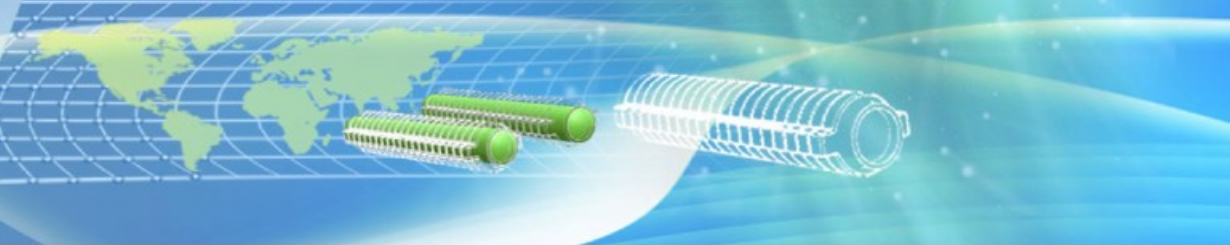




Real Time Database
for High-Resolution
Neutron Monitor
Measurements



From a single Neutron Monitor to an International Network: the Real-Time Database for High-Resolution Neutron Monitor Measurements (NMDB)

<http://nmdb.eu>
mail@nmdb.eu

EU FP7 project Contract No RI-213007

Christian T. Steigies for the NMDB consortium

Institut für Experimentelle und Angewandte Physik

Abteilung Extraterrestrische Physik

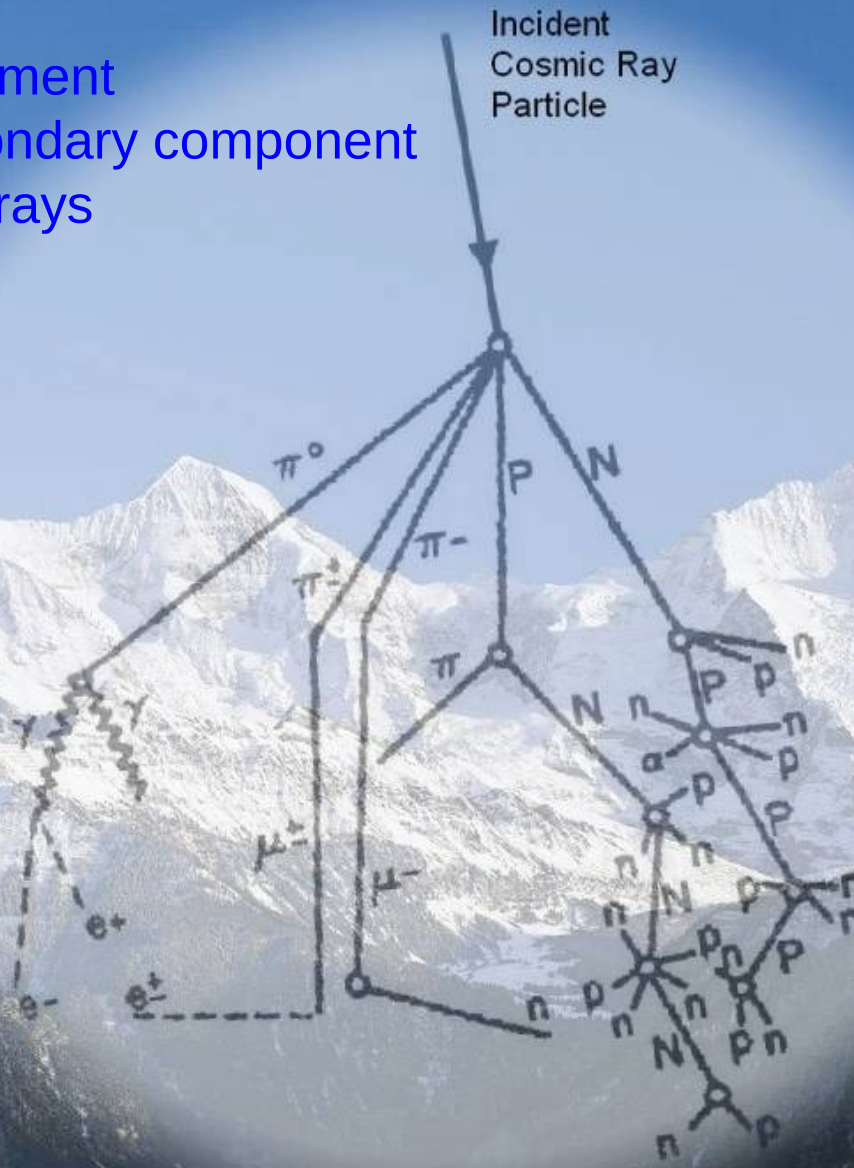
Christian-Albrechts-Universität zu Kiel

Germany



assure infrastructure

Neutron Monitor:
ground-based instrument
to measure the secondary component
of (galactic) cosmic rays

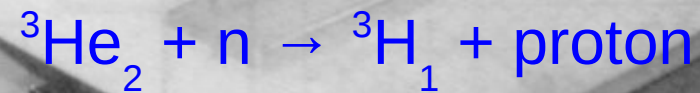
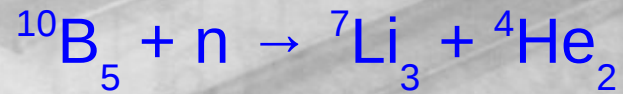




polyethylene reflector

lead producer, moderator

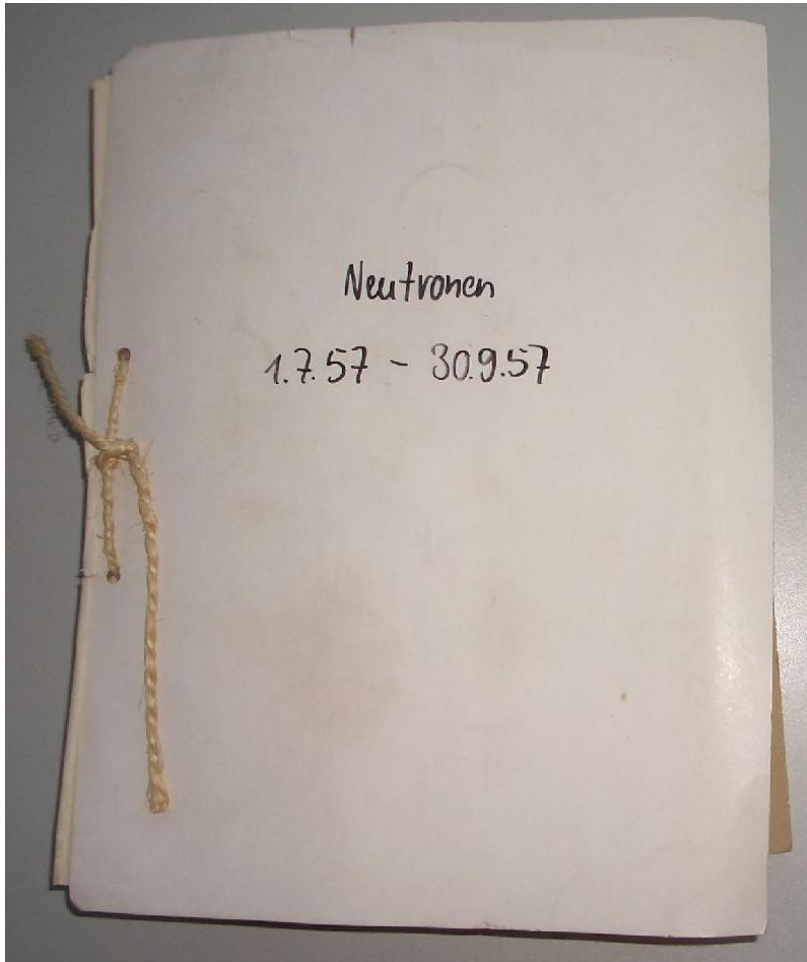
Gas filled tubes:



Neutron Monitor



In Kiel data recorded since 1. July 1957 (IGY, since 1964: 18NM64)



Institut für reine und angewandte Kernphysik
Abteilung für Ultrastrahlung
Eitel, Hindenburgufer 63/64.

Ergebnisse der Neutronenregistrierung

Datum: 1.7.57..... Korrekturfaktor: (%/mm.Hg)

Zeit (MS/WZ)	Messung 1	Messung 2	Gesamt	Luftdruck	Ergebnis
0-2	8350	8160	16510	762,0	17720
4	8090	8520	16610	761,4	17730
6	8490	8460	16950	761,1	18040
8	8610	8550	17160	760,5	18150
9-10	8740	8840	17580	760,0	18500
10-12	8460	8860	17320	759,6	18160
12-14	8910	8850	17760	759,0	18510
14-16	8390	8540	16930	758,5	17850
16-18	8320	8490	16810	758,3	17870
18-20	8540	8080	16620	760,1	17510
20-22	8430	8120	16550	760,7	17540
22-24	8310	7900	16210	761,0	17230
			203010	760,2	214210

Gesamt: 101640 101370 Verhältnis: 1,0027

Vergleich: Genaue Zeit: Uhrzeit:

Bulletin mensuel

Maandbericht

Observations ionosphériques
et de
ionospherische waarnemingen
en van de

BARTOL RESEARCH INSTITUTE
UNIVERSITY OF DELAWARE
NEWARK, DELAWARE 19716

COSMIC RAY NUCLEONIC INTENSITY DATA

FROM

SOUTH POLE (Antarctica) January-December, 1992
McMURDO (Antarctica) January-December, 1992
NEWARK (Delaware) January-December, 1992
THULE (Greenland) January-December, 1992

Atomic Energy of Canada Limited

COSMIC RAY NM-64 NEUTRON MONITOR DATA

from

USA, Newark
Atomic Energy of Canada Limited
United States Air Force

MONTHLY GRAPHS
August 1954 - December 1957

by

M. CARRIGAN and J.F. STELLER, AFCL
CAPTAIN J.M. MAURIN, USAF

Chalk River, Ontario
September, 1958

AFCL 3031

HER DOS HERMANUS COSMIC RAY NEUTRON MONITOR DATA

COSMIC RAY NEUTRON MONITOR DATA
SANAE ANTARCTICA

COSMIC RAY NEUTRON MONITOR DATA
TSUMEB

January 1992 - December 1992
Report No. 115

DATA OF THE NM-64 NEUTRON MONITOR

KERGUELEN

July 1 - December 31, 1995

DATA OF THE NM-64 NEUTRON MONITOR

TERRE ADELIE

January 1 - June 30, 1995

Institut Français pour la Recherche et la Technologie Polaires
47, avenue du Maréchal Foyolle

АКАДЕМИЯ НАУК СССР

КОСМИЧЕСКИЕ ДАННЫЕ

МЕСЯЧНЫЙ ОБЗОР

ZAKLAD GEOFIZYKI
POLSKIEJ AKADEMII NAUK

MATERIAŁY I PRACE

18

COSMIC RAYS

Worldwide network of NMs started with IGY
Data shared between stations:

- by mailing data books
- World Data Center FTP server / CD-Rom
- 1h averages in standard format
- long delays in data availability



[back&reset](#)

[back](#)

[log](#)

[prev step](#)

[zoom left](#)

[zoom center](#)

[zoom right](#)

[zoomout](#)

[next step](#)

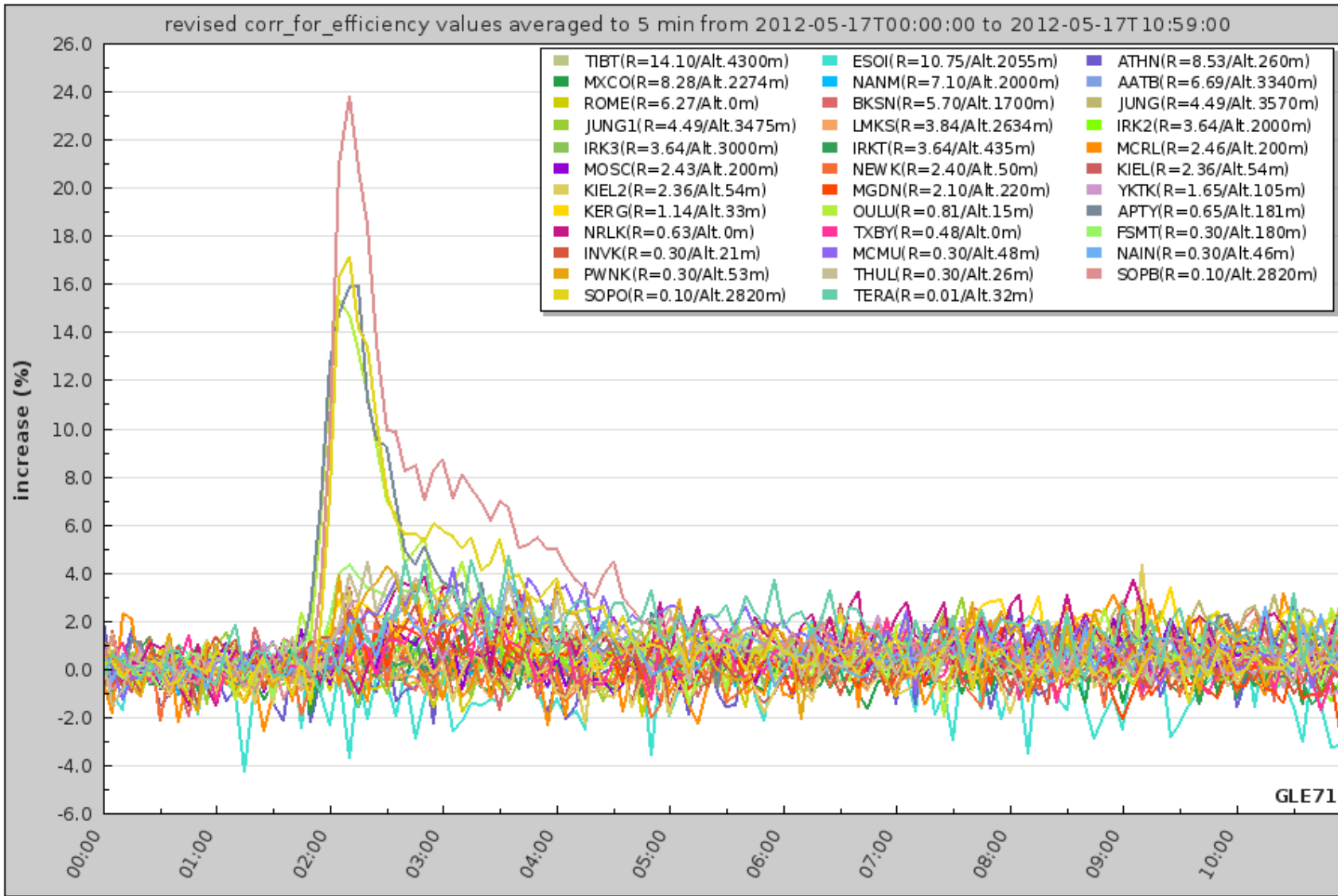
[see the log file](#)

[the MySQL query](#)

[http link](#)

[conditions & information to use data](#)

GLE71, plot from nest.nmdb.eu

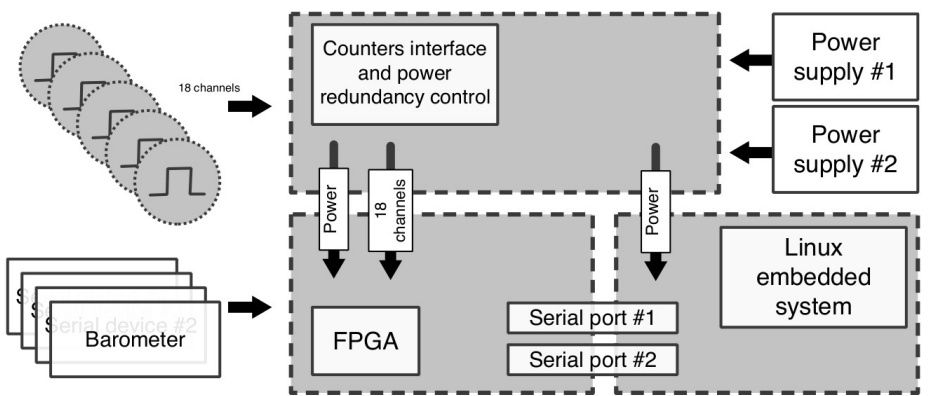




Digital data recording

- on punchcards/-tape
- with a 486 IBM PC
- improved resolution (15m... 1min)
- data available on local servers
- (after a delay of 1h)





real-time data registration systems



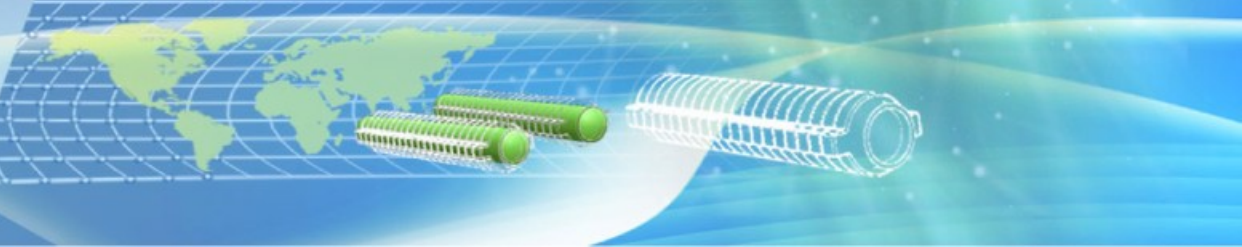


Status in 2007

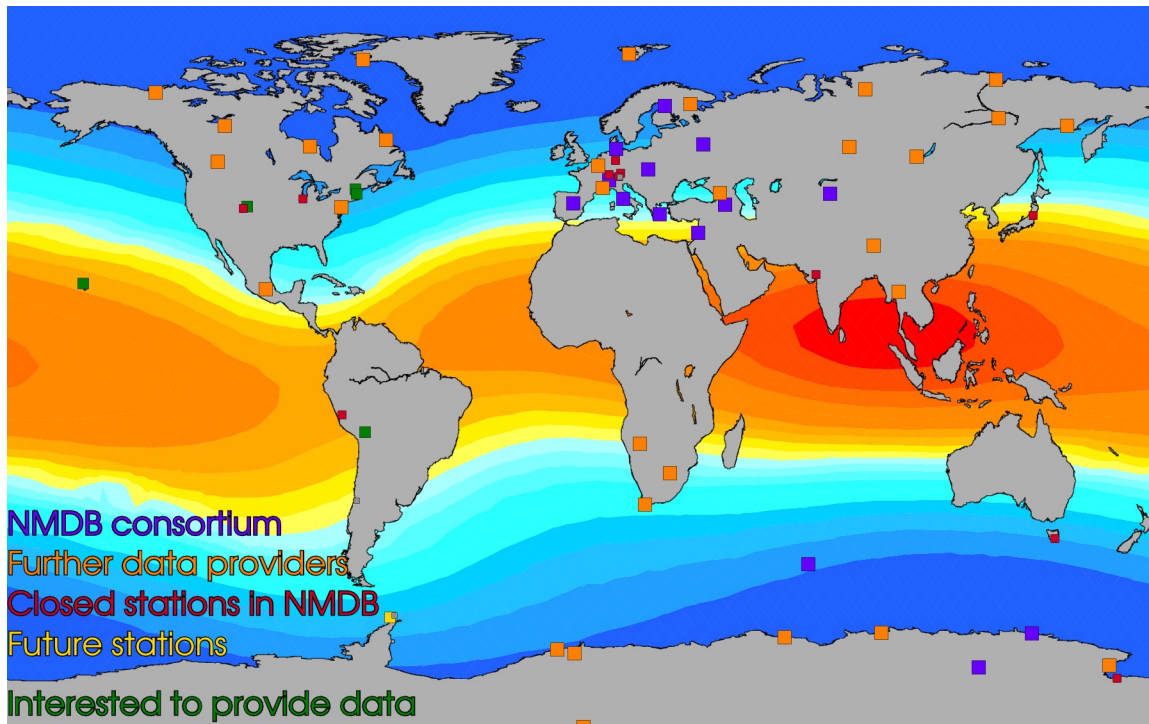
- Data in 1h resolution and common format available at World Data Center (WDC)
- No real-time data @WDC
- No high-resolution data @WDC
- Some high-res data available on various station websites (in varying formats)
- Not suitable for Space Weather applications

NMDB goals

- Provide all data in standard format
- Provide high resolution data
- Provide real-time data (< 5 min delay)
- Make data easily accessible
- Provide designs for modern registration systems
- Applications

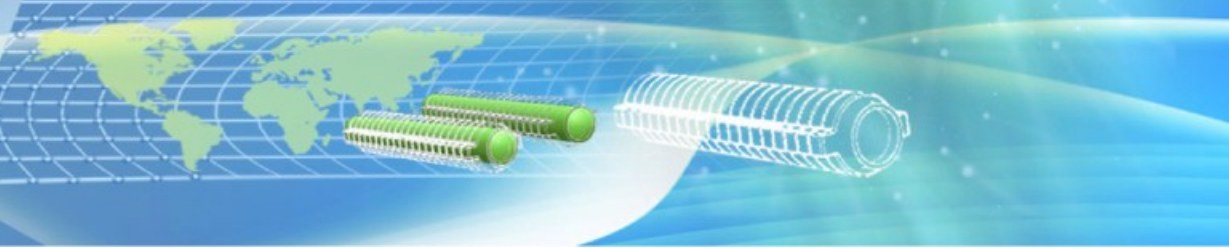


NMDB data providers

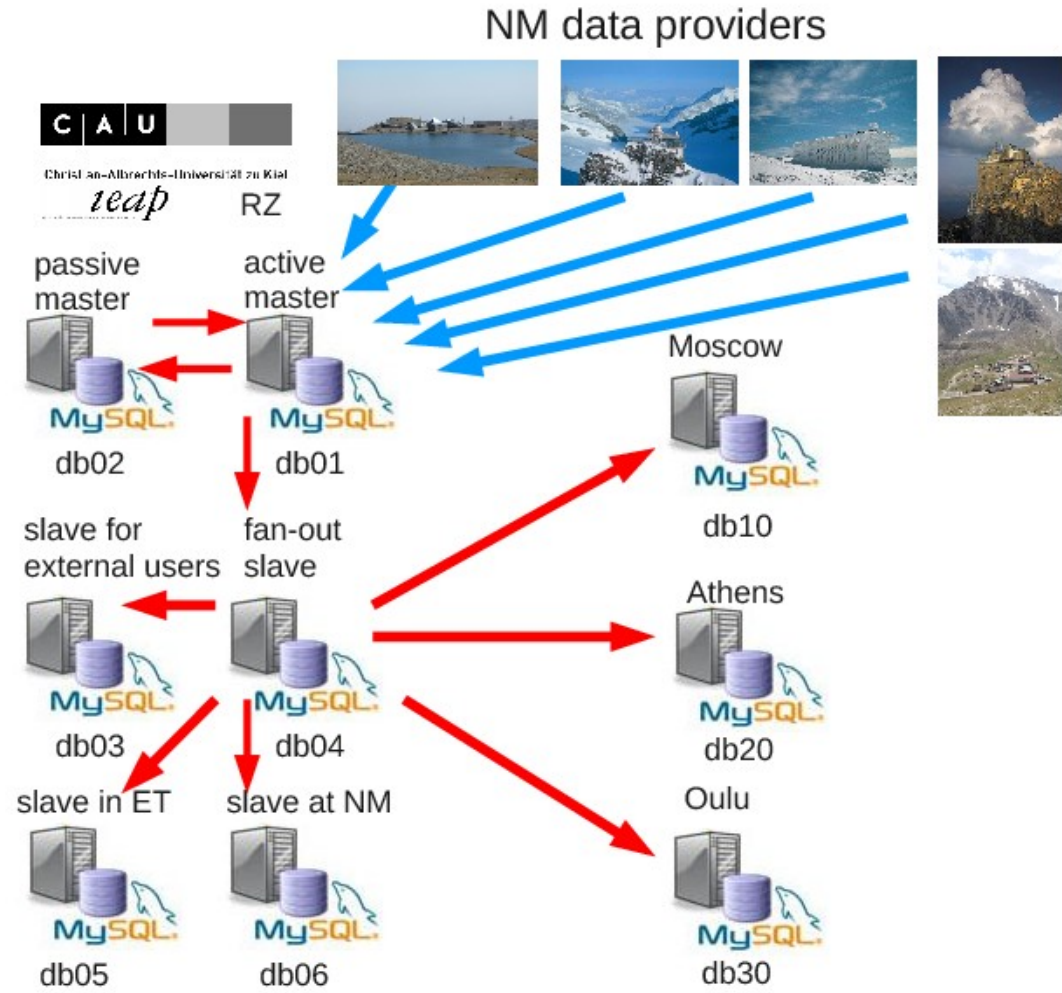


- > 50 stations
- 20-30 real-time
- “New” stations:
 - Delaware (8NMs)
 - Mexico
 - Kingston, Mawson
 - Tibet
 - Dourbes
 - Calgary
 - Thailand
 - South Africa
 - Barentsburg
 - mini NMS (NEU3, DOMC)

- funded by the EC for 2008 and 2009
- started with 12 partners (15 stations)



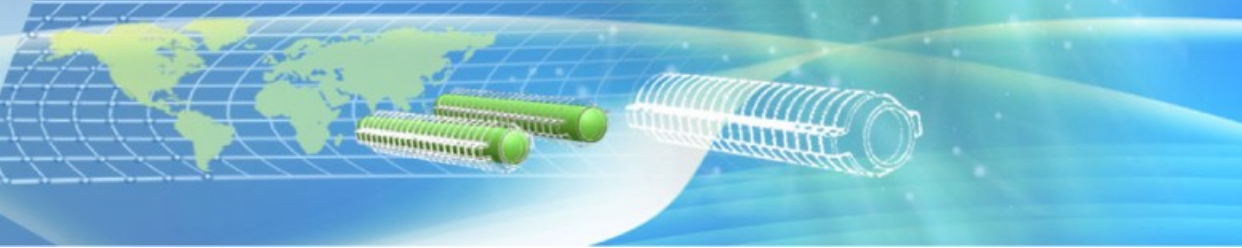
- Two masters
(active <-> passive)
- Fan-out mirror
- Mirror for external users
- Read-only mirrors in
several locations
- All mirrors are a
complete copy of NMDB
(redundancy)





NMDB users

- NMDB Alerts, fluctuations, GLE, solar neutrons, dosimetry...
- Dosimetry for airplane personel at Air France, DLR, Globalog
- Space Weather Alerts at NOAA
- Integrated Space Weather Analysis at CCMC (NASA/GSFC)
- realtime datafile used by NASA/MSFL (since Sep 2016)
- Cosmic Rays and Climate
- Cosmic Ray – cloud connections
- Cosmic Rays and the geomagnetic field
- Soil moisture measurements (US, AUS, UFZ Leipzig, UK)
- Department of Homeland Security / NUSTL
- Space Weather Forecaster at USAF



NMDB achievements

- project goals achieved
- continues to operate 8 years after funding ended
- (regular) meetings of the NM community
- new cooperations of NM scientists
- several projects build on and make use of NMDB data
ESA SSA GLE Alert+, sepserver, hesperia, ...
- new uses made possible by easily available data



back&reset

back

log

prev step

zoom left

zoom center

zoom right

zoomout

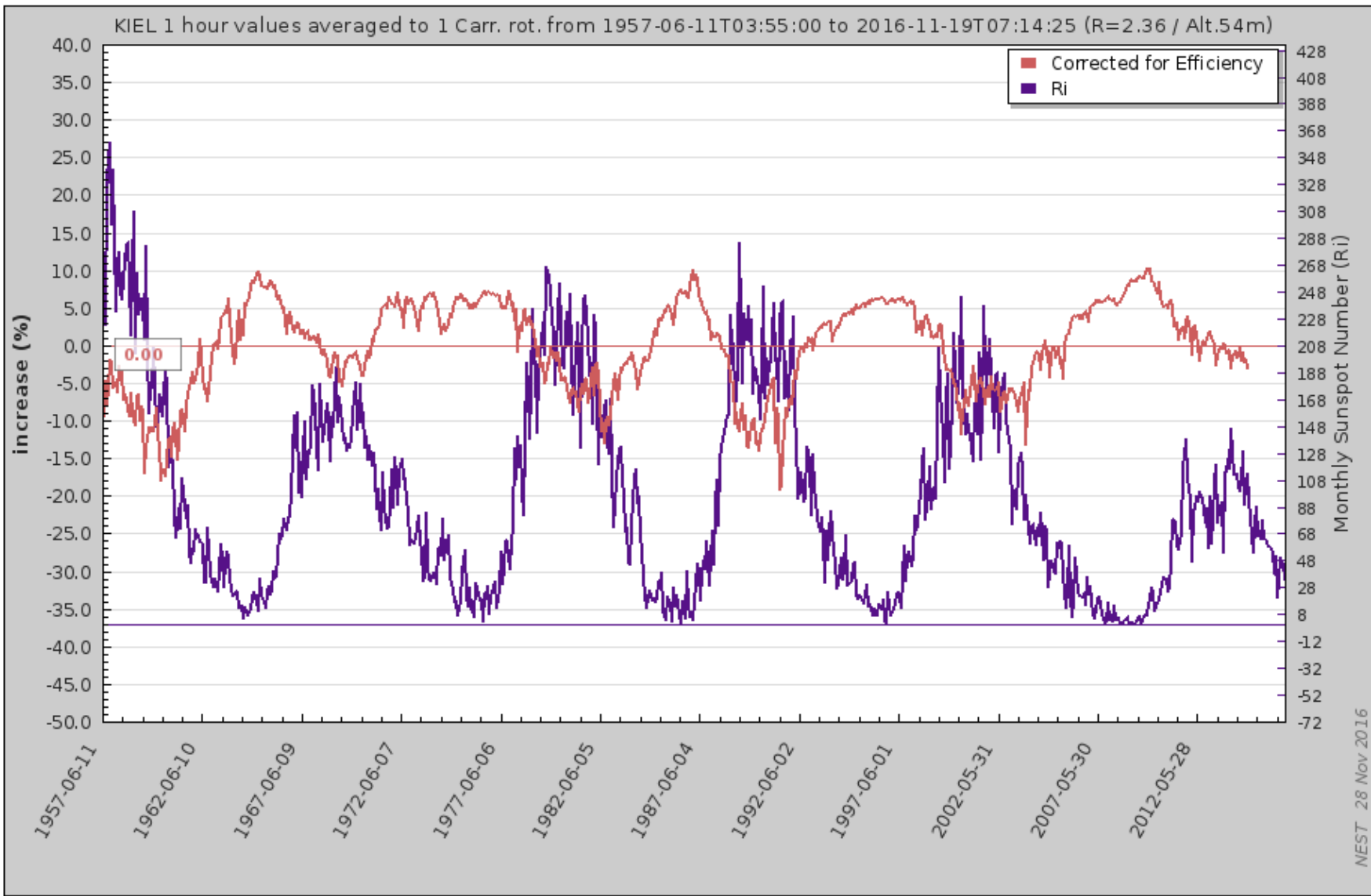
next step

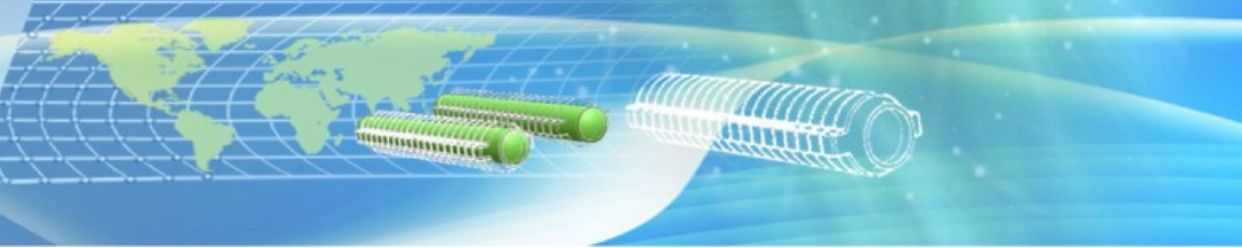
see the log file

the MySQL query

http link

conditions & information to use data





Acknowledgements

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP/2007-2013) under grant agreement no 213007.

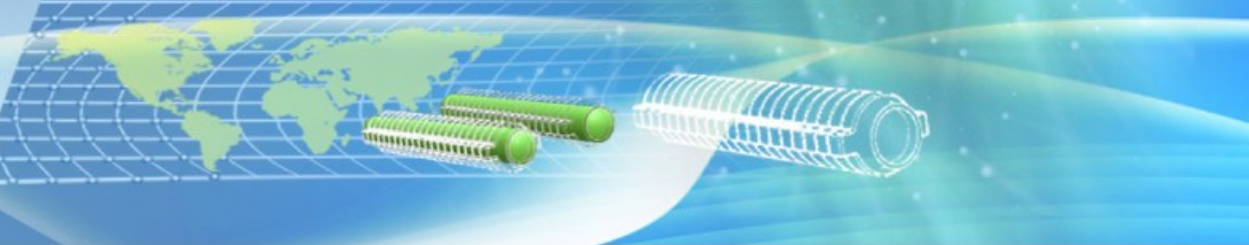
Data retrieved via NMDB are the property of the individual data providers. We acknowledge the PIs of individual neutron monitors for providing data.

Website: <http://nmdb.eu>

Data: <http://nest.nmdb.eu>



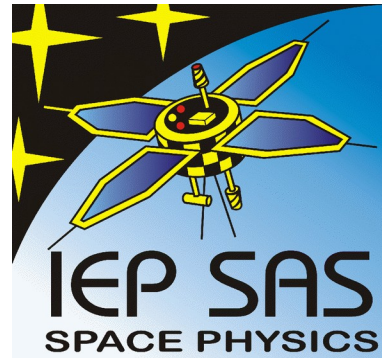
Real Time Database for High-Resolution Neutron Monitor Measurements



C | A | U

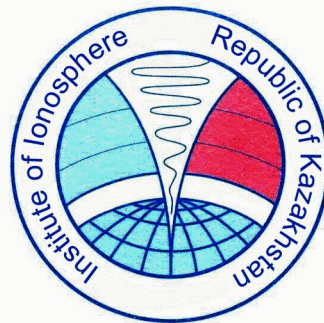
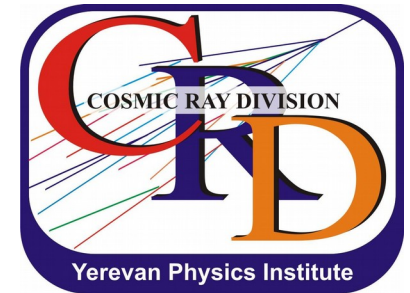
Christian-Albrechts-Universität zu Kiel

UNIVERSITY of OULU
OULUN YLIOPISTO



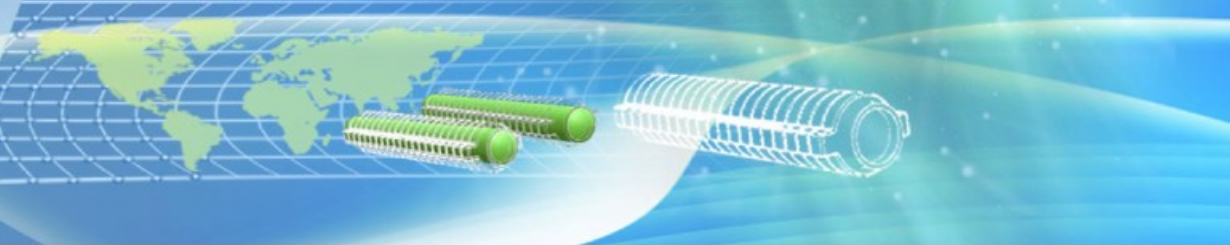
u^b

^b
UNIVERSITÄT
BERN





Real Time Database for High-Resolution Neutron Monitor Measurements



NMDB contributing stations:

Apatity, Baksan, Barentsburg, Magadan, Norilsk, Novosibirsk

Climax, Huancayo, New Hampshire, Leadville



University of New Hampshire

Pic de Bure

Calgary



Dourbes

Fort Smith, Inuvik, Mac Murdo, Nain, Newark,



Peawanuk, South Pole, South Pole Bare, Thule

Hermanus, Potchefstroom, Sanae, Tsumeb



Tixy Bay, Yakutsk



Kingston, Mawson



Mexico



Neumeyer, Polarstern, Dome C (mini NMs)

Tibet

Thailand