

The ISG-format

(version 1.01)

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The ISG-format accommodates local/regional geoid models given as undulations with respect to a certain reference ellipsoid on a grid of points.

Each individual data file consists of three sections:

1. The **comment-section** which starts at the beginning and ends with the keyword “begin_of_head” (as a separator between the comment section and the header). This section is optional.
2. The **header-section** which contains textual and numerical parameters. The beginning of the header is marked by the keyword “begin_of_head” while the end of the header is marked by the keyword "end_of_head". This section is mandatory.
3. The **data-section** with the list of undulation values row by row. Values are separated by at least one blank (no tabs). The carriage return is typed at the end of the row only.

The records in the header have the following keywords with the following meaning:

Keywords	Type	Text or value
model name	textual	name of the geoid model; if it does not exist, indicate the name of the country or the geographical region covered by the data
model type	textual	type of the geoid model, i.e. “gravimetric” or “hybrid” model
units	textual	units of the geoid undulations in the data section, e.g. “meters”
reference	textual	reference ellipsoid of the geoid undulations in the data section, e.g. “GRS80” or “--” if it is unknown
lat min	numeric	grid minimum latitude in degrees, (format %18f.12)
lat max	numeric	grid maximum latitude in degrees, (format %18f.12)
lon min	numeric	grid minimum longitude in degrees, (format %18f.12)
lon max	numeric	grid maximum longitude in degrees, (format %18f.12)
delta lat	numeric	grid step in latitude in degrees, (format %18f.12)
delta lon	numeric	grid step in longitude in degrees, (format %18f.12)
nrows	numeric	grid number of rows, for consistency check, (format %18d)
ncols	numeric	grid number of columns, for consistency check, (format %18d)
nodata	numeric	fictitious value to be used for grid cells with no data available, e.g. “-9999.0000”, (format %18f.4)
ISG format	numeric	version of the ISG format, use “1.01” to refer to this document

Note that:

- textual keywords are left-aligned and always occupy 10 characters;
- between the keyword and the corresponding text or value, there is a separator that is “:” for textual records, or “=” for numeric records;
- there is always a blank before and after the separator;
- textual records have no limits of characters and are left-aligned (after the “:” separator and the blank);
- numeric records occupy at most 10 characters (after the “=” separator and the blank) and are right-aligned.

Geoid undulations are referred to the center of the grid cell. The grid cell has a size that is defined by the fields “delta lat” and “delta lon” in the header section. The upper, lower, left and right grid limits are defined by the fields “max lat”, “min lat”, “min lon” and “max lon” in the header section, respectively. The grid number of rows and columns are reported in the header section for check and are given by the following relations:

$$\text{“nrows”} = (\text{“max lon”} - \text{“min lon”}) / \text{“delta lon”}$$

$$\text{“ncols”} = (\text{“max lat”} - \text{“min lat”}) / \text{“delta lat”}$$

The meaning of the grid parameters is displayed in the figure below:

