

The University of Melbourne cyclone tracking software

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Introduction

The University of Melbourne automatic cyclone tracking scheme (Murray and Simmonds 1991, and subsequent papers) is available as a Fortran 77 software package which will be subsequently referred to as the cyclone tracking software (CTS). The software is designed for operating systems that have a UNIX environment (e.g. Linux) or emulation (Cygwin for Windows) and currently exists in two forms:

1. Low resolution – version L1.1
2. High resolution – version H1.1

Version H1.1 is essentially the same as L1.1 except that it has larger array sizes and one additional namelist parameter. Note: The download links will refer to **L1.1A** and **H1.1A** since some of the utilities (*not* the core cyclone tracking programs) have been updated.

The CTS is available as Fortran source code or precompiled binaries for Linux (Red Hat 2.4.20-20.7) and Cygwin (1.5.25). Note: Many Linux and Cygwin users are able to install the provided binaries. The Fortran compiler that has been traditionally employed is `g77`; however, the software should compile with any standard compiler e.g. `pgf90`. The core package does not require any additional software; however, we use NCAR Graphics (now part of NCL: <http://www.ncl.ucar.edu/>) for plotting cyclone positions, tracks and statistics for publication purposes. The software may be incorporated into UNIX scripts for processing large data sets or long time periods e.g. 1979-2008. We use C-shell scripts i.e. `cs`h (`tcsh`), for our own work.

The input data is typically mean sea level pressure (MSLP) and we also make use of a (constant) 'topography' field – it is recommended to use surface geopotential height.

The CTS may also be used for cyclone tracking of geopotential height fields at different pressure levels e.g. 500 hPa. For more information see:

Cyclone tracking of geopotential height fields

A recent innovation (Lim and Simmonds 2007) is to allow the vertical tracing of cyclones from (say) MSLP to 300 hPa. This requires using the CTS on a set of geopotential height fields and typically MSLP, followed by some additional utilities comprising the vertical tracing software (VTS). For more information see:

The University of Melbourne vertical tracing software

Additional information, including statistics of some of the cyclone variables e.g. system density, for the various reanalysis projects e.g. NCEP Reanalyses (NCEP/NCEP2), can be obtained from:

<http://www.earthsci.unimelb.edu.au/tracks/cychome.htm>

Documentation

Owing to time constraints we are unable to prepare a comprehensive manual at this time. After installation there is a main folder (directory) called `cyc.dir`. This contains other folders such as:

doc.dir: There are descriptions of the core programs – see: cycloc.man, track.man and tstat.man.

test.dir: There is a test suite consisting of some examples – see: **test.man** – as well the files: readme.*.

Cyclone tracking package tests

The general test folder is: cyc.dir/test.dir

There is a test suite consisting of some examples – see: test.man – as well the files: readme.*.

Linux version

For the standard Linux version (L1.1) see:

http://www.earthsci.unimelb.edu.au/~kevin/cyc_L1.1A/README.ver_L1.1A.htm

This version has files organised into separate zip files.

There is another version (H1.1) which only differs in one parameter (for grids with both negative and positive longitudes) and larger grid sizes:

http://www.earthsci.unimelb.edu.au/~kevin/cyc_H1.1A/README.ver_H1.1A.htm

This version has all of the files including binaries in a single zip file.

We suggest installing the usual version (**L1.1**) first. This can handle 1 – 2.5 degree global grids or higher resolution grids over a region. If necessary you can install the other version (H1.1) later. If the precompiled binaries do not work for you then it will be necessary to compile the Fortran source code.

Windows XP version

See the web page at:

http://www.earthsci.unimelb.edu.au/~kevin/cyc_L1.1A/README.cygwin.htm

These are installation notes for Windows XP and possibly the software will work under Vista but this has not been tested. The binaries were compiled with a Cygwin version of g77 and the software performs correctly. Note: At this stage only version **L1.1** is available for Cygwin but H1.1 can be provided if necessary.

The notes assume that you *don't* have Cygwin installed - if you already have Cygwin on your PC then you may omit quite a few instructions. Our distribution includes a cut-down version of NCAR Graphics (now part of NCL) which is used for plotting cyclone positions, tracks and statistics. See the section NCAR Graphics.

NCAR Graphics

The optional graphics functionality requires NCAR Graphics which is now incorporated into NCL. If you have either of these packages then try: `ncargversion` which should print something like:

NCAR Graphics Software Version 5.0.0
Copyright (C) 1987-2007, University Corporation for Atmospheric Research

If not, then you can install the NCL binaries i.e. precompiled programs and libraries, from:

<http://www.ncl.ucar.edu/Download/index.shtml>

Note that the download for NCL requires (free) registration: *Request an ESG account.*

If you are using our supplied version of NCAR Graphics then you need to set the environment variable NCARG_ROOT to the location of the ncarg folder

e.g. `setenv NCARG_ROOT /work/user/ncarg/`

If you install NCL then this variable is the location of the ncl folder

e.g. `setenv NCARG_ROOT /work/user/ncl/`

This is mentioned in the NCL installation notes.

NCAR Graphics utilities

If you have a Linux OS then you *may* be able to use our precompiled binaries.

Download:

http://www.earthsci.unimelb.edu.au/~kevin/cyc_L1.1A/zbin_ncarg.linux.zip

to: /work/user. Then:

```
cd /work/user
unzip zbin_ncarg.linux.zip
```

The binaries will be placed in: `cyc.dir/ubin`

If the binaries don't work then you will need to compile the programs.

Download:

http://www.earthsci.unimelb.edu.au/~kevin/cyc_L1.1A/zutils_ncarg.linux.zip

to: /work/user

Then:

```
cd /work/user
unzip zutils_ncarg.linux.zip
```

conmap

Go to: `cyc.dir/ncarg.dir/src`

```
cd conmap
run-make
```

Note: You will probably need to make some changes to the C-shell script `run-make` including the setting of `NCARG_ROOT` as well as to the file `Makefile`.

kmapline

Go to: `cyc.dir/ncarg.dir/src`

```
cd kmapline  
run-make
```

The binaries `conmap` and `kmapline` should now be located in: `cyc.dir/ubin`

There are some graphics tests in: `cyc.dir/ncarg.dir/test`

Copyright and Disclaimer

As with any free software package, the CTS is given without any warranty and we cannot be held responsible for any errors that may impact your research. However, we have successfully used the CTS as part of our research for many years and believe in the overall fidelity of the technique. The software may be freely used and adapted as you see fit. We only ask that you acknowledge the developers by including a reference to at least one of the papers describing the CTS (see References) and perhaps to:
<http://www.earthsci.unimelb.edu.au/tracks/cychome.htm>

Questions and Feedback

Finally, any questions or feedback may be sent to:

Ian Simmonds: simmonds@unimelb.edu.au

or:

Kevin Keay: keay@unimelb.edu.au

Queries of a technical nature e.g. installation issues, should be sent primarily to Kevin Keay.

References

For a comprehensive listing see: <http://www.earthsci.unimelb.edu.au/tracks/cychome.htm>

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