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Technical Note

WAVEWATCH-III version 1.18 :
Generating GRIB files.[†]

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1 Introduction

This report is an addendum to the user manual and system documentation of version 1.18 of the full-spectral third-generation ocean wind-wave model WAVEWATCH III (Tolman 1999, henceforth denoted as WWATCH). It describes a post-processor that packs fields of mean wave parameters in GRIB format, using GRIB version II and NCEP's w3 and bacio library routines. The GRIB packing is performed using the NCEP's GRIB tables as described in NCEP (1998).

This post-processor presented here has been used on NCEP's Cray C90 and IBM RS6000 SP, and should be easily transferable to other hardware, provided that a local GRIB packing routine comparable to the NCEP library routines is available.

Sections 2 through 4 of this report discuss the running, implementation and system documentation of the post-processor. These sections correspond to sections 4 through 6 of Tolman (1999). For comments, questions and suggestions, please send E-mail to :

wavewatch@ncep.noaa.gov

This documentation and the accompanying software is covered by the disclaimers in section 1.2 of Tolman (1999).

2 Running the post-processor.

Packing fields in GRIB format is performed using a program that processes raw gridded output from the file `out.grd.ww3`, using the model definition file `mod_def.ww3` used in the generating model run (see section 4.1 and Fig. 4.1 of Tolman 1999). The GRIB data is written to the file `gribfile`, which is opened as an unformatted file within the code, and is assigned on the Cray C90 with the `-F` system option. Below, the program is described with its relevant files and with an example input file as in Tolman (1999).

2.1 Program description

Program : ww3_grib (W3GRIB)
 Code : ww3_grib.ftn
 Input : ww3_grib.inp : Formatted input file for program.
 mod_def.ww3 : Model definition file.
 out_grd.ww3 : Raw gridded output data.
 Output : standard out : Formatted output of program.
 gribfile : File with selected data in GRIB format.

start of example input file

```

$ ----- $
$ WAVEWATCH III Grid output post-processing ( GRIB ) $
$ ----- $
$ Time, time increment and number of outputs.
$
  19680606 000000 3600. 3
$
$ Request flags identifying fields as in ww3_shel input and
$ section 2.4 of the manual.
$
  F F F F F T T T T T F F F F F F
$
$ Additional info needed for grib file
$ Forecast time, center ID, generating process ID, grid definition
$ and GDS/BMS flag
$
  19680606 010000 7 10 255 192
$
$ ----- $
$ End of input file $
$ ----- $

```

end of example input file

Although the above input file contains flags for all 16 output fields of WWATCH, not all fields can be packed in GRIB. If a parameter is chosen for which GRIB packing is not available, a message will be printed to standard output. Table 1 shows which parameter can be packed in GRIB, and which kpds value has been used in packing the data. Note that there is a slight

WWATCH output number	description	KPDS number for GRIB packing
1	depth	–
2	mean current	–
3	wind speed	32
	wind direction	31
	wind u	33
	wind v	34
4	air-sea temp. dif.	–
5	friction velocity	–
6	wave height H_s	100
7	mean wave length	–
8	mean wave period T_m	103
9	mean wave direction θ_m	101
10	directional spread	–
11	peak period T_p	108
12	peak direction θ_p	107
13	wind sea period T_w	110
14	wind sea direction θ_w	109
15	average time step	–
16	cut-off frequency f_c	–

Table 1: GRIB packing information for WWATCH. If no KPDS number is given, data cannot be packed in GRIB.

deviation from the standard WMO GRIB description in the peak and wind sea period, and the corresponding mean parameters. These are packed using KPDS values reserved for the ‘primary’ and ‘secondary’ period and direction. Note that these periods are simply obtained by inverting the corresponding frequency, which is the actual output of WWATCH.

3 Implementation of the post-processor.

3.1 Introduction

The GRIB post-processor for WWATCH is written in ANSI standard FORTRAN. The only exception is the use of a LOGICAL*1 array that is required as input for the w3 GRIB packing routine PUTGB. As with the other elements of WWATCH, the files do not contain plain FORTRAN source code, but need to be pre-processed with the native preprocessor. Installation therefore consists of two parts; a) installation of the source code files and auxiliary scripts; b) modification of the automated compile and link system to accomplish compilation of the new program.

3.2 Installing files

In its packed version, the GRIB post-processor for WWATCH is contained in a single file:

`wwatch3.grib.tar` Archive file containing all source code files and an example input file.

This file may be compressed with the standard UNIX commands `compress` or `gzip`, in which case the extension `.Z` or `.gz` is added. Such files can be unpacked with the standard UNIX commands `uncompress` or `gunzip`.

The installation of the new post-processor requires modifications to the compile and link system of WWATCH. Before embarking on making these modifications, it is prudent to make a backup of the present installation of WWATCH by running the archive program `arc_wwatch3` (see Tolman 1999).

The first step in installing the post-processors consists of unpacking the above archive file. This file has to be copied to the WWATCH 'home' directory, i.e., the directory where the other WWATCH archive files are located. While in this directory, the files are installed by typing

```
tar -xvf wwatch3.grib.tar
```


which will place two new source code files in the `ftn` directory and a new input file in the `inp` directory.

3.3 Compiling and linking

After the above source code files have been installed, the programs should be included in the automated compile and link system of WWATCH. This requires some minor modification of most scripts as described in section 5.3 of Tolman (1999). Note that all the necessary modifications are already included as comments in the scripts for WWATCH version 1.18. Please follow the following steps exactly.

- 1) Update `make_makefile.subs` in the `bin` directory.
Add the appropriate file names to the shell script variable `$files` in section 2.c of this script (`ww3_grib` in options 0 and `w3exgb` in option 10 in the `case` statement, make sure that the syntax of the `case` statement remains correct). Execute the script to regenerate the corresponding part of the makefile. If the proper modification have not been made, are warning will be printed mentioning unprocessed files.
- 2) Update `make_makefile.prog` in the `bin` directory.
Add the file name `ww3_grib` to the shell script variable `$progs` in section 2.c of this script. Execute the script to regenerate the corresponding part of the makefile. The script should generate no output.
- 3) Update `w3_new` in the `bin` directory.
Activate keyword `'grib'` in the `case` statement in section 2, and have this option touch the files `ww3_grib.ftn` and `w3exgb.ftn`.
- 4) Update `w3_make` and `w3_source` in the `bin` directory.
Add the name `ww3_grib` to the shell script variable `$progs` in section 1.c and to the shell scripts variable `$checks` in section 2.b.
- 5) Update `link` in the `bin` or `work` directory.
Add the appropriate libraries in section 3.

This completes the modifications to the compile and link system. The compilation of the new programs can be tested by typing

```
w3_make
```

which will respond that all the old programs are up to date, and will compile and link the new program. As an additional test, the entire set of programs can be recompiled by typing

```
w3_new all  
w3_make
```

The program can now be tested by making a link to the input file in the work directory

```
ln -s ../inp/ww3_grib.inp .
```

after which the post-processor can be executed by typing.

```
ww3_grib
```

Make sure that the necessary raw data file `out_grd.ww3` has previously been generated.

This completes the modifications to the compile and link system. No modifications are necessary for the install and archive system. A full backup of WWATCH including the GRIB post-processor can now be made by typing

```
arc_wwatch3
```

and the command

```
install_wwatch3
```

will now install the complete set of WWATCH programs including the GRIB post-processors.

3.4 Model options

There are no compile level model switches available for this post-processor other than the normal test and trace options.

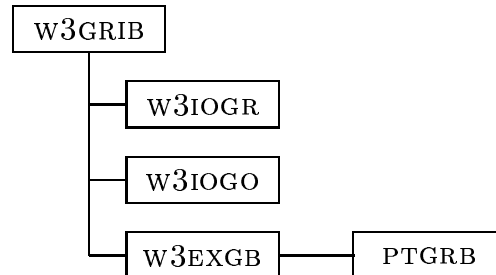


Figure 1: Subroutine structure for the postprocessors. PTGRB is part of NCEP's w3 library.

4 System documentation.

The GRIB post-processors has been fully documented within the source code. Here, only the contents of the different files will be discussed, as well as their relation (see Fig. 1). For a more complete documentation of the new program, reference is made to the source codes. Basic system documentation regarding grid layouts etc. can be found in Tolman (1999)

The two files that constitute the post-processors have the following contents:

ww3_grib.ftn	The main program for processing gridded output N3OUTF.
w3exgb.ftn	Execution subroutine for GRIB output.

5 References

- NCEP, 1998: GRIB. NCEP office note 388. Available by anonymous ftp from <ftp://nic.fb4.noaa.gov>. Revision of 3/10/98 used here.
- Tolman, H. L., 1999: User manual and system documentation of WAVEWATCH III version 1.18. NOAA/NWS/NCEP Technical note **166**, 110 pp.

