Tools

Data access

1. **Data portal**
   The simplest way how to get rather smaller ad hoc data samples (approximately up-to 20 000 retrieved fields per request)
2. **Batch access**
   The ECMWF access in batch should be used for most common types of work (big data samples retrievals)
3. **CMA data portal**
   2nd official TIGGE data portal where all data from all partners can be downloaded. The data on both official portals hosted at ECMWF and CMA is synchronized via LDM.
4. **NCAR data portal**
   Until the end of 2015, TIGGE data up to the end of 2014 are also available via this research data portal at NCAR.
5. **TIGGE Tropical Cyclone Track Data** (UCAR)
   - TC tracks data in CXML format
   - more information in https://www.cawcr.gov.au/research/cyclone-exchange/

ECMWF Tropical Cyclone Track Data (XML format)

Be aware that the links below might work depending on the browser used. Authentification using provided user ID and password can be needed depending on the browser and user location.

- **FTP:** ftp://tigge_glob_tc:tgtc2018@acq.ecmwf.int
- **WEB:** https://acq.ecmwf.int (user: tigge_glob_tc, password: tgtc2018)

Data monitoring

- **History page**
  It shows an overview of the available data from each centre. It is useful also to identify data gaps caused by any kind of problems.

GRIB2 and NETCDF conversion

- **GRIB**
  ECMWF has developed a C GRIB API for encoding, decoding and data manipulation in GRIB-2 format. All TIGGE parameters should be recognized through GRIB_API.
- **grib2_to_netcdf**
  grib2_to_netcdf is an NCAR conversion utility built on the ECMWF GRIB_API and Unidata NetCDF libraries. The utility converts regular lat/lon gridded TIGGE data from GRIB-2 to NetCDF format.

Other External tools

- **TIGGE Museum**
  The museum includes a set of scripts to download TIGGE data, and plot it (using GrADS) in file TIGGE_sample.tar.gz - available directly from here .
- **Cyclone XML tools**
  Tools for use with Cyclone XML data are available from the CAWCR CXML website.
- **NCAR Tools:**
  - NCL
    The NCAR Command Language (NCL) is a free interpreted language designed specifically for scientific data processing and visualization. NCL has robust file input and output with support for NetCDF, HDF, GRIB-1 and GRIB-2 file formats, including support for all published TIGGE GRIB-2 parameters.
    NCL is provided with a couple of useful command line tools:
    - ncl_filedump - prints the contents of supported files in a netCDF-like view.
    - ncl_convert2nc - converts one or more files in any of the supported formats to netCDF formatted files.
  - {PyNGL and PyNIO
    PyNGL and PyNIO provide a Python interface to most of the NCL tools and its functionality, with an emphasis on high quality 2D visualizations. PyNIO, in particular supports TIGGE GRIB-2 with the functionality provided by NCL.
  - MET
    Model EvaluationTools (MET) is a suite of software utilities designed by NCAR Developmental Testbed Center (DTC) to the provide the capability to validate model forecasts using observational data.

- **NOAA Tools:**

    - NCEP tools for GRIB-2
      National Centers for Environmental Prediction (NCEP) provides a generalized set of codes for encoding, decoding and data manipulation in GRIB-2 format. Many TIGGE parameters will not be recognized using's NCEP's GRIB-2 table definitions.
    - wgrib2
      Climate Prediction Center (CPC) provides a tool (wgrib2) for examining and manipulating GRIB-2 files. Many TIGGE parameters will not be recognized using wgrib2. A modified version of wgrib2 designed to read all TIGGE parameters can be downloaded here: tiggewgrib2.tar (only tested on Sun OS 2.10, and Linux).
    - ncBrowse
      ncBrowse is a GUI based tool that can be used to visualize TIGGE NetCDF data.
- **Unidata tools:**
    - GEMPAK provides functionality for analysis of GRIB-2 data.
    - GRIB Java Decoder provides file manipulation functionality.
    - Unidata IDV is a GUI based tool that can be used to visualize both NetCDF and GRIB-2 data.
- **NASA tool:**
    - Panoply is a GUI based tool that can be used to visualize TIGGE NetCDF data and easily compute/plot zonal averages.

Algorithms for TIGGE diagnostics

Zoltan Toth offers Fortran examples of CAPE and CIN computations performed at NCEP:

- CALCAPE.f, example for CAPE calculation
- TTBLEX.f, example for CIN calculation