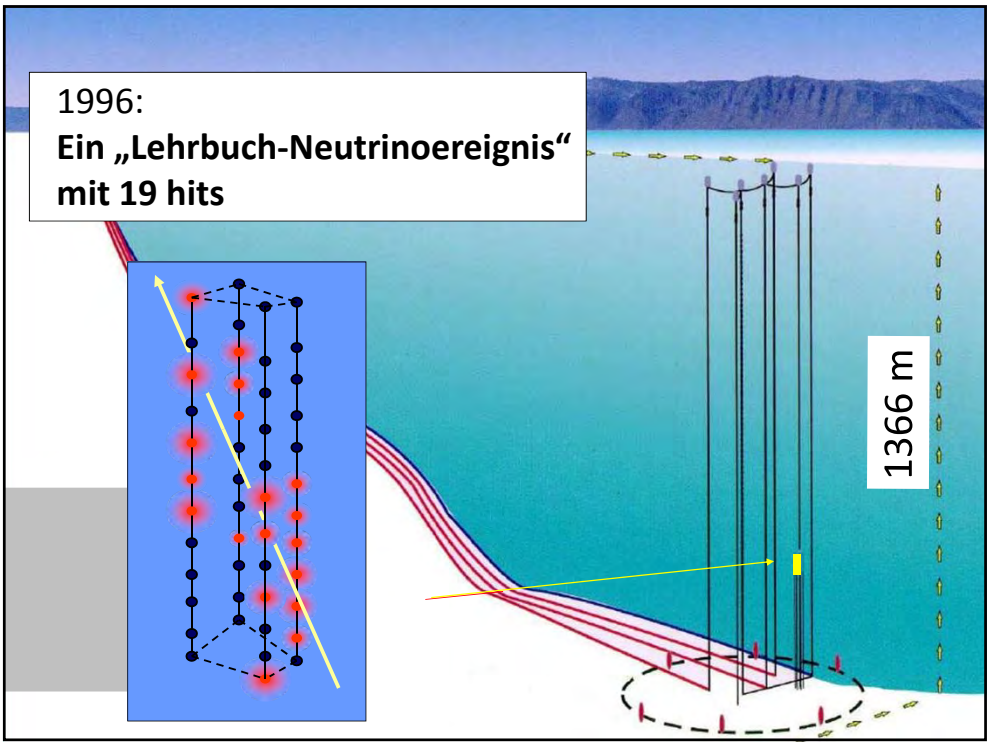
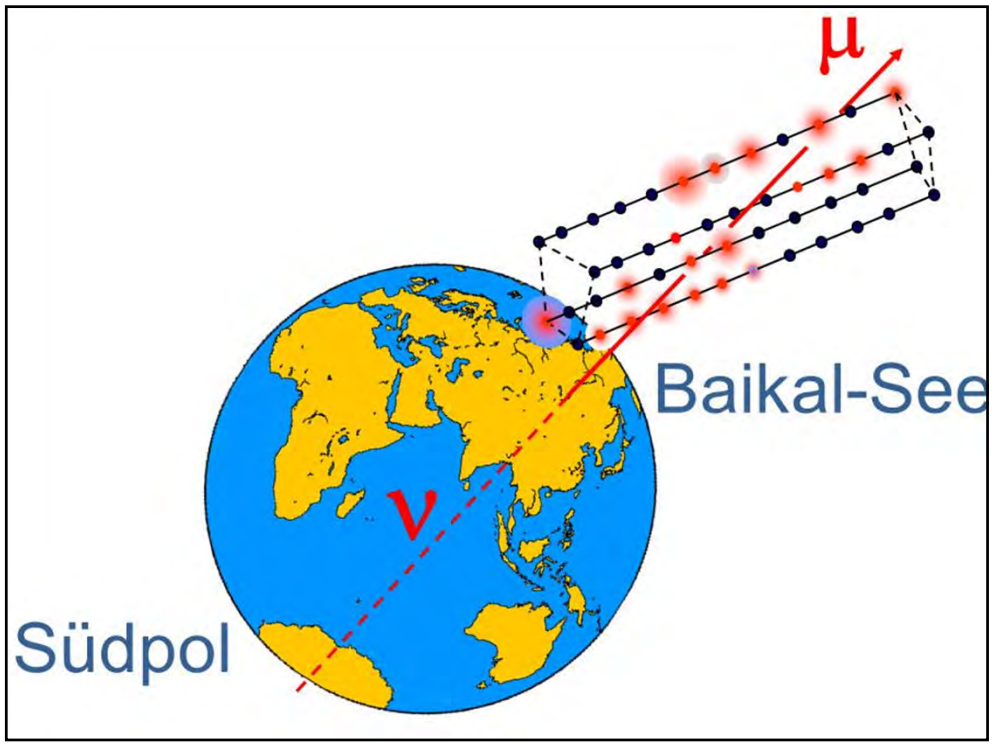
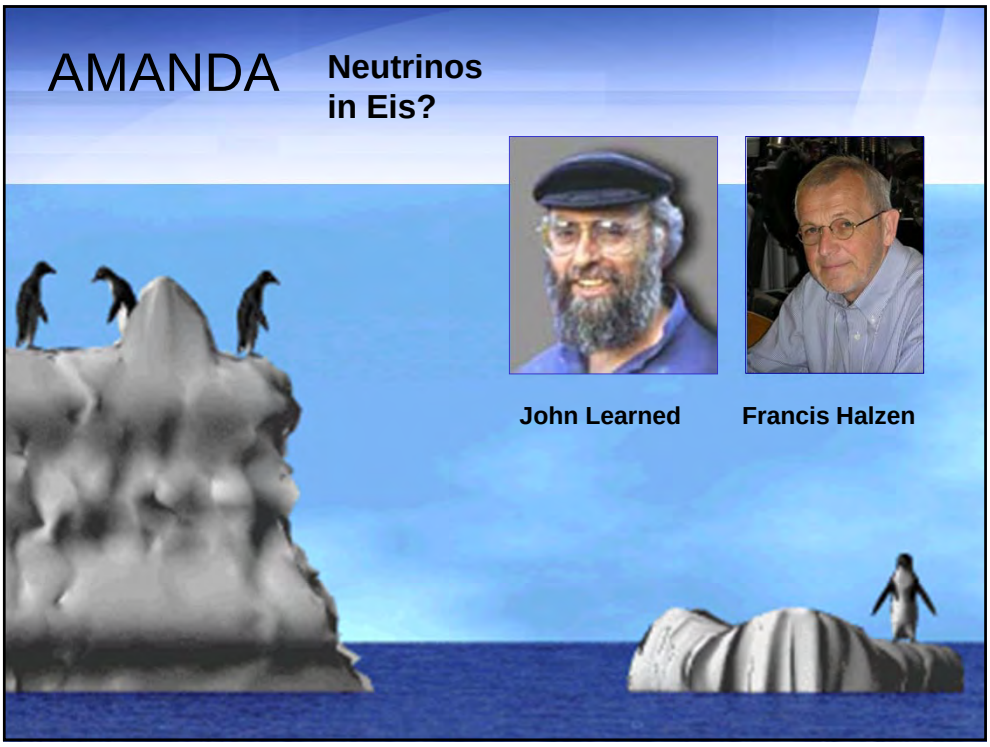
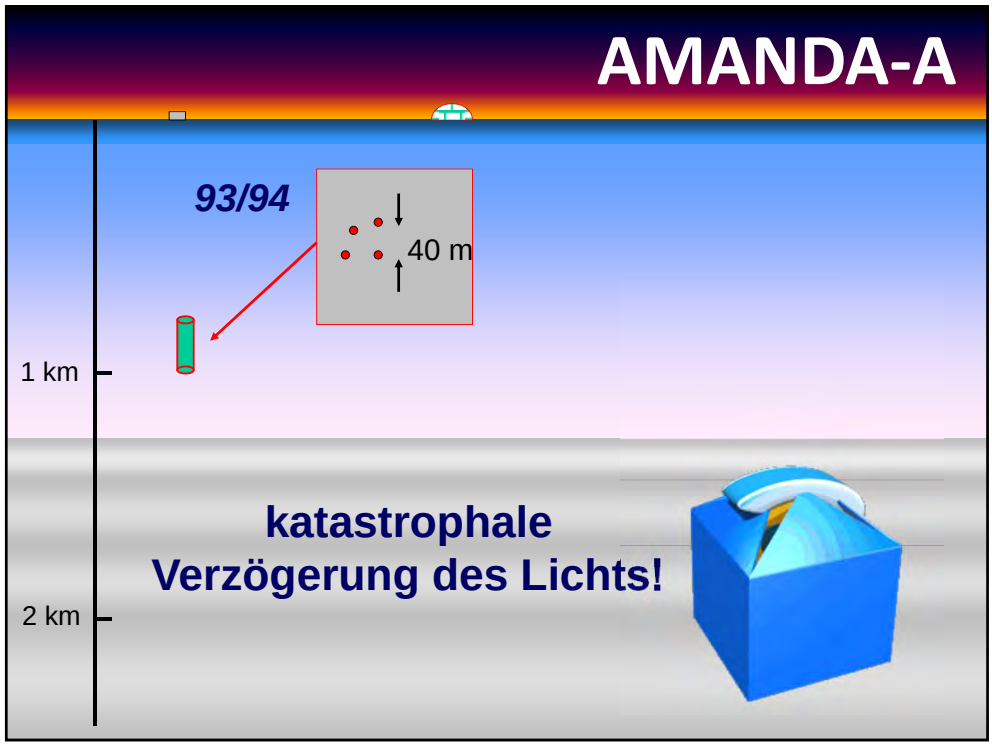
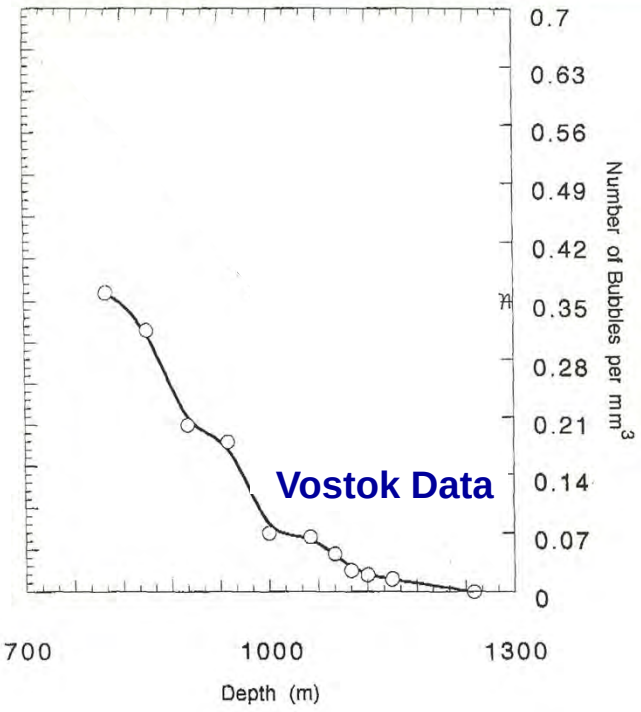

1996:
Ein „Lehrbuch-Neutrinoereignis“
mit 19 hits
1366 m


μ
Baikal-See
ν
Südpol

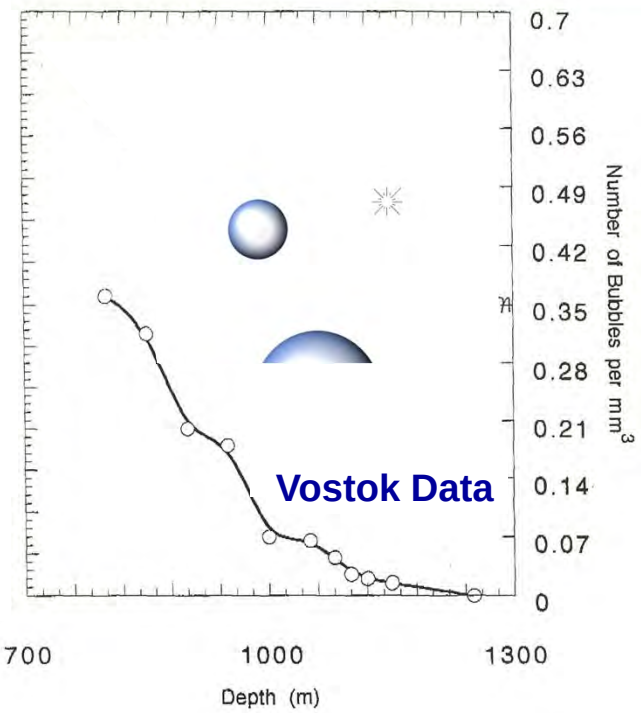

AMANDA
Neutrinos
in Eis?
John Learned
Francis Halzen


AMANDA-A
93/94
40 m
1 km
2 km
katastrophale
Verzögerung des Lichts!

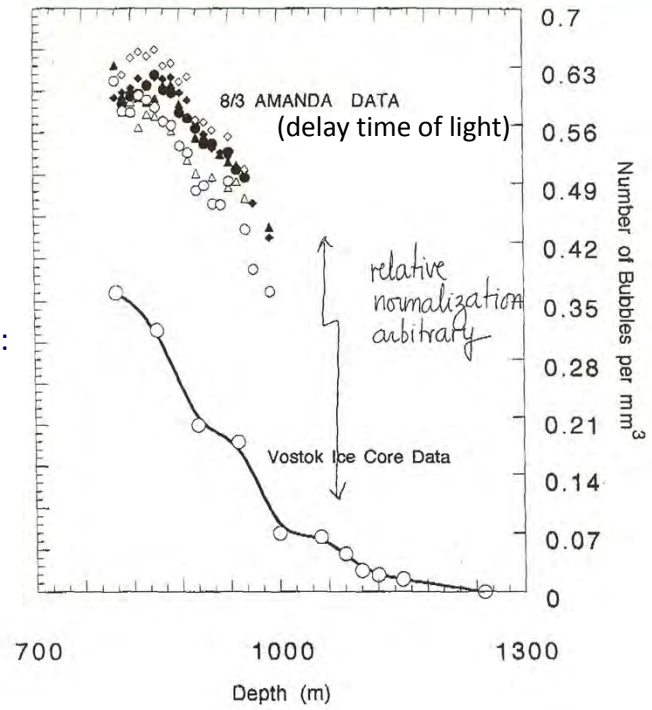
- Februar 94:
  Amanda misst die Verzögerung
- März 94, Venedig:
  G. Domogatsky verweist auf Vostok-Resultate: Streuung an Luftblasen ?!



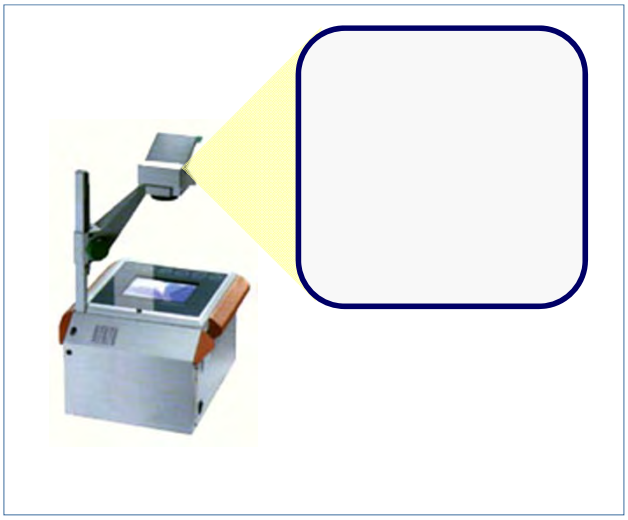
- Februar 94:
  Amanda misst die Verzögerung
- März 94, Venedig:
  G. Domogatsky verweist auf Vostok-Resultate: Streuung an Luftblasen ?!



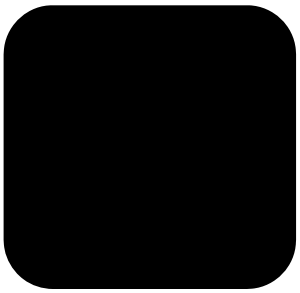
- Februar 94:
  Amanda misst die Verzögerung
- March 94, Venedig:
  G. Domogatsky verweist auf Vostok-Resultate: Streuung an Luftblasen ?!
- April 94:
  Tendenz durch Amanda-Daten bestätigt!

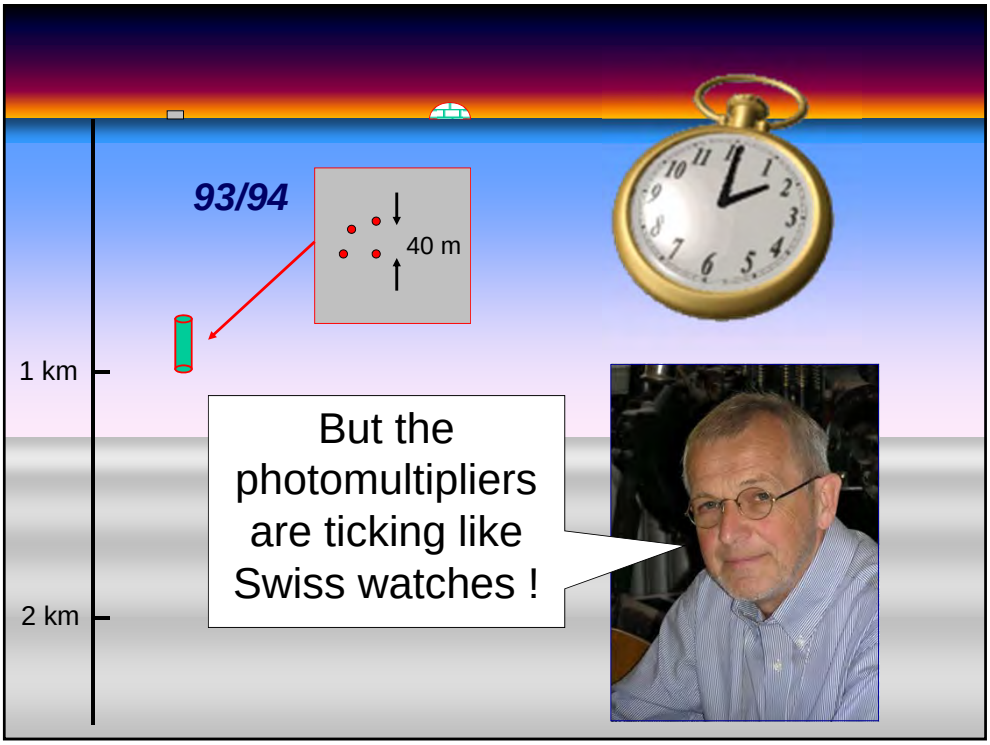


Vic Stenger (DUMAND): This is what Amanda sees

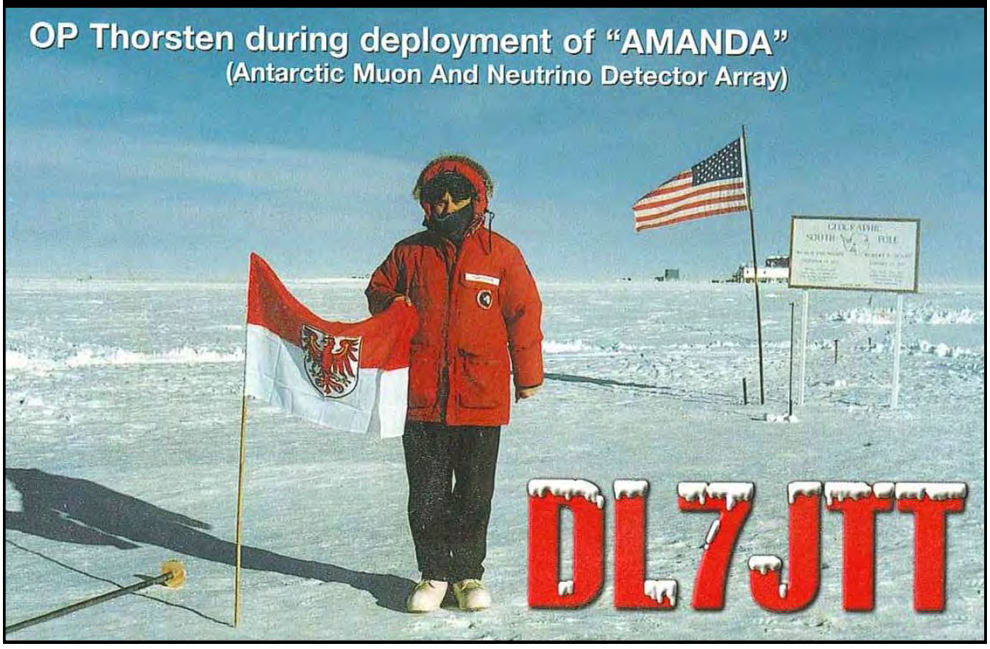


Francis Halzen: and this is what DUMAND sees

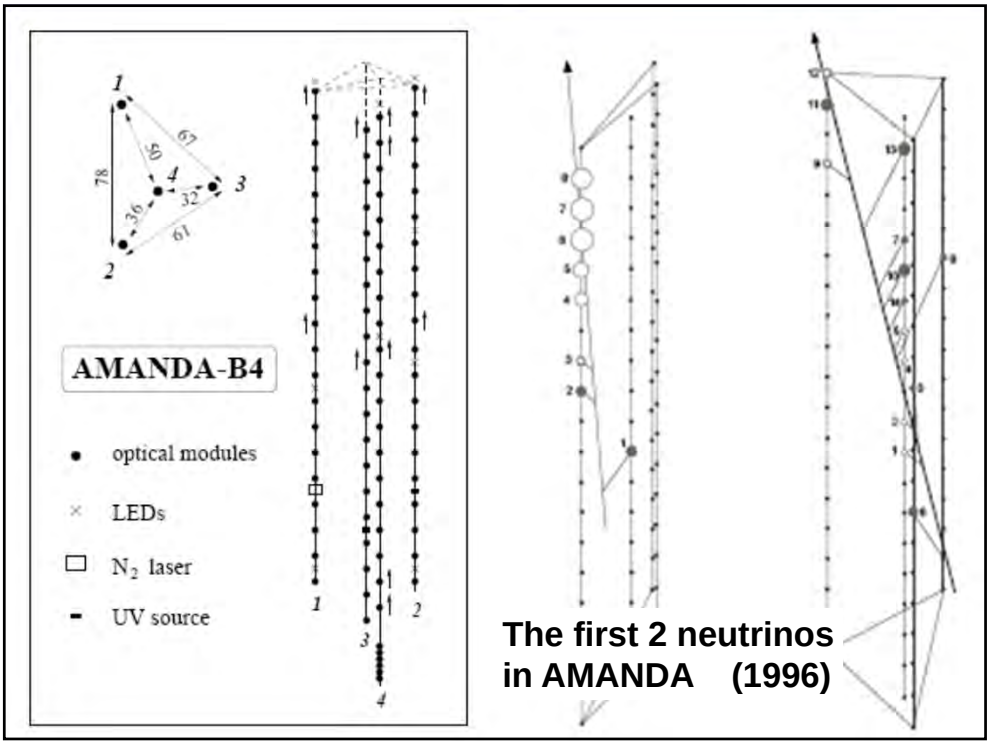




1994/95: Ralf, Thorsten Thon und Hans Heukenkamp zum Pol



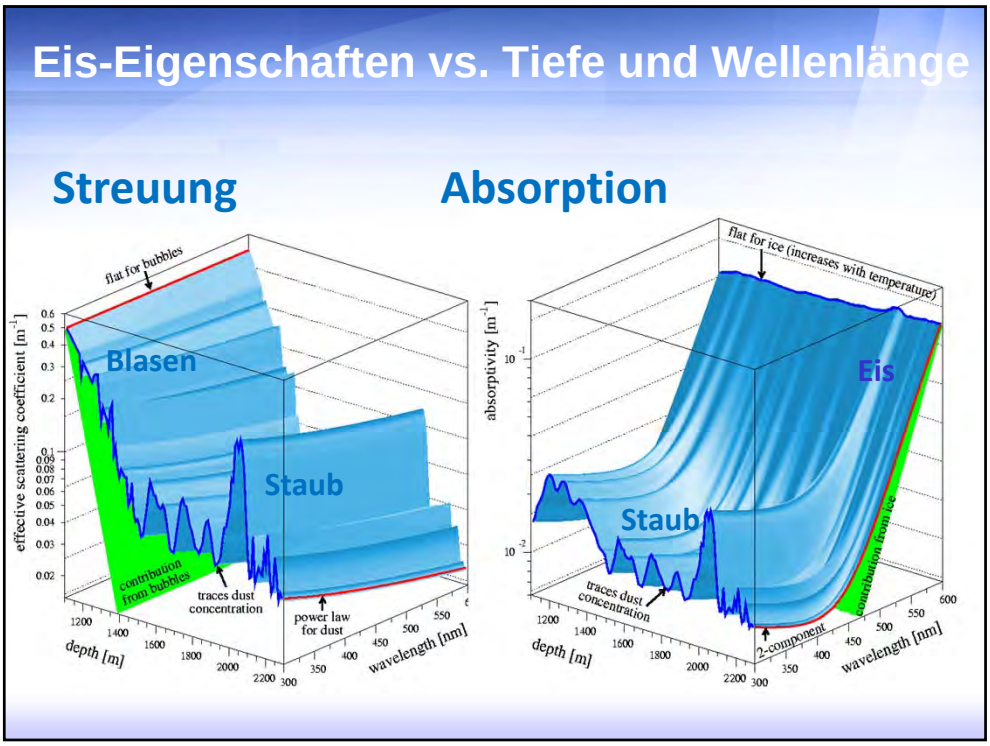

GEOGRAPHIC
SOUTH POLE
ROBERT F. SCOTT
JANUARY 17, 1912


AMANDA-B4
optical modules
LEDs
N_2 laser
UV source
The first 2 neutrinos
in AMANDA (1996)


Lauter Hürden


Das Blasen-Problem
Amanda:
Sein oder Nichtsein!


Das Eis-Problem


Eis-Eigenschaften vs. Tiefe und Wellenlänge
Streuung
Absorption
flat for bubbles
Blasen
Staub
contribution from bubbles
traces dust concentration
power law for dust
effective scattering coefficient [m⁻¹]
depth [m]
wavelength [nm]
flat for ice (increases with temperature)
Eis
Staub
contribution from ice
traces dust concentration
2-component
absorptivity [m⁻¹]
depth [m]
wavelength [nm]

Spur-Rekonstruktion

Observation of high-energy neutrinos using Čerenkov detectors embedded deep in Antarctic ice

E. Andrés*, P. Askebjer†, X. Bai‡, G. Barouch*, S. W. Barwick§, R. C. Bay‖, K.-H. Becker¶, L. Bergström†, D. Bertrand#, D. Bierenbaum§, A. Biron**, J. Booth§, O. Botner††, A. Bouchta**, M. M. Boyce*, S. Carius††, A. Chen*, D. Chirkin‖¶, J. Conrad††, J. Cooley*, C. G. S. Costa#, D. F. Cowen‡‡, J. Dailing§, E. Dalberg†, T. DeYoung*, P. Desiati**, J.-P. Dewulf#, P. Doksus*, J. Edsjö†, P. Ekström†, B. Erlandsson†, T. Feser§§, M. Gaug**, A. Goldschmidt‖, A. Goobar†, L. Gray*, H. Haase**, A. Hallgren††, F. Halzen*, K. Hanson‡‡, R. Hardtke*, Y. D. He‖, M. Hellwig§§, H. Heukenkamp**, G. C. Hill*, P. O. Hulth†, S. Hundertmark§, J. Jacobsen‖, V. Kandhadai*, A. Karle*, J. Kim§, B. Koci*, L. Köpke§§, M. Kowalski**, H. Leich**, M. Leuthold**, P. Lindahl††, I. Liubarsky*, P. Loaiza††, D. M. Lowder‖, J. Ludvig‖, J. Madsen*, P. Marciniewski††, H. S. Matis‖, A. Mihalyi‡‡, T. Mikolajski**, T. C. Miller‡, Y. Minaeva†, P. Miočinović‖, P. C. Mock§, R. Morse*, T. Neunhöffer§§, F. M. Newcomer‡‡, P. Niessen**, D. R. Nygren‖, H. Ögelman*, C. Pérez de los Heros††, R. Porrata§, P. B. Price‖, K. Rawlins*, C. Reed§, W. Rhode¶, A. Richards‖, S. Richter**, J. Rodriguez Martino†, P. Romenesko*, D. Ross§, H. Rubinstein†, H.-G. Sander§§, T. Scheider§§, T. Schmidt**, D. Schneider*, E. Schneider§, R. Schwarz*, A. Silvestri¶**, M. Solarz‖, G. M. Spiczak‡, C. Spiering**, N. Starinsky*, D. Steele*, P. Steffen**, R. G. Stokstad‖, O. Streicher**, Q. Sun†, I. Taboada‡‡, L. Thollander†, T. Thon**, S. Tilav*, N. Usechak§, M. Vander Donckt#, C. Walck†, C. Weinheimer§§, C. H. Wiebusch**, R. Wischnewski**, H. Wissing**, K. Woschnagg‖, W. Wu§, G. Yodh§ & S. Young§

NATURE 2001

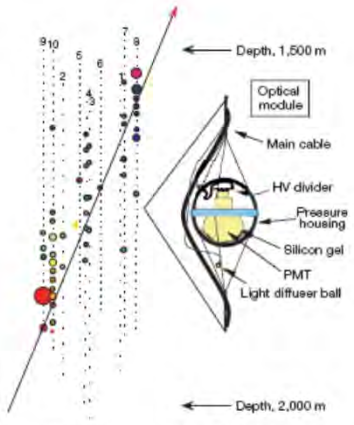


Figure 1 The AMANDA-B10 detector and a schematic diagram of an optical module. Each dot represents an optical module. The modules are separated by 20 m on the inner strings (1 to 4), and by 10 m on the outer strings (5 to 10). The coloured circles show pulses from the photomultipliers for a particular event; the sizes of the circles indicate the amplitudes of the pulses and the colours correspond to the time of a photon's arrival. Earlier times are in red and later ones in blue. The arrow indicates the reconstructed track of the upwardly propagating muon.

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NATURE 2001

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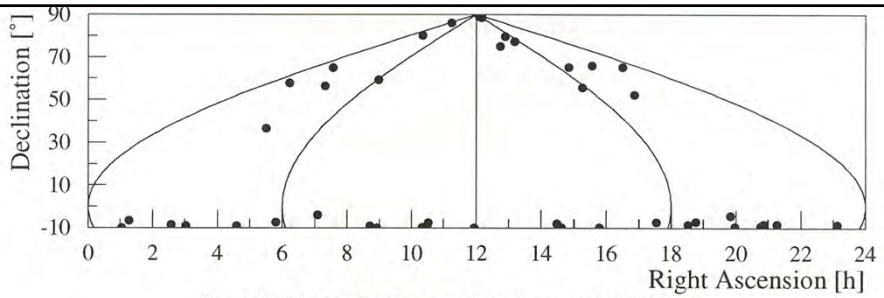
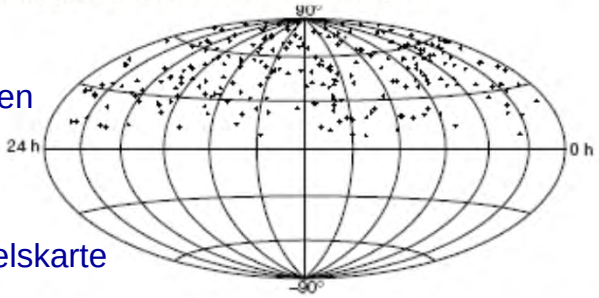


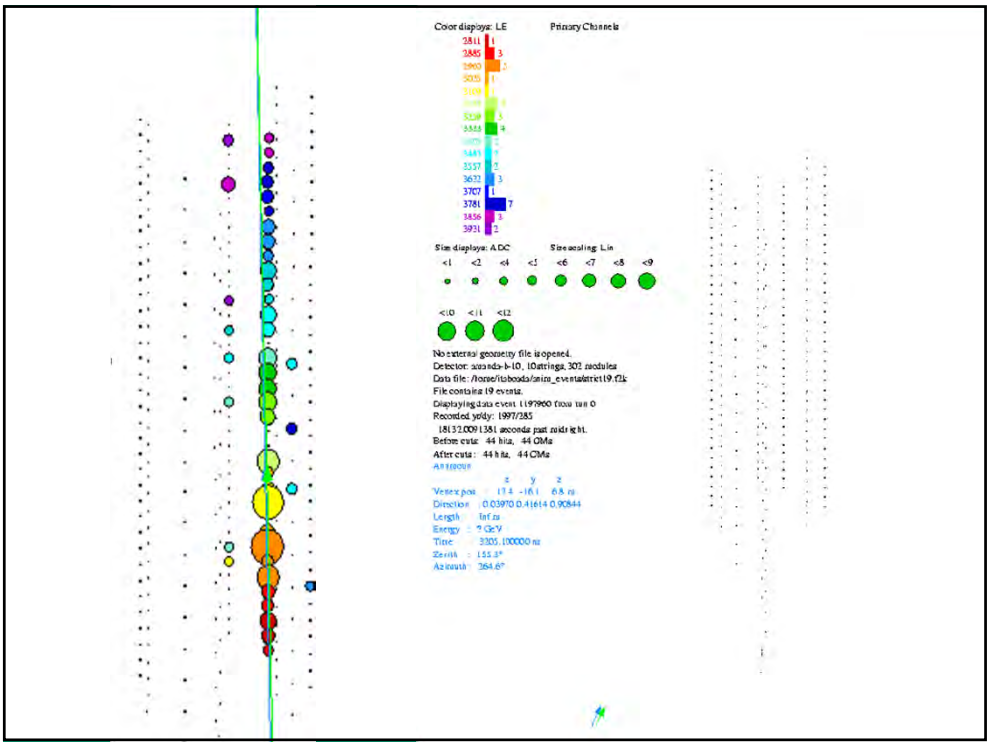
Figure 2: Sky plot of all events that pass level 4 quality cuts.

Himmelskarte der ersten 17 Neutrino-Kandidaten (10 Strings)

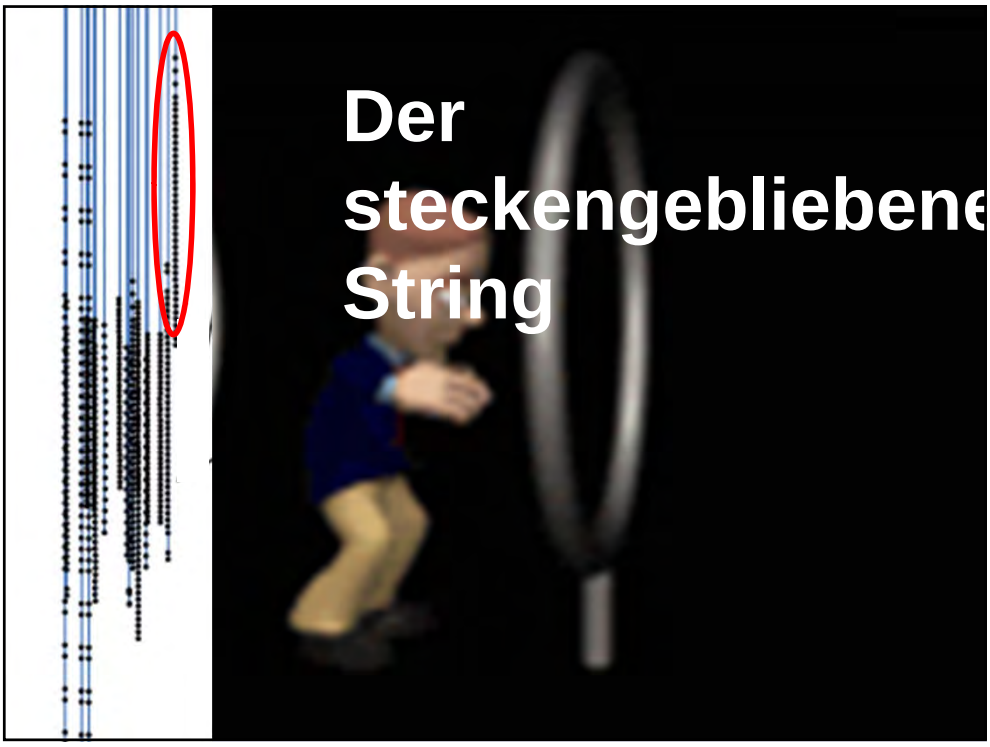


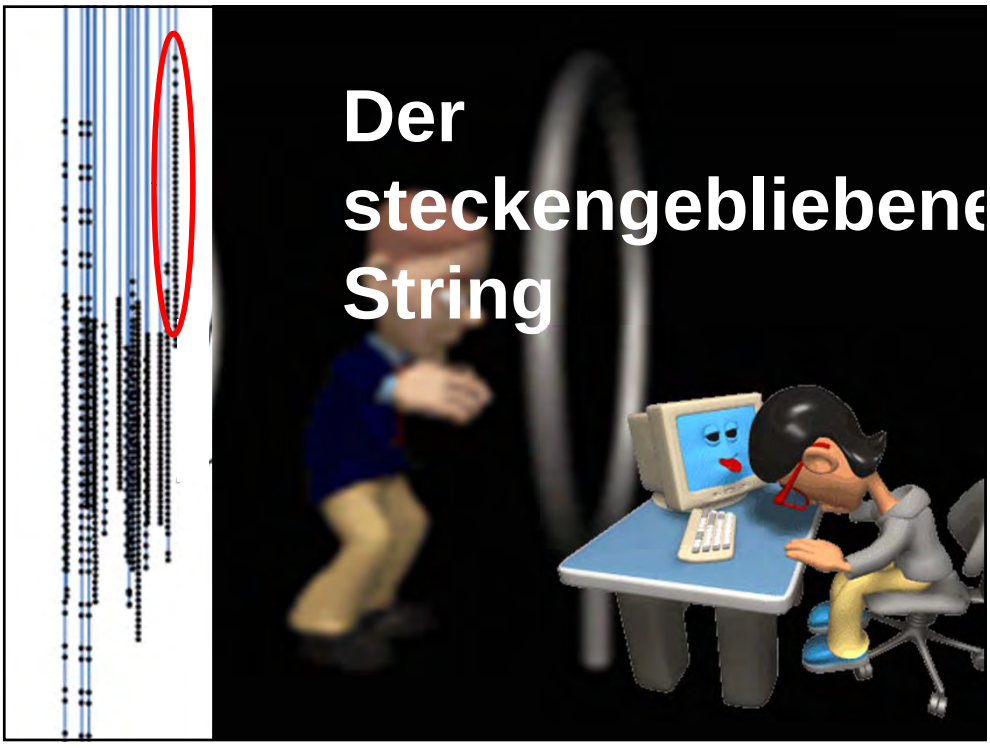
10-string Himmelskarte publiziert in in Nature 2001

Figure 4 Distribution in declination and right ascension of the upwardly propagating events on the sky. The 263 events shown here are taken from the upward muons contained in both analysis A and analysis B. The median difference between the true and the reconstructed muon angles is about 3 to 4 degrees.


Color displays: LE
Primary Channels
Size displays: ADC
Size scaling: Lin
No external geometry file is opened.
Displaying data event 1197900 from run 0
Recorded: y04y: 1997/285
Before cuts: 44 hits, 44 OMs
After cuts: 44 hits, 44 OMs
Antiproton
Vertex pos : 17.4 -16.1 6.8 m
Direction : 0.03970 0.41614 0.90844
Length : Inf m
Energy : 9 GeV
Time : 3305.100000 ns
Zenith : 155.3°
Azimuth : 264.6°


Schrumpfende Signale


Der
steckengebliebene
String


Der
steckengebliebene
String

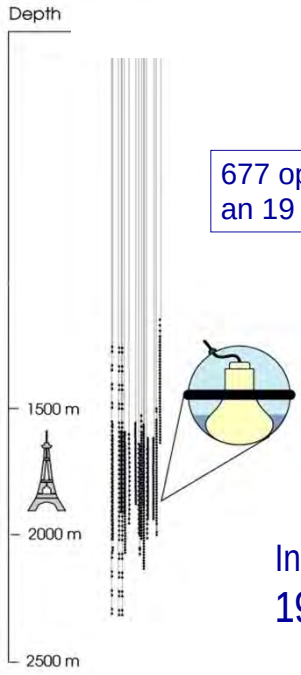

Miteinander
und nicht gegeneinander


Miteinander
und nicht gegeneinander
NO

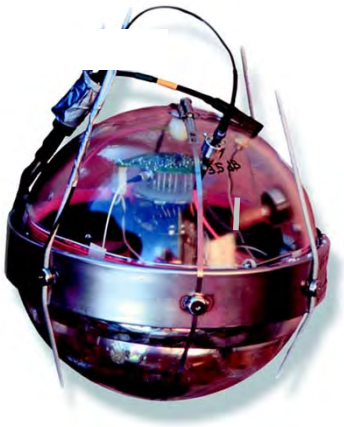

Miteinander
und nicht gegeneinander
PEACE


2000
das jahr der physik

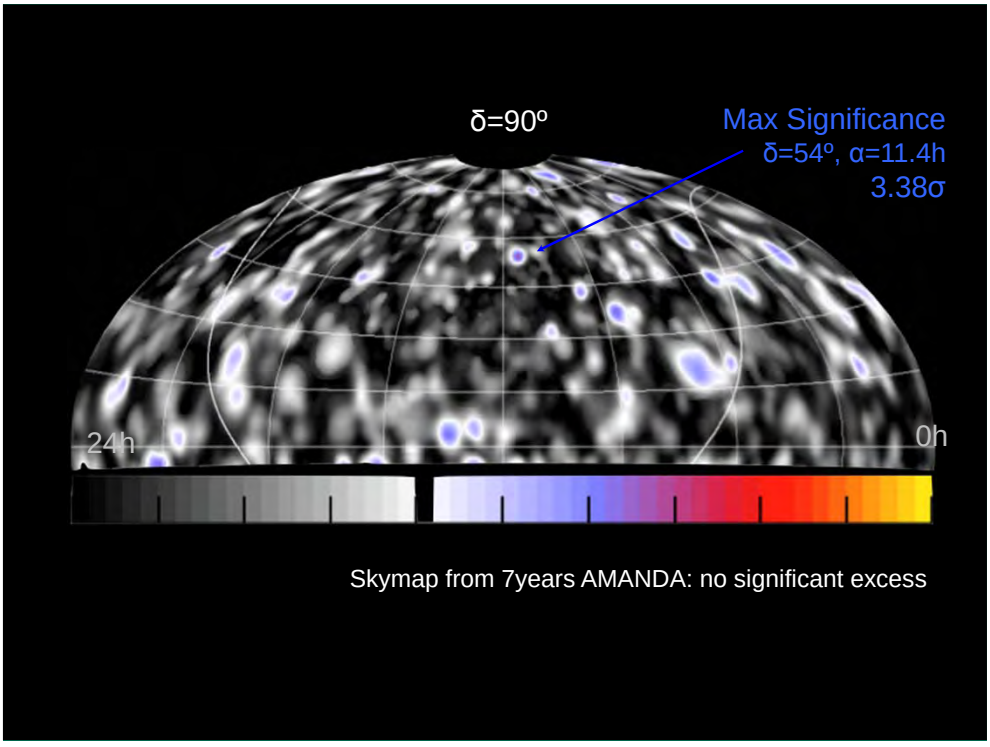
AMANDA



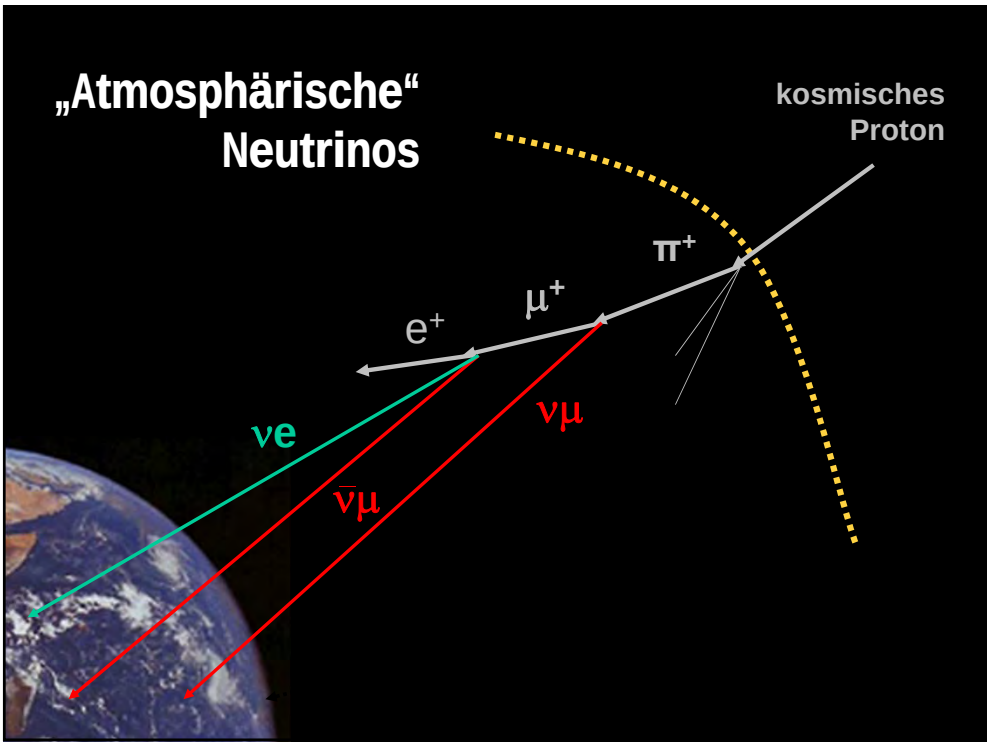
677 optische Module
an 19 Trossen



Installation
1996-2000

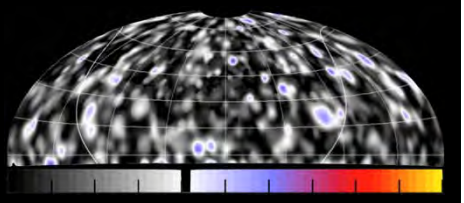


Skymap from 7years AMANDA: no significant excess



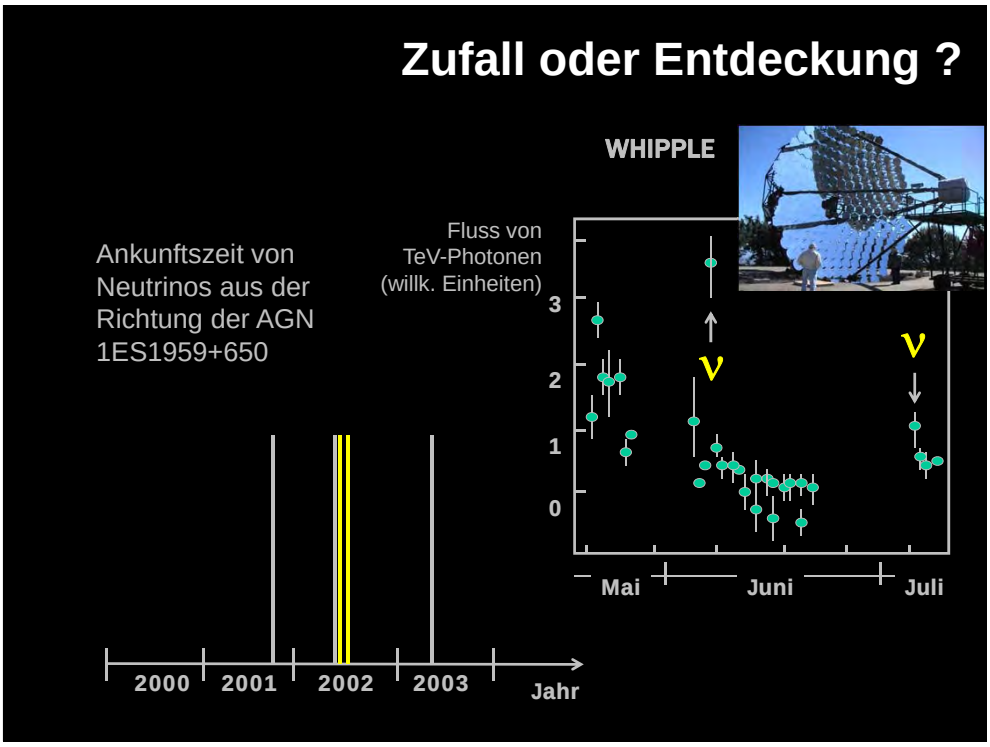
AMANDA 7 Jahre: Die Resultate

- 6595 Neutrinos mit Rekord-Energien bis 200 TeV
- Rekord Limits für Flüsse kosmischer Neutrinos (diffuse, point sources, GRB)



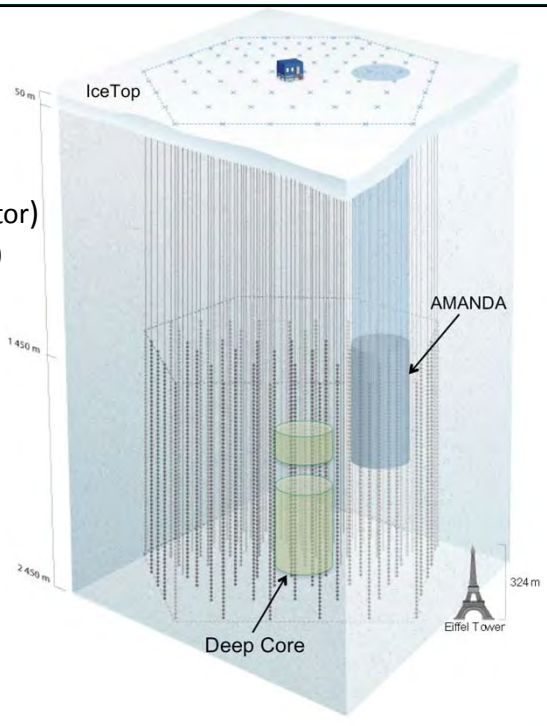
- Rekord-Limits für die Suche nach dunkler Materie, magnetischen Monopolen, Verletzung der Lorentz -Invarianz
- Monitoring der Milchstraße auf Supernova Bursts
- Spektrum und Zusammensetzung kosmischer Strahlen

Zufall oder Entdeckung ?

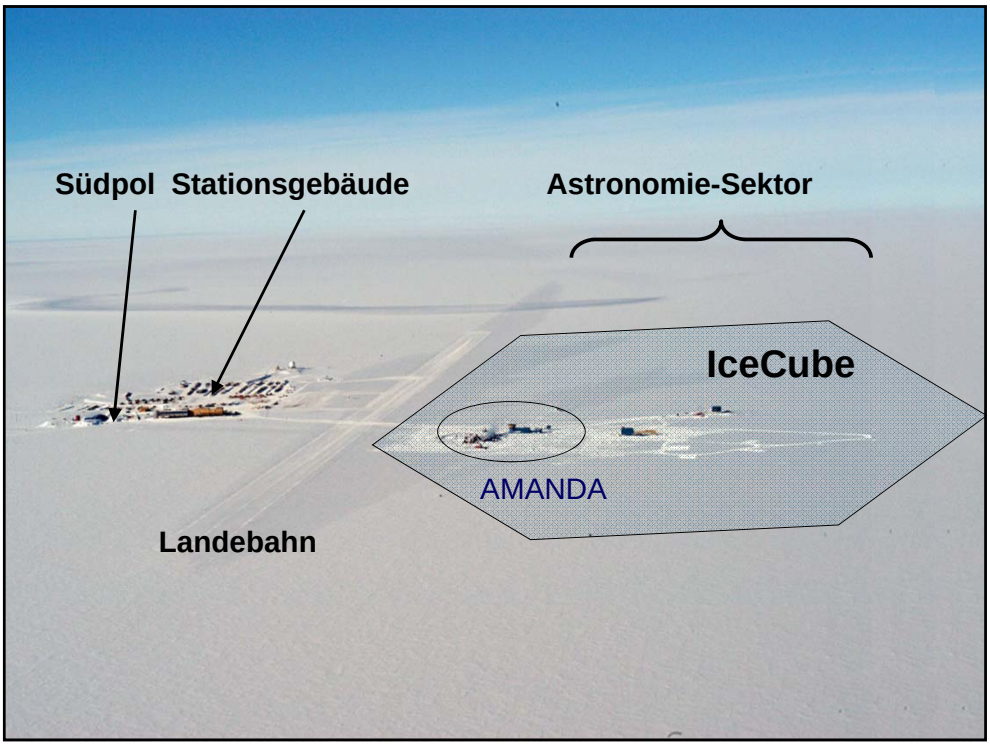


IceCube

- 86 Trossen
- 5160 optische Module
- + IceTop (Luftschauerdetektor)
- Fertiggestellt: 18.12.2010



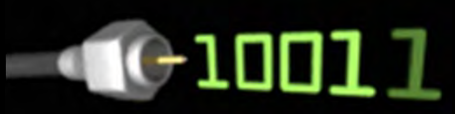
- ~220 ν/day
- 1.7×10^8 μ/day

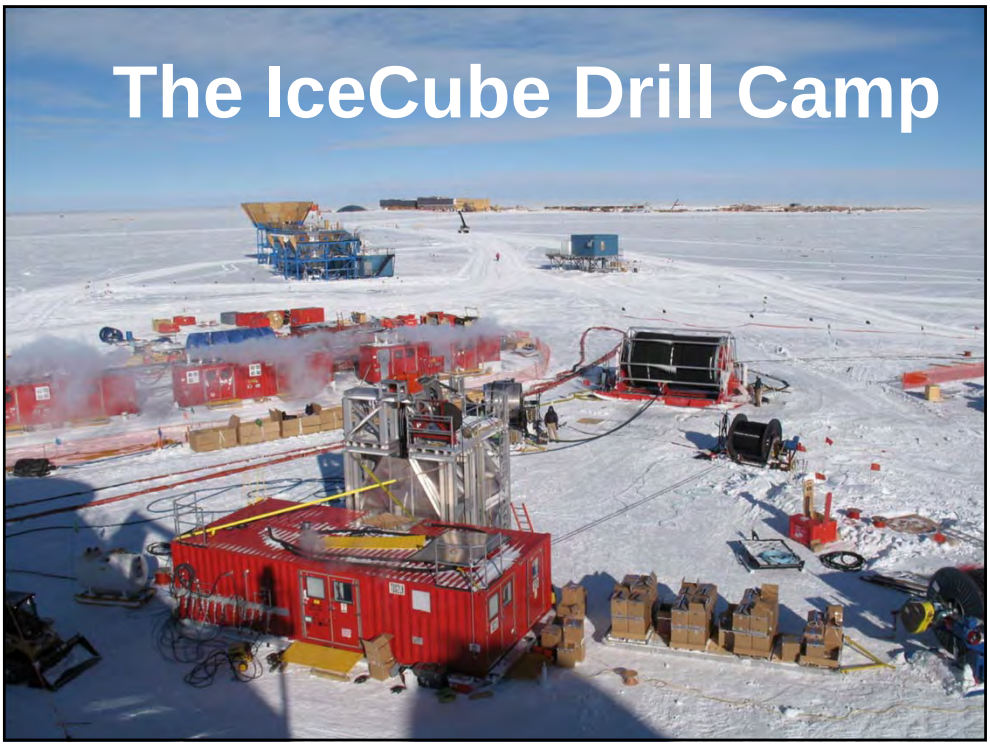


Suche nach der besten technischen Lösung für die IceCube-Auslese

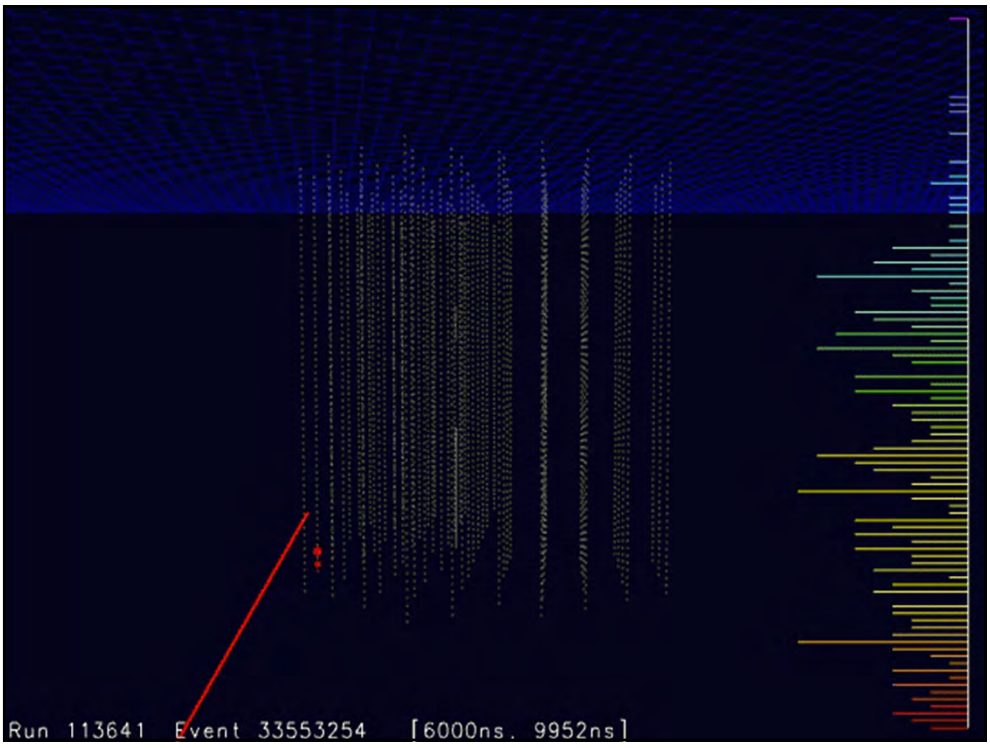
dAOM (DESY)

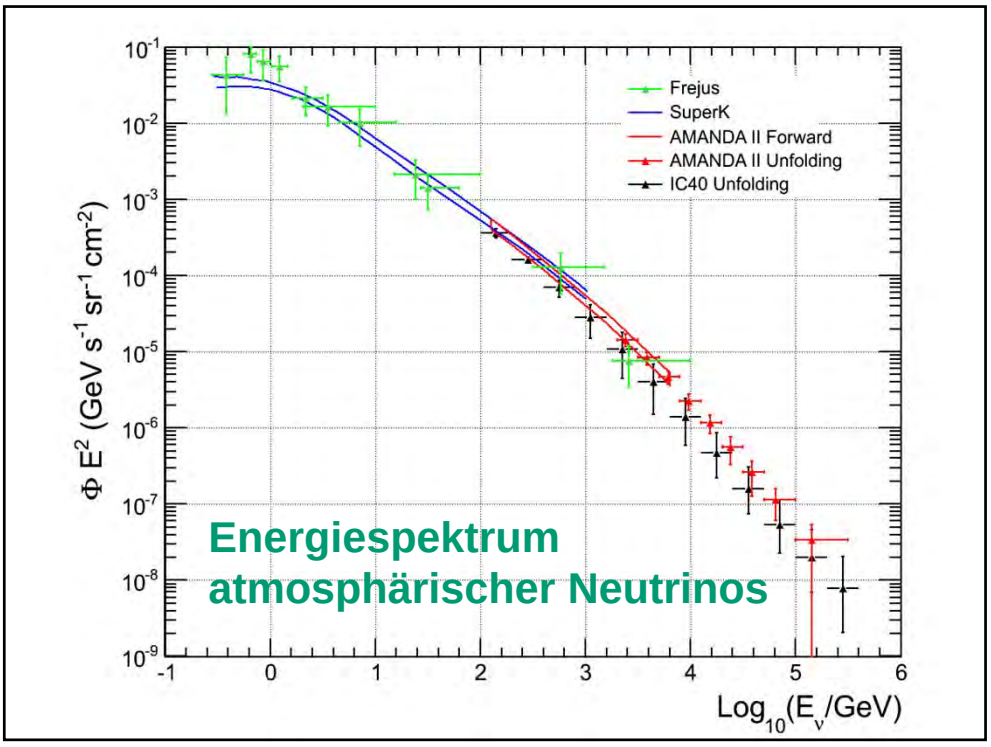
DOM (LBNL)



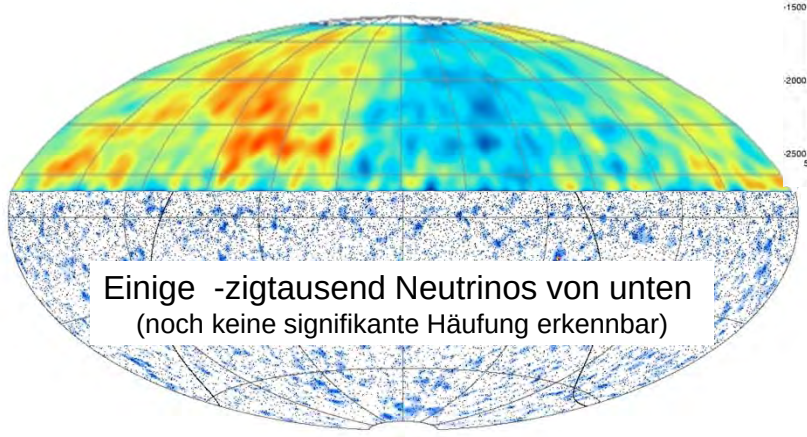

The IceCube Drill Camp

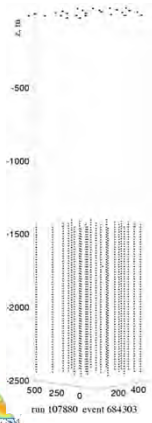

The IceCube Laboratory


Run 113641 Event 33553254 [6000ns, 9952ns]



- Einige Milliarden Myonen von oben (Süden)
- Hochsignikante Anisotropien von ~0.1%
- **Erklärung?**





Einige -zigtausend Neutrinos von unten
(noch keine signifikante Häufung erkennbar)


1912
2012
Mitglieder der IceCube Collaboration freuen sich über die Entdeckung ihrer ersten kosmischen Neutrinoquelle (?)


Fröhliche Weihnachten!
Fröhliche Weihnachten!