

# Real-Time database for high resolution Neutron Monitor measurements

Christian T. Steigies, Manfred Thomann, Oliver M. Rother,  
Robert F. Wimmer-Schweingruber, Bernd Heber

Institut für Experimentelle und Angewandte Physik  
Abteilung Extraterrestrische Physik  
Christian-Albrechts Universität zu Kiel

Athens, 27.09.2007

# status quo

- cosmic ray intensity has been continuously measured with standardized Neutron Monitors since the International Geophysical Year 1957/58
- approximately 50 monitors are in operation worldwide
- high-resolution data (1-minute or better) are needed to study solar cosmic ray events
- only few NM stations can provide data in 1-min resolution and make them available in real-time
- no common data format, no data center for high-resolution data in real-time
- no common real-time applications, only post event analysis

FTP\_NM1/C/2007C/20071nmT:

total 4728

-rw-r--r-- 1 steigies users 1607040 Feb 1 01:00 07011nmT.01c.txt  
-rw-r--r-- 1 steigies users 1607040 Mar 1 00:58 07021nmT.01c.txt  
-rw-r--r-- 1 steigies users 1607040 Mar 10 18:37 07031nmT.01c.txt

FTP\_NM1/C/2007C/2007ATHN:

total 1136

-rw-r--r-- 1 steigies users 284952 Feb 28 21:09 0701ATHN.W1C  
-rw-r--r-- 1 steigies users 284952 Apr 16 13:07 0703ATHN.W1C  
-rw-r--r-- 1 steigies users 284952 May 6 23:10 0704ATHN.W1C  
-rw-r--r-- 1 steigies users 284952 May 6 23:10 0705ATHN.W1C

FTP\_NM1/C/2007C/2007BKSN:

total 840

-rw-r--r-- 1 steigies users 281232 Feb 8 14:30 0701BKSN.W1C  
-rw-r--r-- 1 steigies users 281232 Mar 5 17:59 0702BKSN.W1C  
-rw-r--r-- 1 steigies users 281232 Apr 10 14:43 0703BKSN.W1C

FTP\_NM1/C/2007C/2007MRNY:

total 232

-rw-r--r-- 1 steigies users 230580 Apr 17 09:10 0703MRNY.W1C

FTP\_NM1/C/2007C/2007NRLK:

total 568

-rw-r--r-- 1 steigies users 284952 Feb 28 21:09 0701NRLK.W1C  
-rw-r--r-- 1 steigies users 284952 May 6 23:11 0704NRLK.W1C

FTP\_NM1/C/2007C/2007mcrl:

total 6304

-rw-r--r-- 1 steigies users 1607040 Feb 1 01:00 0701mcrl.01c.txt  
-rw-r--r-- 1 steigies users 1607040 Mar 1 00:58 0702mcrl.01c.txt  
-rw-r--r-- 1 steigies users 1607040 Apr 1 01:59 0703mcrl.01c.txt  
-rw-r--r-- 1 steigies users 1607040 Apr 19 14:34 0704mcrl.01c.txt

0701MOSC.W1C:

9798 9986 9939 10007 10076 10231 9784 9962 9890 9777 9899 9967  
10141 9957 10148 9804 10118 9851 9880 9924 9685 9806 9703 10012  
9951 10003 9945 9790 9990 9807 9796 9973 9808 9851 10004 9945  
9908 9851 10071 9902 10028 9919 9834 10072 9767 9820 9966 10026  
9954 9888 9944 10117 9983 10073 10027 10145 10102 9875 9833 9945 0701 1 0.  
9943 9790 9968 9854 9913 9665 9825 9954 9907 10035 9828 10002  
9744 9927 9680 9999 9813 9926 10044 9996 9765 10030 9853 10064  
9957 10208 9913 9898 10162 9827 9970 9676 9993 9830 9995 10118  
9944 9937 10130 9846 10166 9795 9760 10033 10045 10002 9952 10262  
9830 9799 10147 10060 9782 10027 10076 10011 9824 9956 9690 10145 0701 1 1.

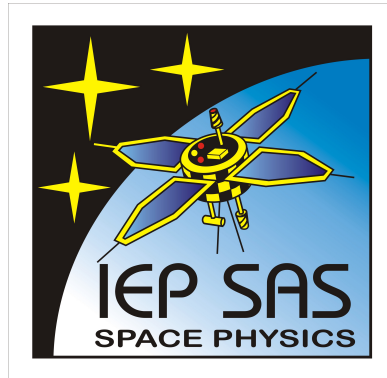
0701BKSN.W1C:

6200 6284 6126 6429 6045 6382 6307 6193 6251 6300 6060 6254  
6449 6460 6075 6115 6373 6591 6387 6084 6201 6044 6513 6142  
6224 6132 6511 6257 6106 6237 6534 6217 6348 6356 6367 6125  
6338 6137 6175 6467 6190 6365 6135 6312 6293 6114 6160 6272  
6152 6223 6367 6404 6489 6353 6269 6272 6405 6306 6228 6210 1 0  
6223 6343 6299 6247 6130 6119 6256 6189 6269 6240 6361 6279  
6075 6278 6346 6130 6577 6354 6351 6466 6386 6480 6221 6508  
6301 6392 6359 6268 6283 6359 6187 6232 6300 6175 6394 6283  
6393 6289 6041 6203 6201 6389 6124 6114 6378 6388 6329 6221  
6010 6318 6070 6409 6036 6177 6227 6319 6089 6233 6180 5998 1 1

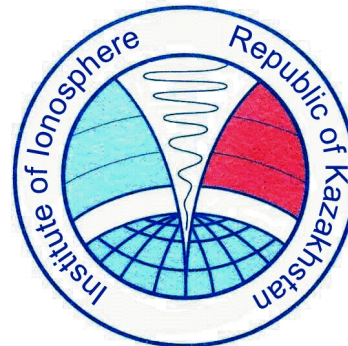
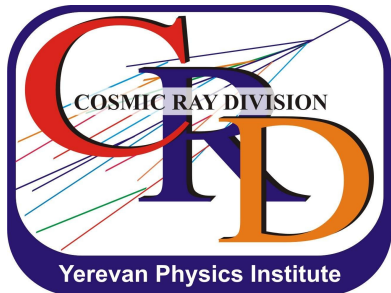
0701mcrl.01c.txt:

2007-01-01 00:00:00+00 2716  
2007-01-01 00:01:00+00 2788  
2007-01-01 00:02:00+00 2700  
2007-01-01 00:03:00+00 2681  
2007-01-01 00:04:00+00 2728  
2007-01-01 00:05:00+00 2858  
2007-01-01 00:06:00+00 2683  
2007-01-01 00:07:00+00 2629  
2007-01-01 00:08:00+00 2719

# Real-Time database for high resolution Neutron Monitor measurements



<sup>b</sup>  
**UNIVERSITÄT  
BERN**





# Project Consortium



- Christian-Albrechts-Universität zu Kiel, Germany
- Slovak Academy of Sciences, Slovakia
- Sodankylä Geophysical Observatory, Finland
- University of Bern, Switzerland
- Belgian Institute for Space Aeronomy, Belgium
- Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation by Pushkov, Russia
- Observatoire de Paris, France
- National & Kapodistrian University of Athens, Greece
- Aragats Space Environmental Center, Armenia
- Universite Roma Tre Dipartimento di Fisica, Italy
- Institute of Ionosphere, Kazakhstan
- Israel Cosmic Ray and Space Weather Center, Israel



Database

nm64 (3)

nm64 (3)

- cfp1
- cfp2
- nm1h

Showing rows 385410 - 385430 (385,431 total, Query took 0.3517 sec)

SQL query:

```
SELECT *
FROM `cfp1`
LIMIT 385410, 30
```

[ Edit ] [ Explain SQL ] [ Create PHP Code ] [ Refresh ]

Query results operations

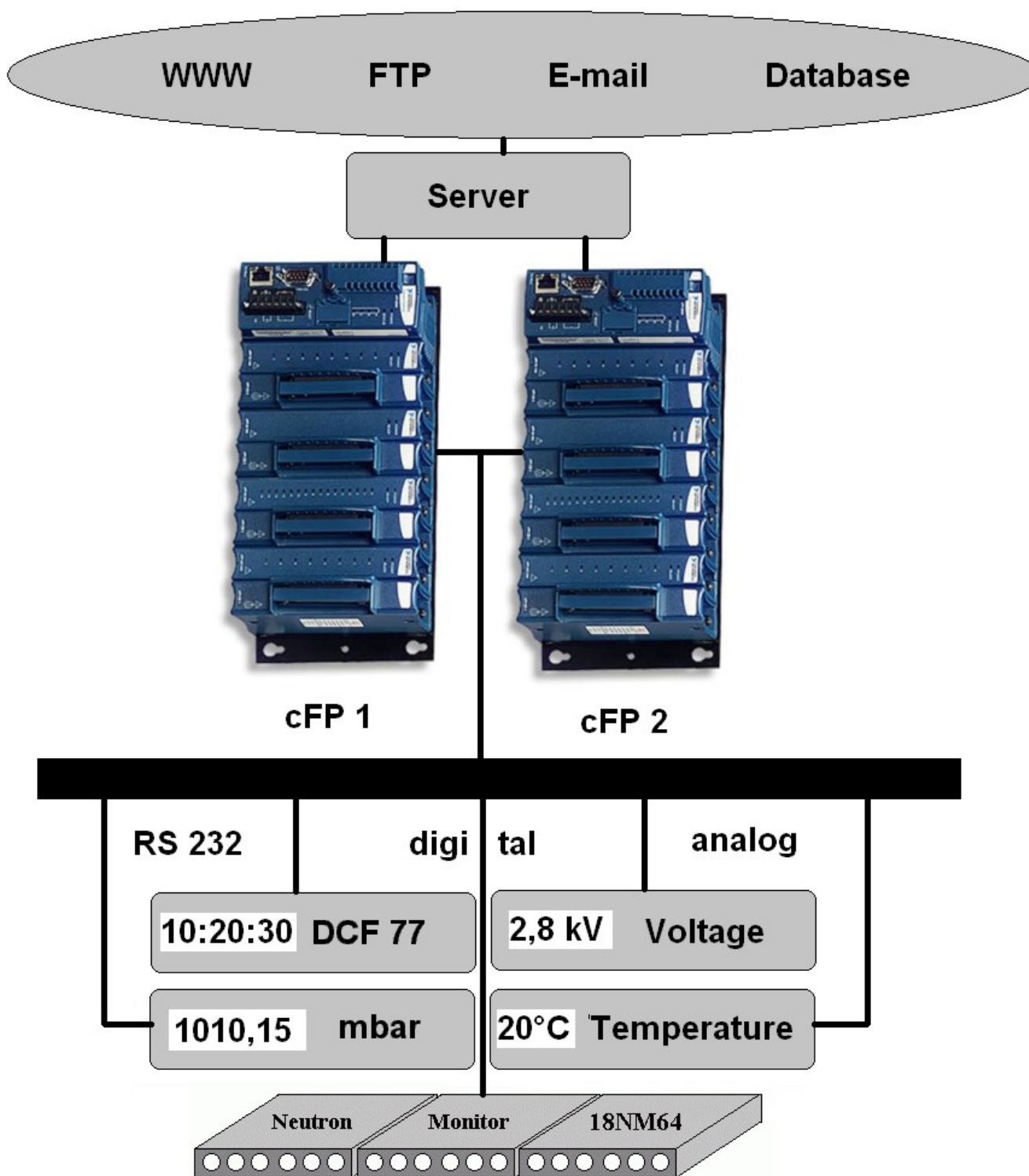
Print view Print view (with full texts) Export

<< < Show : 30 row(s) starting from record # 0 Page number: 12848

in horizontal mode and repeat headers after 100 cells

Sort by key: None Go

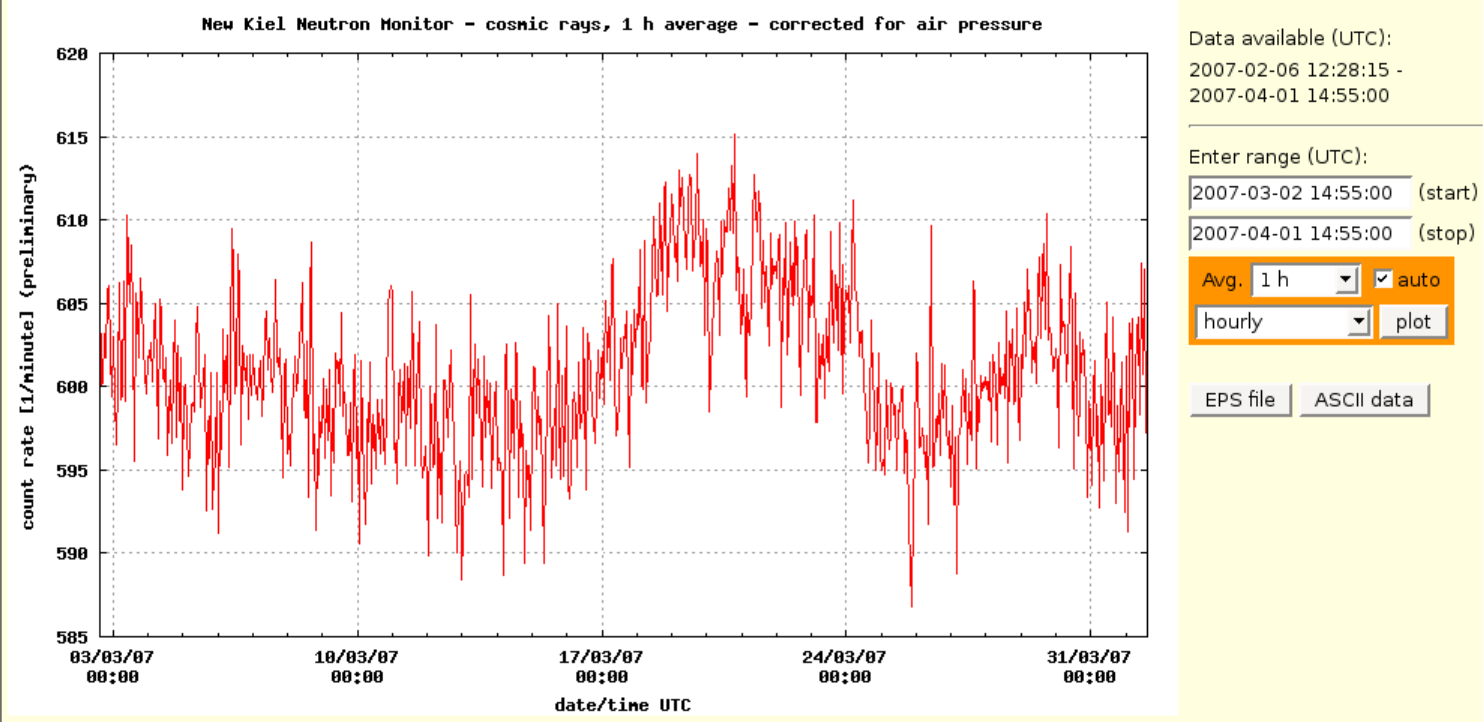
			datetime	cr1	cr2	pressure	crcr
<input type="checkbox"/>			2007-03-23 15:39:00	111	70	1012.12	90
<input type="checkbox"/>			2007-03-23 15:39:10	222	156	1012.12	189
<input type="checkbox"/>			2007-03-23 15:39:20	316	244	1012.12	280
<input type="checkbox"/>			2007-03-23 15:39:30	421	345	1012.12	383
<input type="checkbox"/>			2007-03-23 15:39:40	540	432	1012.12	486
<input type="checkbox"/>			2007-03-23 15:39:50	642	519	1012.12	580
<input type="checkbox"/>			2007-03-23 15:40:00	103	89	1012.14	96
<input type="checkbox"/>			2007-03-23 15:40:10	198	182	1012.14	190
<input type="checkbox"/>			2007-03-23 15:40:20	316	268	1012.14	292





**C | A | U** Institut für Experimentelle und Angewandte Physik  
**Abteilung Extraterrestrische Physik**

# New Kiel Neutron Monitor real time data (preliminary)



Data available (UTC):  
 2007-02-06 12:28:15 -  
 2007-04-01 14:55:00

Enter range (UTC):  
 (start)  
 (stop)

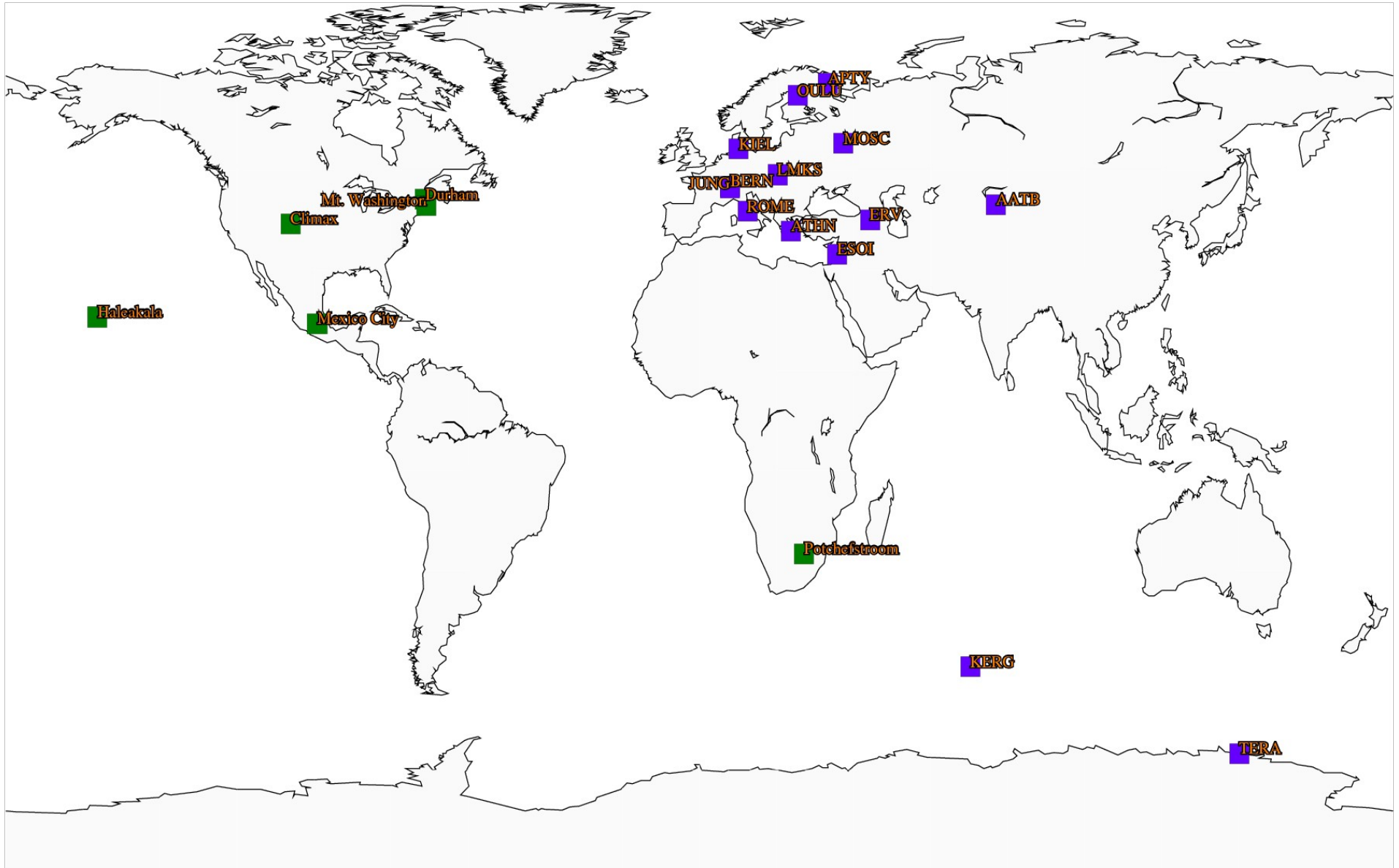
Avg.   auto

[\[Imprint\]](#) Please inform [us](#) before using this data for scientific analysis or if you have comments or problems. Implementation by [Oliver M. Rother](#).

# Work Packages

- WP1 management
- WP2 architectural design  
design and build NM database
- WP3 data acquisition  
develop high-res RT registration system
- WP4 user tools  
submit data to db, access db
- WP5 applications/service  
alert, spectra, radiation dose, ...
- WP6 training/public outreach

# NMDB participants and data providers



# goals of the project

- upgrade stations and connections to make high-resolution NM data available in real-time
- build state of the art, centralized database with distributed mirrors
- collect high-resolution NM data in real-time, make it publicly available in common format
- develop application tools using NM data (solar cosmic ray event alert, dosimetry calculations, cosmic ray characteristics outside the geomagnetosphere, at the top and inside the Earth's atmosphere)
- create a public outreach website to inform about cosmic rays and possible effects on humans, technological systems, and environment

# Schematic concept of NMDB

