GRIB API: Keys

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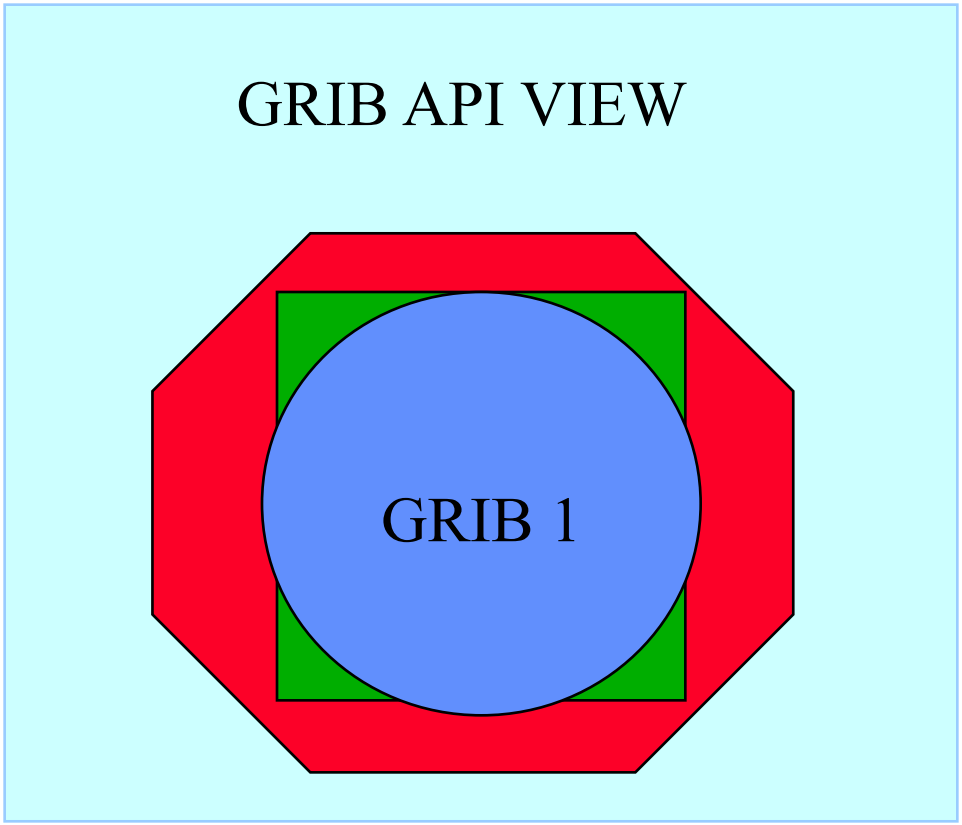
GRIB API keys



GRIB API keys

- Each key has a native type (real, integer, string) and conversions are provided from one type to another when possible.
- The set of keys available changes from one message to another as it depends on the content of the message.
- Changing the value of some keys can cause some other keys to disappear and new keys to be available.
- The value of a key is not always coded in the GRIB message because it can be the result of the combination of several other keys through a given algorithm or just temporary (transient). Therefore we talk about
  - CODED keys (coded in the message as they are)
  - COMPUTED keys (temporary or computed from other keys)

GRIB API keys: Namespace

- A namespace is a name for a set of keys.
- A key belonging to a namespace can be get/set by prefixing it with the namespace or simply without any prefix:

  time.step == step

  parameter.paramId == paramId

- Several namespaces are available e.g.
  - parameter
  - time
  - geography
  - vertical
  - statistics

GRIB API keys: THE REFERENCE

- GRIB1
  http://old.ecmwf.int/publications/manuals/d/gribapi/fm92/grib1/
- GRIB2
  http://old.ecmwf.int/publications/manuals/d/gribapi/fm92/grib2/
- Edition independent
  http://old.ecmwf.int/publications/manuals/d/gribapi/keys/

GRIB API keys

- The easiest way to inspect a GRIB file is by using the tools
  - `grib_ls` to get a summary of the content
  - `grib_dump` to get a more detailed view
  - `grib_filter` to get a custom output format

- Most of what will follow will make more sense once you've had more hands-on experience! Bear with me ☺

GRIB API keys: file related

- **count**
  - Message number in a file
- **countTotal**
  - Message number in a set of files
- **offset**
  - Position in bytes of the start of a message in a file

GRIB API keys: data values

- values
  - array of all the data values and missing values
- numberOfCodedValues
  - number of values in the data sections (missing values excluded)
- numberOfPoints
  - number of grid points = size of the values array
- numberOfMissing
  - number of missing values
- max, min, average
  - maximum, minimum and average of the field

GRIB API keys: geography

- distinctLatitudes, distinctLongitudes
  - array with the longitude/latitude distinct values
- latitudes, longitudes
  - array with all the latitudes/longitudes for each point of the grid
- latLonValues
  - array with all the latitudes/longitudes/values for each point of the grid
    - (lat1,lon1,value1,lat2,lon2,value2,…,latN,lonN,valueN)

GRIB API keys: time

- Start of the forecast run
  - dataDate YYYYMMDD (20070212)
  - dataTime (0000, 0600, 1200,…)
- Forecast step
  - stepType (instant, accum, avg, max, min, diff, rms, sd, cov, …)
  - stepUnits (s, m, h, 3h, 6h, 12h, D, M, Y, 10Y, 30Y, C)
  - startStep
  - endStep
  - stepRange (“startStep-endStep” “endStep”)
  - step
- Validity of the forecast
  - validityDate
  - validityTime

GRIB API keys: grid (gridType)

- For both editions:
  - -regular_ll
  - -reduced_ll
  - -mercator
  - -lambert
  - -polar_stereographic
  - -UTM
  - -simple_polyconic
  - -albers
  - -miller
  - -rotated_ll
  - -stretched_ll
  - -stretched_rotated_ll
  - -regular_gg
  - -rotated_gg
  - -stretched_gg
  - -stretched_rotated_gg
  - -reduced_gg
  - -sh
  - -rotated_sh
  - -stretched_sh
  - -stretched_rotated_sh
  - -space_view
- For edition 2 only:
  - -triangular_grid
  - -equatorial_azimuthal_equidistant
  - -azimuth_range
  - -cross_section
  - -Hovmoller
  - -time_section

GRIB API keys: geography

- Number of points:
  - Ni (Nx) along a parallel or x axis
  - Nj (Ny) along a meridian or y axis
- All latitude and longitude parameters are provided in a InDegrees version
  - longitudeOfFirstGridPoint -> longitudeOfFirstGridPointInDegrees
  - latitudeOfFirstGridPoint -> latitudeOfFirstGridPointInDegrees
  - longitudeOfLastGridPoint -> longitudeOfLastGridPointInDegrees
  - latitudeOfFirstGridPoint -> latitudeOfLastGridPointInDegrees
  - iDirectionIncrement -> iDirectionIncrementInDegrees
  - jDirectionIncrement -> jDirectionIncrementInDegrees

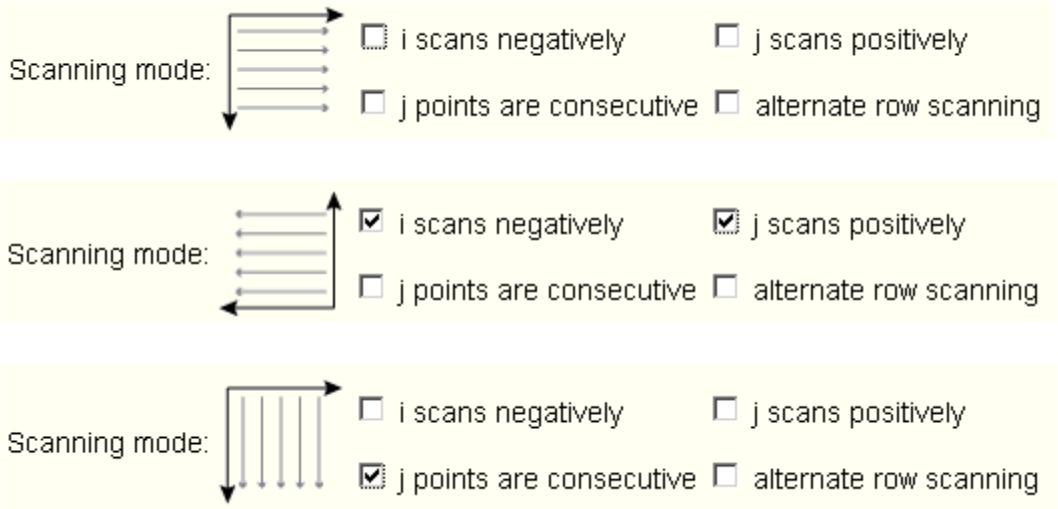
GRIB API keys: geography

- Scanning mode should not be accessed directly. Use the following keys available for both editions.
  - iScansNegatively
  - jScansPositively
  - jPointsAreConsecutive
- Changing those keys doesn't change the order in which the data are stored in the grib. To change the data order and the scanning flag use the following keys:
  - swapScanningX
  - swapScanningY
  - swapScanningLon (same as swapScanningX)
  - swapScanningLat (same as swapScanningY)

GRIB API keys: geography

- To play with this flags and the grid definition see: http://tigge.ecmwf.int/grid.html

- Examples



GRIB API keys: geography

- For the following gridTypes a list of the latitudes and longitudes of the grid points can be obtained with grib_get_data (tools) and through a grib_iterator in C/F90/Python.
  - regular_ll (regular lat lon)
  - reduced_ll (reduced lat lon)
  - regular_gg (regular gaussian)
  - reduced_gg (reduced gaussian)
  - lambert (lambert conformal)
- The list of latitudes/longitudes can be obtained also if a bitmap is present.

GRIB API keys: vertical

- typeOfLevel : surface, cloudBase, cloudTop, isothermZero, adiabaticCondensation, maxWind, tropopause, nominalTop, seaBottom, isothermal, isobaricInhPa, isobaricInPa, isobaricLayer, meanSea, heightAboveSea, heightAboveSeaLayer, heightAboveGround, heightAboveGroundLayer, sigma, sigmaLayer, hybrid, hybridLayer, depthBelowLand, depthBelowLandLayer, theta, thetaLayer, pressureFromGround, pressureFromGroundLayer, potentialVorticity, eta, depthBelowSea, entireAtmosphere, entireOcean
- level
- topLevel
- bottomLevel
- pv list of coefficients of the vertical coordinate

GRIB API keys: levels (GRIB 2)

- typeOfFirstFixedSurface (type and units)
- scaleFactorValueOfFirstFixedSurface
- scaledValueOfFirstFixedSurface
- typeOfSecondFixedSurface (type and units)
- scaleFactorValueOfSecondFixedSurface
- scaledValueOfSecondFixedSurface

GRIB API keys: parameter

- The definition of the parameter is very different in the two editions
- GRIB API provides some edition independent keys to identify a parameter :
  - paramId
  - shortName
  - name
  - units
  - centre

(Parameters will be covered in more depth later)

GRIB API keys: parameters (GRIB 1)

- centre
- table2Version
- indicatorOfParameter
- levelType
- level
- …

GRIB API keys: parameters (GRIB 2)

- discipline
- parameterCategory
- parameterNumber
- typeOfFirstFixedSurface
- scaleFactorOfFirstFixedSurface
- scaledValueOfFirstFixedSurface
- typeOfSecondFixedSurface
- scaleFactorOfSecondFixedSurface
- scaledValueOfSecondFixedSurface
- productDefinitionTemplateNumber
- …

GRIB API keys: packingType

- For GRIB edition 1:
  - -grid_simple
  - -grid_simple_matrix
  - -grid_second_order
  - -spectral_complex
  - -spectral_simple
- For GRIB edition 2:
  - -grid_simple
  - -grid_simple_matrix
  - -grid_second_order
  - -spectral_simple
  - -spectral_complex
  - -grid_simple_log_preprocessing
  - -grid_jpeg
  - -grid_png
  - -grid_ieee

It’s almost lunchtime!
Questions ?