



Geomagnetic forecast tool

User's manual

Version 0.3 (2013-02-01)

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1. General description

The geomagnetic forecast tool ("product") predicts the Dst index up to 4 hours ahead in near-real time (as soon as data becomes available). The prediction quality is usually on par with best available operational systems or better. The forecast itself typically takes not more than a few seconds. The longest operation is downloading the data, which takes about 2 minutes.

The module is designed to work under Linux OS (tested with Ubuntu 12.04, 12.10, and Centos 6.3). Windows version is available upon request.

Recommended usage: expand the archive in your home directory and add a line

```
15 * * * * ~/prepro [JobOrderFile.xml] && ~/farm_nrt,
```

where [JobOrderFile.xml] is an optional Job Order File name, to your crontab file. Refer to cron manual for details.

2. List of files

The product consists of the following files:

- prepro - pre-processor
- farm_nrt - processor
- *.RES and *.COV - files with model data used by the processor
- README.TXT - this document

3. Pre-processor

The pre-processor is used to supply NRT data to the processor.



Syntax:

```
./prepro [JobOrderFile.xml]
```

It can operate in 2 modes: as a forecast module (with Job Order File) or as a standalone service (without command line parameters).

When used as a forecast module, it performs the following operations:

1. seeks the XML file with the name passed to it as a command-line argument,
2. parses this XML file,
3. fetches the names of data files and other parameters listed therein,
4. checks if the structure of these files matches the template,
5. creates a file "FARM_NRT.CFG" used by the processor,
6. creates a file "ErrorFile.XML" with errorlevels of each operation performed (0 = OK, 1 = Error).

If some or all of the files are missing or corrupt, it automatically downloads these specific files from the open sources on the Internet.

The structure of the Job Order File should be compliant with the Job Order File used in SWACI system. Please refer to AFFECTS deliverable report D5.1 for more information.

The structure of the data files should match those available from data providers. The product needs the following data (4 files in total):

- hourly ACE MAG and SWEPEM data starting from the first hour of the previous month (their format should match those found at <ftp://ftp.swpc.noaa.gov/pub/lists/ace2>, but with the header reduced to last 3 lines),
- quicklook Dst and Kp data starting from the first hour of the previous month in WDC format (same as used by WDC-C2 Kyoto and GFZ Potsdam).

When used as a standalone service mode, the pre-processor downloads all the necessary data files from the Internet.

In both modes the pre-processor should be granted access to the Internet via HTTP and FTP protocols.

4. Processor

The processor is used to issue the forecast and generate metadata.

Syntax:

```
./farm_nrt
```



The processor is configured through the configuration file FARM_NRT.CFG. It is automatically generated by the preprocessor. The explanation of each parameter is given in the configuration file itself. Here only the most important parameters are listed:

- KY – predictand, i.e. which value to forecast (10 = Kp, 11 = Dst, 12 = ap);
- LT – maximum lead time in hours (should be proportional to cadence);
- FNRES and FNCOV – names of .RES and .COV files with relevant model data (the first entry is for the lead time equal to cadence, the second - for twice the cadence etc. till the maximum lead time);
- FMDAT – format of the file, where the forecast will be written;
- FMDATH – format of the header of the file, where the forecast will be written;
- FNDAT – name of the file, where the forecast will be written (if a file with such filename already exists, it will be overwritten);
- FNMET – name of the file, where the metadata will be written (if a file with such filename already exists, it will be overwritten);
- FNMAG – name of the file with ACE/MAG data;
- FNSWEPAM – name of the file with ACE/SWEPAM data;
- FNKP – name of the file with Kp data;
- FNDST – name of the file with Dst data.

The forecast is output in the following order:

- the number of hours since the beginning of the year;
- the number of hours till the next day (to make plot production easier);
- year;
- month;
- day of month;
- day of year;
- UT hour;
- measured value of the predictand;
- the forecast with once the cadence lead time (i.e. 1h for Dst, 3h for Kp);
- the forecast for twice the cadence lead time, and so on.

If the forecast cannot be issued, the corresponding value will be filled.

The metadata format is self-explanatory. The MSE is given in data units, other metrics – in per cent.

5. Known limitations and bugs

- Run-time error F6511 (variable name not found) occurs when the configuration file is composed incorrectly. Please, stick to the provided example.
- Currently, there are no checks of the filenames provided in the configuration file. It will be implemented in future versions.



6. Acknowledgements

We acknowledge the Geoforschungszentrum, Potsdam for the near-real-time Kp data, and the World Data Center for Geomagnetism, Kyoto (WDC-C2) for the near-real-time Dst data.

We thank the ACE MAG and SWEPAM instruments teams and the ACE Science Center for providing the ACE data.

7. Disclaimer




This product was created on best efforts basis and is provided “as is” without warranties of any kind. The forecasts issued by this product are accurate to the best knowledge of the developers; however, the developers cannot be held responsible for any damage, loss of profit and similar charges rising out of the use of this product and its output. In particular, the developers of this product cannot be held responsible for the consequences of any action, or the lack of, based on the forecast provided by this product. Any such consequences shall be at sole responsibility of the respective decision makers.

8. Contact information

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	<p>Acknowledgement</p> <p>The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under the grant agreement n° 263506 (AFFECTS).</p>	 
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