Appendix: Spatial Data Format – NWS XMRG Grid

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Overview

The National Weather Service (NWS) *XMRG* file format is used to store gridded data, for example for precipitation. The following documentation is from the NWS web site.

Hourly precipitation estimates on an HRAP grid generated by MPE and Stage3 are written in *xmrg* format. At an RFC, the *xmrg* files are input to the OFS MAPX preprocessor.

File Format

xmrg files are written row by row from within a "do-loop" using a FORTRAN unformatted write statement (see section below entitled **Format of FORTRAN Unformatted Records**). The loop is from `1` to `MAXY` which places the southernmost row as the first row of the file. Each file consists of a two record header followed by the data. The first record of the header contains the following values:

Field #	Description
1	`HRAP-X` coordinate of southwest corner of grid (also referred to as `XOR`)
2	`HRAP-Y` coordinate of southwest corner of grid (also referred to as `YOR`)
3	Number of `HRAP` grid boxes in X direction (also referred to as `MAXX`)
4	Number of `HRAP` grid boxes in Y direction (also referred to as `MAXY`)

These values appear in the file */.../geo_data/ascii/coord_XXXXX.dat* where `XXXXX` is the site name. These four values are written as `I*4`. The second record of the header was added in June 1997 and contains the following information:

Field #	Description	Type	Explanation
0	oper sys	`char*2`	`HP` or `LX`
1	user id	`char*8`	`LOGNAME` of user that saved the file
2	saved date/time	`char*20`	`ccyy-mm-dd hh:mm:ss` (Z time)
3	process flag	`char*8`	see below
4	valid date/time	`char*20`	`ccyy-mm-dd hh:mm:ss` (Z time)
5	maximum value	`integer*4`	`units` = mm
6	version number	`float`	AWIPS Build number

Fields 4,5,6 were added as part of the AWIPS Bld 4.2 upgrade that was implemented during the summer of 1999. For gridded FFG data, field 5 is not used and is set to `-999` and field 6 is the file version number. At Bld 5.2.2, the first field was split into two fields - field 0 of size `char*2` and field 1 of size `char*8`. Before Bld 5.2.2, the first field was `char*10` so the total size of the second record was unchanged.

The precipitation data values are written to the file as `I*2` values in units of hundredths of mm. Data values for bins that have no radar coverage are set to `-1`. There are `MAXY` rows of data each with `MAXX` values.

Because the I*2 data type can hold values only up to approximately 32,000, the *xmrg* format is not appropriate for large data values. Precipitation values greater than approximately 12 inches cannot be stored in this format.

Process Flag

The process flag is defined as follows:

`XXyHH`

where `XX` = process code
`y` = `A` (automatic) or `M` (manual)
`HH` = duration in hours

Examples are

auto_stageiii	S3A01
manual stageiii	S3M01
mpe_fieldgen	MPA01
mpe_gui	MPM01

The process flag is used by the *xmrg* to *grib* encoder process for defining *grib* parameters.

Format of FORTRAN Unformatted Records

FORTRAN unformatted records have a 4 byte integer at the beginning and end of each record that is equal to the number of 4 byte words contained in the record. When reading *xmrg* files through C using the ***Read*** function, the user must account for these extra bytes at the beginning and end of each record.