

# ARW (WRF) output to ARL Tutorial

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This tutorial is for Mac/Linux/Unix users

- **bold** means command line
- *italics* means the literal names of files or directories
- normal text are instructions

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## NOTE

You should already have NETCDF Libraries installed in your computer to complete this procedure.

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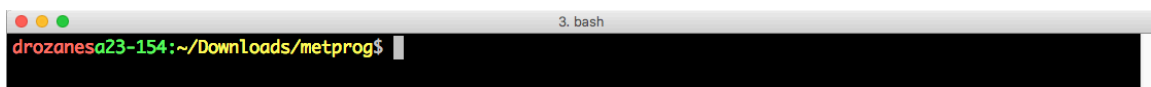
Go to:

[https://ready.arl.noaa.gov/HYSPLIT\\_data2arl.php](https://ready.arl.noaa.gov/HYSPLIT_data2arl.php)

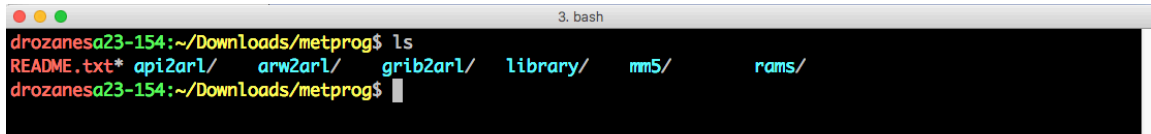
and download the *metprog.zip* file under “Meteorological Data Sources”.

After downloading the *metprog.zip* file from the ARL website do:

**cd ~/Downloads/metprog**



You'll see the following directories/file:

A terminal window titled "3. bash" showing a directory listing. The prompt is "drozanesa23-154:~/Downloads/metprog\$". The command "ls" has been executed, resulting in the output: "README.txt\* api2ar1/ arw2ar1/ grib2ar1/ library/ mm5/ rams/". The prompt is now "drozanesa23-154:~/Downloads/metprog\$".

```
drozanesa23-154:~/Downloads/metprog$ ls
README.txt* api2ar1/  arw2ar1/  grib2ar1/  library/  mm5/  rams/
drozanesa23-154:~/Downloads/metprog$
```

For WRF output files, we only care about the *arw2ar1* directory, but the files in it need to be modified in order to work on your own computer. First of all, you'll have to create an empty *exec* directory:

**mkdir exec**

Now we need to build again the *library* directory.

**cd library**

**ls**

You should see a bunch of *.f* files. Do a **make clean** here in case you have a previous build. Then do:

**make**

After compiling do an **ls** and you should see the *libhysplit.a* file.

```
3. bash
ar -vr libhysplit.a fcopen.o
a - fcopen.o
ranlib libhysplit.a
rm -f fcopen.o
gfortran -c -O2 -fconvert=big-endian -frecord-marker=4 -ffree-form fcpts.f
ar -vr libhysplit.a fcpts.o
a - fcpts.o
ranlib libhysplit.a
rm -f fcpts.o
gfortran -c -O2 -fconvert=big-endian -frecord-marker=4 -ffree-form fcread.f
ar -vr libhysplit.a fcread.o
a - fcread.o
ranlib libhysplit.a
rm -f fcread.o
drozanesa23-154:~/Downloads/metprog/library$ ls
DEFPACK.INC*  cg2cxy.f*  cnxyll.f*  eqvlat.f*  pakini.f*  stcm2p.f*  update.bat*
Makefile*    cg2wll.f*  cpoll.f*  fcclos.f*  pakinp.f*  stlmb.r.f*  update.sh*
cc2gll.f*    cg2wxy.f*  cpolxy.f*  fcgtps.f*  pakndx.f*  tm2day.f*  w3code.f*
cc2gxy.f*    cgszll.f*  cspanf.f*  fcopen.f*  pakout.f*  tm2jul.f*
ccrvll.f*    cgszxy.f*  cw2gll.f*  fcpts.f*   pakrec.f*  tm2min.f*
ccrvxy.f*    cll2xy.f*  cw2gxy.f*  fcread.f*  pakset.f*  tminit.f*
cg2c1l.f*    cnlly.f*   cxy2ll.f*  libhysplit.a  stcm1p.f*  tmplus.f*
```

Now go to the *arw2arl* directory, where you have to modify *Makefile*:

```
cd ../arw2arl
vi Makefile
```

The original Makefile would look like this:

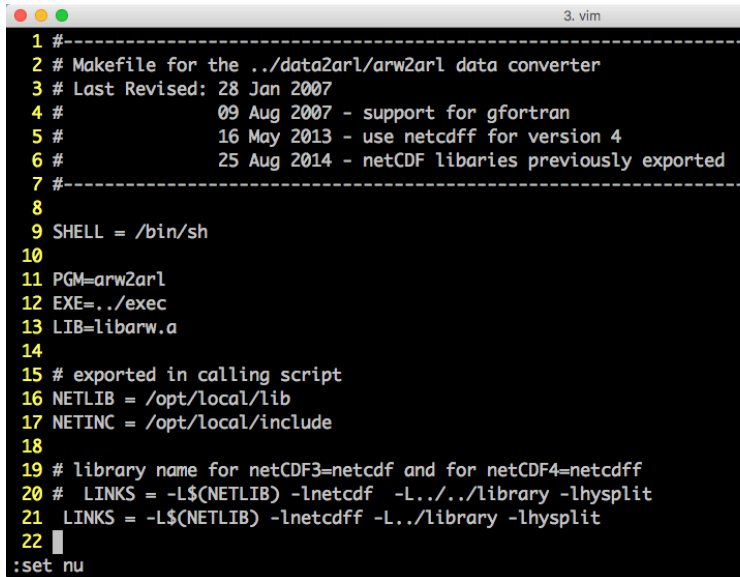
```
3. vim
#-----
# Makefile for the ../data2arl/arw2arl data converter
# Last Revised: 28 Jan 2007
#
#       09 Aug 2007 - support for gfortran
#       16 May 2013 - use netcdf for version 4
#       25 Aug 2014 - netCDF libraries previously exported
#-----
SHELL = /bin/sh

PGM=arw2arl
EXE=../exec
LIB=libarw.a

# exported in calling script
# NETLIB = /usr/local/lib
# NETINC = /usr/local/include

# library name for netCDF3=netcdf and for netCDF4=netcdf
LINKS = -L$(NETLIB) -lnetcdf -L../library -lhysplit
# LINKS = -L$(NETLIB) -lnetcdf -L../library -lhysplit
```

You should change it to look like this:



```
1 #-----
2 # Makefile for the ../data2arl/arw2arl data converter
3 # Last Revised: 28 Jan 2007
4 #           09 Aug 2007 - support for gfortran
5 #           16 May 2013 - use netcdf for version 4
6 #           25 Aug 2014 - netCDF libraries previously exported
7 #-----
8
9 SHELL = /bin/sh
10
11 PGM=arw2arl
12 EXE=../exec
13 LIB=libarw.a
14
15 # exported in calling script
16 NETLIB = /opt/local/lib
17 NETINC = /opt/local/include
18
19 # library name for netCDF3=netcdf and for netCDF4=netcdf
20 # LINKS = -L$(NETLIB) -lnetcdf -L../library -lhysplit
21 LINKS = -L$(NETLIB) -lnetcdf -L../library -lhysplit
22 |
:set nu
```

Notice changes in lines: 12, 16, 17, 20 and 21.

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#### NOTE

Line 12 should be the same as in example.

On lines 16 and 17, you should point to the directory where you have the NETCDF libraries installed in YOUR computer. For this tutorial, this is */opt/local/lib* and */opt/local/include*, respectively.

On lines 20 and 21, uncomment the line which works with your NETCDF version you have installed and comment the other one, i.e. 20 for NETCDF 3 and 21 for NETCDF 4.

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Do **make clean** in case you have a previous build.

And compile again:

**make**

(you will not see any changes in this directory).

Go back to the */metprog/exec/* directory you created below:

**cd ../exec**

And you should see a executable there: *arw2arl*

Copy or soft-link this executable to the directory where you have your WRF output files. (first move to the directory where your WRF output files are using **cd**). It is good practice to keep a backup of your original WRF output files somewhere else, just in case.

To copy:

```
cp [path where the downloaded metprog directory is]/metprog/exec/arw2arl .
```

(Notice the dot "." at the end of the command)

To soft-link:

```
ln -s [path where the downloaded metprog directory is]/metprog/exec/arw2arl .
```

To concatenate different time outputs into a single ARL file you can use with HYSPLIT, you will need to have the executable *arl\_concat* (\*\*\*) in that same directory.

Once you do, type:

```
./arl_concat
```

This will prompt you with a question to input the number of the domain you want to use the ARL conversion on. Input a one digit number. If you need to do several domains, you will have to carry out this procedure again for each.

For example, for domain 01 (wrfout\_d01...), an *arl\_domain01.BIN* file will be created which will contain the information of all the WRF outputs for the period of your simulation. This is the only file you will need to input to HYSPLIT. You can rename it after that.

\*\*\* This can be found on a common repository or with your instructor.