British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Recent work at the World Data Centre for Geomagnetism (Edinburgh)

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GEOSPACE meeting, Edinburgh, 20-21 Sep 2010

Ongoing maintenance

All institutes operating geomagnetic observatories are expected to contribute the resulting definitive data to the International Council for Science World Data System for long-term storage and dissemination. For geomagnetism this currently comprises a number of World Data Centres, one of which is at the BGS in Edinburgh. Each year we send a request for any new data to all the institutes involved, perform basic checks on the received data reformatting where necessary, and make the data available online at www.wdc.bgs.ac.uk. Files of annual means and global magnetic survey data are also maintained and made available online.

ICSU WORLD DATA SYSTEM

Data-checking procedures

On receipt of minute mean values we

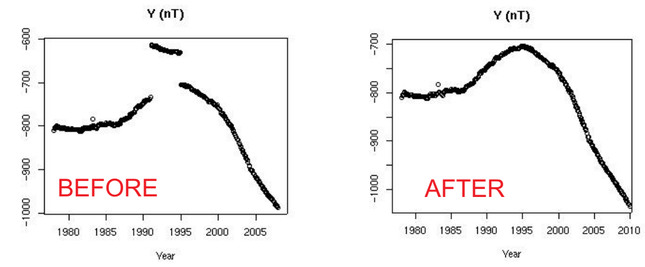
- transform to INTERMAGNET CD binary format
- check for spikes, drifts and intra-year jumps using INTERMAGNET CD data viewer software (includes comparison with nearby observatories)
- compute hourly and annual means if missing from WDC holdings

On receipt of hourly mean values we

- transform to WDC format
- check for data-formatting problems, intra- and inter-year jumps by plotting monthly means
- compute annual means if missing from WDC holdings

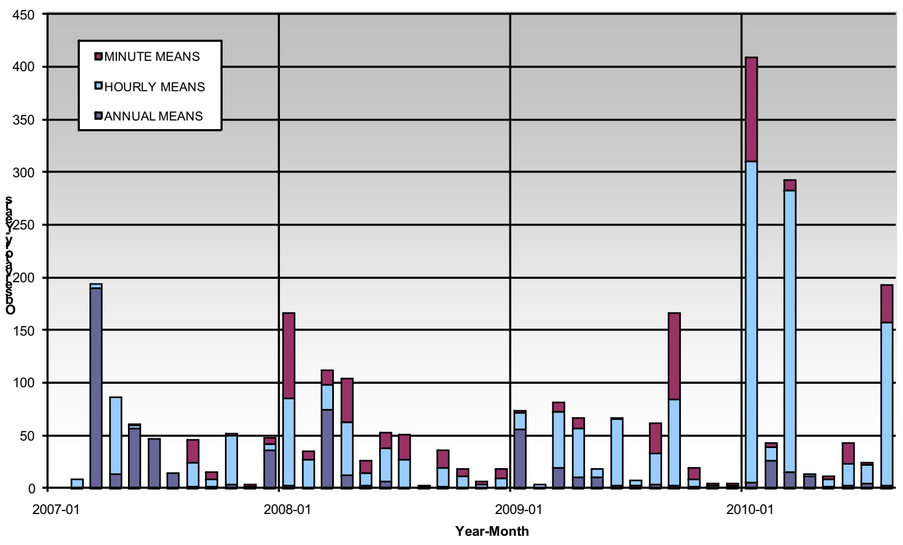
On receipt of annual mean values we

- check for consistency and inter-year jumps by plotting annual means and annual rates of change



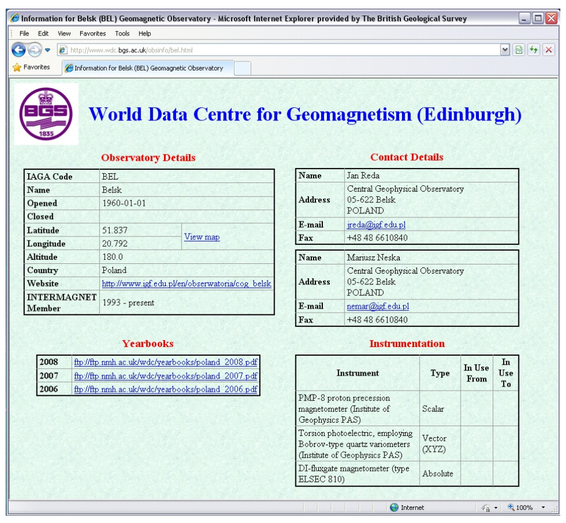
If any data quality issues are revealed by these procedures we communicate them to the data provider. Otherwise the data are made available online.

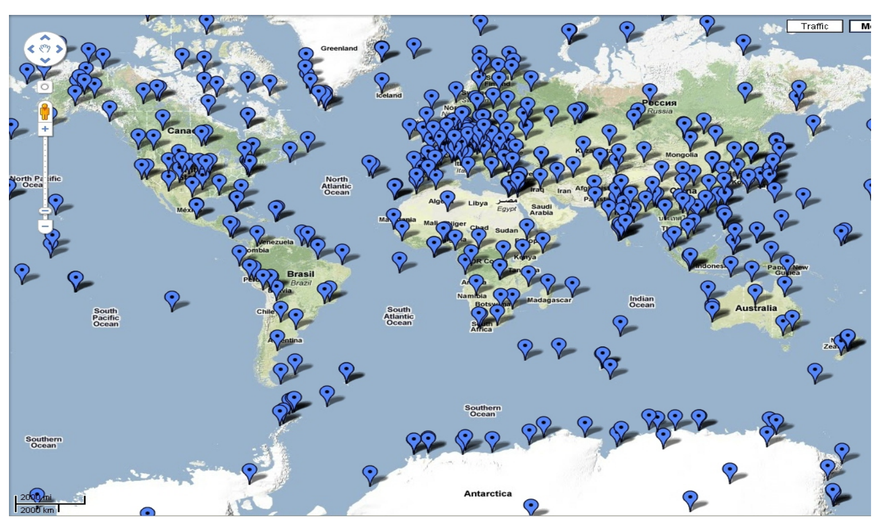
Recent additions



The plot above shows data recently added at WDC Edinburgh. The peak in January 2010 corresponds to data previously held only at WDC Kyoto.

Improvements have been made to the metadata available for each observatory. Contact details, position, opening and closing dates, URL, instrumentation details and yearbooks are now collected and disseminated as a matter of course. Below is an example of metadata available for one observatory. Observatories shown on map have similar



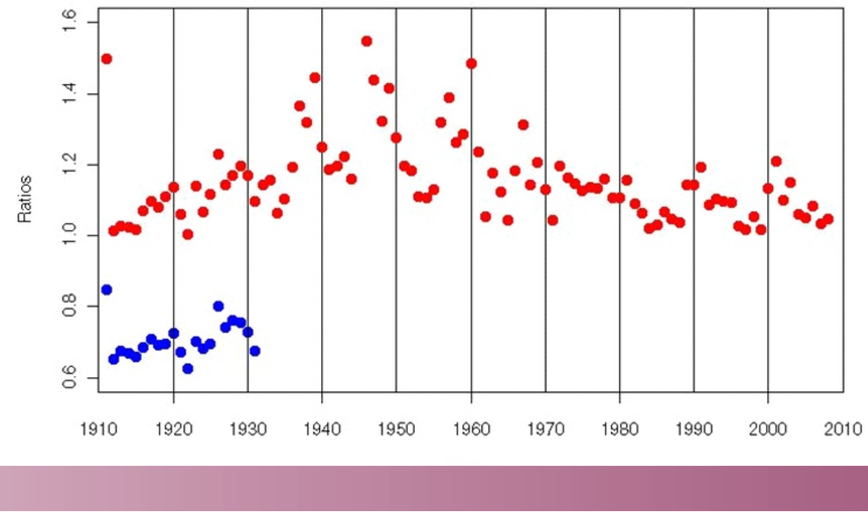


Recent corrections

Hourly means are stored and disseminated in WDC format. The characteristics of this format are one line of data per day per component, use of a base value and precision of 1 unit, where the unit for intensities is nT and for angles tenth arc-minute. A number of "typographical" errors have been identified in the WDC-format hourly mean files. The following corrections have been made:

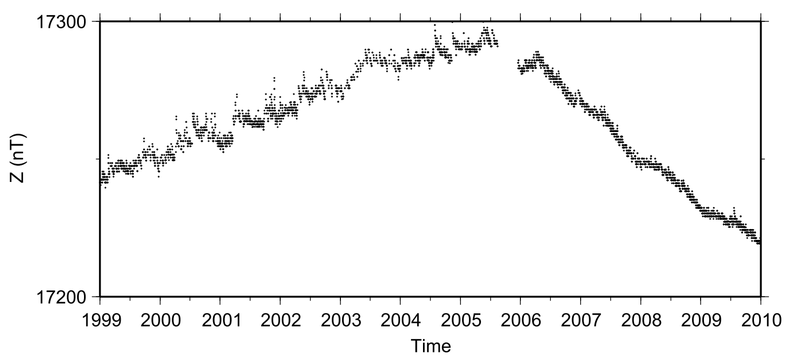
ANN	1967-1979 D bases were wrong sign
ARS	1977 Jan - D base is 11 instead of 1, Oct D base is 11 instead of 100
ARS	1995 May day 31 5542020 changed to 554 20
ARS	1995 Oct - Z base is 529 instead of 2504
ARS	1996 May - Z base is 529 instead of 554 (mix up with base for F in same file)
ESA	2006 Jun - incorrect missing value flag
ESK	1911-1931 values replaced (see right)
FUQ	several years - missing value flag 999 replaced with 9999
FUQ	1993 Mar & 1994 Mar H base is 278 instead of 287
FUQ	2004 & 2006 - spikes in D converted to 9999
FUQ	2005 & 2006 - line 1003 change Z for D
HRB	1987 H base for all months EXCEPT Oct had 1 added (thereby adding 100 nT)
HRB	1992 Feb D base is 3 instead of 2
HRB	1994 Z base is 441 instead of 52, 53 and 54
HRB	1994 Z base for Feb, Apr, May, Jun, Jul, Aug and Oct had 1 subtracted
IRT	1991-1994, signs of D bases and tabular values corrected
ISK	1989-1994 H base had 3 subtracted
KGD	1975 Mar Z tabular base should be 520 instead of 250
MGD	1987 Z base is 524 instead of 525 for all months EXCEPT Oct and Dec
VAL	1993 Feb Z base is 454 rather than 54
YSS	1981-1985 D base is -9 instead of 9 and changed sign of corresponding tabular values
YSS	1981 Feb - subtract 200 from D tabular values

Since the Inter-Hourly Variability index has been used to investigate solar influence on climate, it has been known that the ESK hourly values from 1911 to 1931 available from the Edinburgh WDC were post-processed from the values in the original yearbooks. The post-processing was the application of a 2-point running mean and transformation to DHZ from the original XYZ. This has now been remedied with the aid of files held at WDC Kyoto and scanned and digitised yearbook tables. Plot below shows ratios of annual means of ESK and NGK IHV indices based on data available from Edinburgh WDC before (blue) and after (red) 9 August 2010.

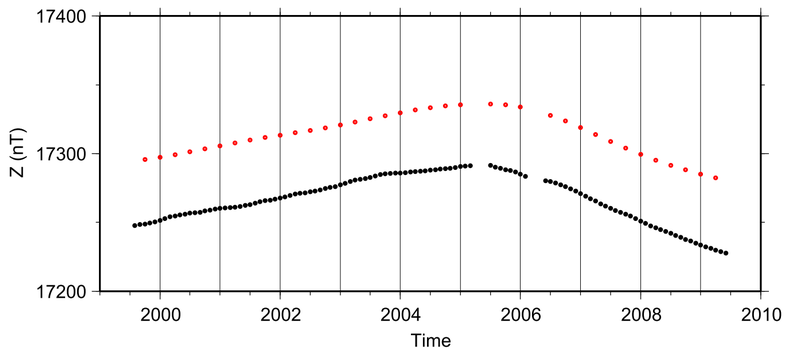


Corroboration from satellite-based models

Occasionally an unexpected trend in an isolated observatory can be validated by comparisons with models based predominantly on satellite data.



The plot on the left shows selected hourly mean values from TAM observatory in Algeria (nearest other observatories are in Spain, over 1800 km distant). The change in trend after a data gap was initially doubted but corroborating evidence from CHAOS-3 model (right, showing running annual averages) confirms it as real.



Acknowledgement We thank all the insititutes operating observatories for their continued support of the ICSU World Data System.