Nimrod System
Documentation Paper No.2

Nimrod format for image and model field files

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Version:1.7 edited by Stuart Read
Date: 07/08/08

Nimrod File Format

With the exception of raw observations and some constants, most files on the Nimrod system will be held in a standard format developed from the NDG format.

Each file consists of one or more records held in sequential format. Each record consists of a 512 byte header followed by a data array. The data array may be in integer format with 1,2 or 4 bytes per item or in real format with 4 bytes per item.

The default values for each element of the header will be; -32767 for integer elements, -32767.0 for real elements, and a 'null' string for character elements. It is recommended that all input data files have their data origin at the top left hand corner whenever possible. However, routines for reading the contents of Nimrod files will contain the option to return a data array with the first element being either the top left or bottom left point of the image/field. The header is constructed as follows.

Data Type	Element number	Description of header element
Integer*2	**1-31**	**General header entries (Bytes 1-62)**
I*2	1.	VT year. VT is the Validity Time of the data.
I*2	2.	VT month.
I*2	3.	VT day.
I*2	4.	VT hour.
I*2	5.	VT minute.
I*2	6.	VT second.
I*2	7.	DT year. DT is the Data Time. It can be used for models, forecast images, or forecast data.
I*2	8.	DT month.
I*2	9.	DT day.
I*2	10.	DT hour.
I*2	11.	DT minute.
I*2	12.	=0 if data is of type real, =1 if data is of type integer, =2 if data is of type byte.
I*2	13.	Number of bytes for each data element (1, 2, or 4).
I*2	14.	Experiment number (user supplied).
I*2	15.	Horizontal grid type (0=NG, 1=lat/lon, 2=space view, 3=polar stereographic, 4=x/y grid, 5=other).
I*2	16.	Number of rows in field.
I*2	17.	Number of columns in field.
I*2	18.	Header file release number (2 for the first release of the Nimrod header).
I*2	19.	Field code number (includes data type).

I*2	20.	Vertical co-ordinate type (0=height above orography, 1=height above sea-level, 2=pressure, 3=sigma, 4=eta, 5=radar beam number, 6=temperature, 7=potential temperature, 8=equivalent potential temperature, 9=wet bulb potential temperature, 10=potential vorticity, 11=cloud boundary).
I*2	21.	Vertical co-ordinate of reference level eg. for thickness fields (values as for element 20).
I*2	22.	Number of elements, starting at element 60, which are used for data-specific information eg. calibration information only appropriate to a radar image. (this element previously indicated whether or not a supplied colour table is used).
I*2	23.	Number of elements, starting at element 109, which are used for data-specific information (previously this was the number of categories in colour table).
I*2	24.	Location of origin of data (0=top LH corner, 1=bottom LH corner, 2=top RH corner, 3=bottom RH corner).
I*2	25.	Integer missing data value.
I*2	26.	Period of accumulation or average (minutes)
I*2	27.	Number of Model Levels
I*2	28.	Projection biaxial ellipsoid [0 = Airy 1830 (NG), 1 = International 1924 (modified UTM-32), 2 = GRS80 (GUGiK 1992/19)].
I*2	29.	Spare
I*2	30.	Spare
I*2	31.	Spare
Real*4	**32-59**	**General header entries (Bytes 63-174)**
R*4	32.	Value of vertical co-ordinate (eg. 500.0 for a 500hPa height field), or radar beam number (8888.0=sea-level, 9999.0=ground level or undefined). If the vertical co-ordinate type (element 20) is set to 3 or 4 then the value is set to model level number. For example, 3.0 for model level three or 2.5 for model level two and a half.
R*4	33.	Value of reference vertical co-ordinate (eg. 1000.0 for a 500 - 1000hPa thickness field)
R*4	34.	Northing or latitude or start line of first row of data (metres for NG, degrees for PS grids).
R*4	35.	Interval between rows ie. pixel size. For PS images this will be the resolution in the y-direction at the standard latitude of 60 degrees North (metres or degrees).
R*4	36.	Easting or longitude or start pixel of first point of first row of data (metres or degrees).
R*4	37.	Interval between columns ie. pixel size. For polar stereographic images this will be the resolution in the x-direction at the standard latitude of 60 degrees North (metres or degrees).
R*4	38.	Real missing data value.
R*4	39.	MKS scaling factor for data (=100.0 for pressure in millibars).
R*4	40.	Data offset value.
R*4	41.	X-offset of model data from gridpoints (positive = to East, negative = to West).

R*4	42.	Y-offset of model data from gridpoints (positive = to North, negative = to South)
R*4	43.	Standard latitude or latitude of true origin(TM or PS projection) in degrees
R*4	44.	Standard longitude or longitude of true origin(TM or PS projections) in degrees
R*4	45.	Easting of true origin (TM Projection) in metres
R*4	46.	Northing of true origin (TM Projection) in metres
R*4	47	Scale factor on central meridian for TM Projections [NG = 0.9996012717, modified UTM-32 = 0.9996, GUGiK 1992/19 = 0.9993].
R*4	48 - 59.	To be used for general header entries. These elements were previously used for a colour table.
Real*4	**60-104**	**Data specific header entries (Bytes 175-354)** These elements were previously used for a colour table.
R*4	60	Northing or latitude of top left corner of the image (metres for NG, degrees for PS grids)
R*4	61	Easting or longitude of top left corner of the image (metres for NG, degrees for PS grids)
R*4	62	Northing or latitude of top right corner of the image (metres for NG, degrees for PS grids)
R*4	63	Easting or longitude of top right corner of the image (metres for NG, degrees for PS grids)
R*4	64	Northing or latitude of bottom right corner of the image (metres for NG, degrees for PS grids)
R*4	65	Easting or longitude of bottom right corner of the image (metres for NG, degrees for PS grids)
R*4	66	Northing or latitude of bottom left corner of the image (metres for NG, degrees for PS grids)
R*4	67	Easting or longitude of bottom left corner of the image (metres for NG, degrees for PS grids)
R*4	68	Satellite calibration co-efficient
R*4	69	Space count (satellite data)
R*4	70	Ducting Index
R*4	71	Elevation Angle
Character	**105-107**	**Character header entries (Bytes 355-410)**
C*8	105[1].	Character string denoting the units of the field.
C*24	106.	Character string to describe the source of the data.
C*24	107.	Title of field.
Integer*2	**108-**	**Data specific header entries (Bytes 411-512)** These elements were previously used for a colour table.
I*2	108.	The radar number for a single site image (set to zero for a radar composite).
I*2	109.	The radar sites which have gone into forming a composite image. Each site is represented by a particular bit which is set to 1 if the site was available, and 0 if it was not. Radar site 1 will be represented by the least significant bit of element 109.

[1] *This element was originally 2 real*4 elements in the NDG header. The numbering of subsequent elements has therefore changed.*

I*2	110.	As element 110 for additional radar sites. This will only be required if the number of operational sites exceeds 16.
I*2	111.	Clutter map number.
I*2	112.	Calibration Type (0=uncalibrated, 1=frontal, 2=showers, 3=rain shadow, 4=bright band ; the negatives of these values can be used to indicate a calibration which has subsequently been removed.
I*2	113.	Bright band height (units of 10m).
I*2	114.	Bright band intensity. This is defined as the enhancement of the rainfall in the bright band relative to the rain beneath it.
I*2	115.	Bright band test parameter 1. This is the percentage of sectors (24 in all) which have detected a possible bright band.
I*2	116.	Bright band test parameter 2. This is the percentage of the sectors in entry 30 which agree with the bright band height of 28.
I*2	117.	Infill Flag (for level 4.1)
I*2	118.	Stop Elevation (for level 4.1)
I*2	119-131	Used to duplicate real*4 general header entries 32-44 for data transfers to COSMOS (Note: All entries are $\times 10^{-3}$).
I*2	132-139	Used to duplicate real*4 specific header entries 60-67 for data transfers to COSMOS (Note: All entries are $\times 10^{-3}$).
I*2	140	Sensor identifier (Satellite data)
I*2	141	Meteosat identifier (currently 5 or 6)
I*2	143	Availability of synop meteosat and forecast alphas in combined alphas field (e.g 111 all available, 100, only synop)
etc.		The remaining space may be used for further data/application-specific entries.

Notes :

1. The field code number (19) will identify the type of data. For example, Meteosat IR readings or weather radar returns. Numbers 1-400 are reserved for unified model field codes as used in (CF) FieldsFiles. A list of field type codes is as appendix A.

2. The grid descriptor elements in the header (elements 34 & 36) will refer to the location of the **centre of the pixel** for image data, and to the **gridpoint position** for model data. Wind components u & v are often 'staggered' in model grids, the appropriate X and Y offsets must be specified in elements 41 and 42 of the header.
   The DT (Data Time) specified in elements 7 to 11 should be set to -32767 for basic images. For forecast images, DT will refer to the time of the base image from which forecasts are done. For model files, T+0 initial fields should have DT equal to VT, in forecast fields DT will refer to the T+0 initial field from which forecasts are made.

3. In handling polar stereographic images, it is assumed that the South Pole is the reference pole, the standard latitude is given in entry 43, and the downward longitude in entry 40. The origin of the image is specified by latitude and longitude in entries 34 & 36. These values, together with the resolution at standard latitude (entries 35 & 37), and the number of rows and columns in the field (entries 16 & 17), are enough to completely define a PS image.

4. The above scheme preserves the generality of the first section of the header. Elements 1 to 31 are I*2 entries which are not data or application-specific. It is proposed that elements 32 to 59 inclusive should be similarly reserved R*4 entries. The data-specific elements should thus be placed in elements 60-104 if they are Real, and beginning at element 108 if they are integer.

Appendix A

Field code numbers

Field code	Field description	Levels
2	Height	35
3	Temperature	35
5 (u) 6 (v)	Wind	35
8	Relative humidity	35
12	Mean sea level pressure	1
18	Surface temperature	1
27	Probability of snow	1
29	Fog probability	1
50	Freezing level	1
58	Screen temperature	1
61	Model rainaccum	1
63	Model rainrate	1
73	Orography	1
74	Coastline	1
79	Cloud cover	35
80	Cloud top brightness temperature	1
87	Convective cloud base	1
88	Convective cloud top	1
89	Cloud top temperature (deg Celsius)	1
121	Snowdepth	1
122	Screen water temperature	1
133	Screen total water content	1
154	Screen dew point temperature	1
155	Minimum visibility	1
161	Cloud base	1
172	Cloud cover	1
185	Snow melt	1
190	Soil temperature	4
191	Soil moisture	4
205	Pressure	35
206	Wet bulb freezing level	1
207	Cloud top	1
208	Dilute CAPE	1
209	Orographic roughness	1
213	Total precipitation rate	1
214	Total precipitation accumulation	1
215	Catchment maps for heavy rainfall warning	1
216	Accum warning forecast products	1
217	Radar data in dbZ	1
221	Screen aerosol	1
401	Visible channel counts	1
402	Infrared channel counts	1
403	Water vapour channel ??	1
404	Infrared channel temperature	1
405	Rain rate code (satellite)	1
406	Satellite reprojection lookup table	1
410	Rain forecast area map	1
420	Rain fraction	1
421	Precipitation type	1
422	Lightning rate	1
423	Snow probability	1
424	Riming rate	1

425	Probability of rain	1
426	Probability of rain > 0.5 mm/hr	1
427	Probability of rain > 4.0 mm/hr	1
428	Probability of large hail (%)	1
429	Probability of a tornado (%)	1
430	Probability of a severe thunderstorm (%)	1
431	Hail size (mm)	1
450	Area of radar coverage	1
451	Probability of no rain	1
452	Probability of anaprop	1
453	Orographic enhancements	1
454	Radar beam infilling map	1
455	Radar anaprop climatology	1
456	Radar hierarchy map	1
457	Radar domain map	1
458	Radar weights field	1
459	Radar overlap maps	1
600-615	CDP fields	1
800	Peak convective gust (m/s)	1
801	10m wind gust (knots)	1
802	10m wind gust (Beaufort scale)	1
803	10m wind u&v (m/s)	1
804	10m wind speed (knots)	1
805	10m wind force (Beaufort scale)	1
806	10m wind direction	1
807	Pressure anomaly	1
808	Press. gradient anomaly for u wind	1
809	Press. gradient anomaly for v wind	1
810	Vegetative roughness	1
811	Frictional velocity	1
812	Outer layer wind speed	1
813	Inner layer wind speed	1
814	Reference wind speed	1
815	Reference height	1
816	Wave number	1