



# gins training 2016

*April 2016, Toulouse*

New format for  gins  
directive file (directeur)

# Plan

## 1. New format principles

- A. YAML format
- B. The blocs structure

## 2. Tools to manage directive file

- A. Yaml\_tools
- B. Version translation
- C. Include file
- D. Grammar file (advanced use)

# New format principles

- YAML format
- The blocs structure

# Principle of YAML format

- YAML language
  - Many libraries to use this format
  - Indentations define bloc structure and prevent from using keys like « begin » and « end »
  - Easy to add or change
- Organization by theme
  - 6 (+1) main blocs can appear :
    - Date,
    - Model,
    - Object,
    - Observation,
    - Parameter,
    - Output,
    - User\_extension.

# Date bloc et Version bloc

This bloc defines the version of literal key set

```
version : 15_2
```

NOTA – if not defined, last stable version is used.

This bloc defines the dates of beginning and end of the arc.

```
date      :  
arc_start    : [23783, 64819.0]  
arc_stop     : [23783, 79219.0]
```

# Model bloc

This bloc defines global models to take into account, i.e :

- central body,
- gravity potential,
- oceanic tides,
- mean pole
- etc ...

```
model      :  
environment :  
    gravity          : .yaya.GT/E/mgx/potentiel.eigen_6s_off  
    ocean_tides       : .yaya.GT/E/mgx/fes2012  
    atmospheric_tides : .yaya.GT/E/mgx/ray_ponte  
    ocean_pole_tide   : .yaya.GT/E/mgx/desai2002  
    inverse_barometer : unused  
    atmospheric_pressure : unused  
    mean_sea_surface  : unused  
    solar_activity     : .yaya.GT/E/mgx/acsol2  
    thermosphere        : unused  
    albedo_ir          : .yaya.GT/E/mgx/albedo_emissivite_stephens  
    earth_orientation_parameters : .yaya.GT/E/mgx/POLE_NRO.dat  
    temporal_nutation  : unused  
    trigonometric_nutation : unused  
    planet_ephemerides  : .yaya.GT/E/mgx/de405bd1f.ad  
    natural_satellite   : unused  
    gnss_antenna        : .yaya.GT/E/mgx/igs08_plus_mgex.atx  
    gnss_clock           : .yaya.GT/E/mgx/horloges_pour_CA  
    gnss_dynamic_models  : unused  
    ionex_files          : .yaya.GT/E/mgx/igsg0430.15i  
    macromodel           : .yaya.GT/E/mgx/LISTE_GNSS_KOUBA_ANT2.xml  
    apriori_parameters   : .yaya.GT/E/mgx/apriori_CA4MGX  
    atmospheric_s1s2_loading_model : .yaya.GT/E/mgx/s1_s2_def_cm.dat  
mean_pole :  
    mean_c21_s21 : potential_model  
    iers_model   : 2010.0
```

# Object bloc

This bloc enumerates objects and describes parameters and options.

These objects can be :

- Quasar
- Station
- Constellation
- Satellite

```
object          :  
quasar        : unused  
station        :  
    station_coordinates : .yaya.GT/E/mgx/stat_autom_CR4MGX_las  
    ocean_tide_loading   : .yaya.GT/E/mgx/load_fes2012_itrf2008  
    atmosphere_loading  : unused  
constellation :  
    - name              : haut  
      initial_state_vector : .yaya.GT/E/mgx/bulletins_pour_CA4MGX  
      gnss_center_of_mass  : [corrected, corrected, corrected, corrected]  
      force               :  
        gravity_field_maximum_degree           : 12  
        gravity_from_solar_system             : earth_sun_moon_j_v_s_u_ma_n  
        integration_reference_frame          : inertial_j2000  
        atmospheric_drag                   : not_computed  
        thermospheric_wind                 : no  
        solar_pressure                    : analytical_albedo_and_ir_file  
        gravity_from_earth_and_pole_tides     : iers_2003_conventions  
        gravity_from_ocean_tides            : iers_2010_with_admittance  
        ocean_tide_maximum_degree          : 12  
        relativistic_acceleration         : schwartzschild_lense_thirring  
        gravity_from_atmospheric_pressure_variations : not_computed  
        satellite_thermal_emission       : not_computed  
        accelero_file_data               : not_computed  
        stochastic_force                :  
        periodic_sf : [adjusted_rtn, -0.31, 1.0e-05, 1.0e+17]
```

# Observation bloc

This bloc describes the set of measurement to take into account, and elimination policy. Each observation links 2 objects.

```
observation      :  
removal          :  
    minimum_laser_raw_data           : 0  
    minimum_doppler_data_per_pass    : 0  
    minimum_gnss_data_per_pass       : 0  
    nsigma_threshold                 : 5  
    first_iteration_residual_threshold: 9999  
    minimum_elevation_threshold      : 0  
    simulation_stepsize              : 900  
interobject_data :  
- file            : .yaya.GT/E/mgx/WC_300.CR4MGX  
  objects          : [haut, station]  
  type             : undifferentiated_gnss  
  remove_observations_of_station   : [JPLM, JPLM_GL, KERG_GL, KIT3, KIT3_GL, NVSK, YIBL]  
  remove_observations_of_satellite : [GP_8, GP_26]  
  tropospheric_correction         : [wet, vmf1, gpt2]  
  apriori_obs_stddev              : 0.05  
  apriori_model_stddev            : 5.0  
  observation_bias_adjustment     : clock_per_epoch_and_ambig_per_pass_global_method  
  nb_adjusted_biases_per_day_per_station : 12  
  ...
```

# Parameters bloc

This bloc describes some algorithmic options and the set of parameters which have to be fitted.

```
parameter      :
  constellation      :
    - name           : haut
    integration       :
      integration_stepsize   : 300.0
      nb_iter_min_max     : [5, 9]
      convergence_criterion : 0.09
      low_inclination_formalism : normal
      regularization       : not_regularized
      integration_algorithm  :
variable_order_cowell_with_rectangular_elements
  integration_order    : 8
  encke_technique     : 0
direct_solar_pressure :
  adjustment_type     : adjust_coef
  initial_value       : 1.0
  apriori_stddev      : 0.0
  nb_days             : 0.0
  surface_to_mass_ratio : 0.0
albedo_ir            :
  adjustment_type   : not_adjusted
  adjustment_param  : 0.0
  coefficient        : [1.0, 0.0]
thermal_reemission  :
  adjustment_type   : not_adjusted
  coefficient        : [1.0, 0.0]
  ...
  ...
```

# Output bloc

Bloc which defines output :

```
output      :
edition    :
measurement_residuals_print : no
normal_matrix_print         : no
archiving   :
orbit                  : standard_format
extrapolated_orbit        : 0
measurement_file_update   : no
statistic_file            : no
residuals_station_print   : no
normal_equation           : after_convergence
non_gravitational_forces : no
```

# User\_extension bloc

This bloc gather options which are not fully consolidated. Because GINS is a research tool, we allow to add options in a “free” form into this subsection. Then we can add temporary parameterization.

```
user_extension :  
  userext_addition :  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK IIA"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK I"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK II"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK IIR"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK IIR-A"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK IIR-B"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK IIR-M"  
    - "GPS_SOUSPONDER_ECL 02.00 000.050 BLOCK IIF"  
    - "POINT_SUB_SOLAIRE"  
    - "NOBSMAX_BLOC 5500"  
    - "GAL_SIG_SATE_ 18 100 1000"
```

# Include option

In order to derive a new case from a first one with exactly the same options, the include option can be used.  
(see further)

# Tools to manage directive file

- [Yaml\\_tools](#)
- Version translation
- Include file
- Grammar file (advanced use)

# Yaml\_tools

There are many tools for manipulating YAML file consistently with grammar file

```
julien@localhost:~
```

Fichier	Édition	Affichage	Rechercher	Terminal	Aide
yaml_add_by_path		yaml_get_by_id		yaml_nelem	
yaml_bloc_id		yaml_get_by_key		yaml_path	
yaml_change_by_key		yaml_get_by_path		yaml_pos_by_key	
yaml_change_by_path		yaml_gram_instanciate		yaml_pos_by_path	
yaml_change_by_path2		yaml_gram_path		yaml_shell.sh	
yaml_change_path_by_path		yaml_gram_prettyprint		yaml_type_by_id	
yaml_collection		yaml_gram_validate		yaml_type_by_key	
yaml_delete_by_key		yaml_info		yaml_type_by_path	
yaml_delete_by_path		yaml_merge			

```
[julien@localhost ~]$ yaml
```

Demonstration : (see practical exercises)



# Descriptive file

The command '`gins_info`' gathers many documentations, especially descriptive file of directive file.

Demonstration (see practical exercises)



Which grammar for which directive file (see practical exercises)



Fichier Édition Affichage Rechercher Terminal Aide

```
#####
version :
-----
  Description :
  | The 'version' section specify the version of grammar to use
This key is a root.

#####
date :
-----
  Description :
  | The 'date' section gathers all dates relative to the whole computation.
  | Dates are expressed as two values -- CNES julian day and seconds in
  | the day -- separated by a comma and grouped together in square brackets
This key is a root.

Possible subsection :
  -> arc_start
  -> arc_stop
  -> initial_state_vector_date
  -> trunc

#####
arc_start :
-----
  Description :
  | Start date of the arc - [ day, seconds ]
Subsection of :
  date

Could be followed by : [ JDAY SECS ]
  Where JDAY can be :
    -> see description of 'arc_start'.
--Plus--
```

# File inclusion

Inclusion function of a directive file allows to minimize effort for modifying an existing file. For instance, when we want to create a case where only few options differ from a first one :

```
1 # exemple for include file
2
3 include      : DIR_included
4
5 date        :
6   arc_start : [22349, 18019.0]
7
8 observation  :
9   interobject_data :
10  - file     : orbites/GR2
11    name     : GNSS_ephemeris
12  - file     : File_name
13    name     : GNSS_measurement
14 |
```

Fusion rules for each options

	Present in reference	Absent in reference
Present in modification	Option from modification	Option from modification
Absent in modification	Option from reference	No option

For list “name” is required to associate each element for the fusion.

# The grammar file (advanced use)

```
emacs: gram_14_1.txt (on l92-ci-e)
File Edit View Cmds Tools Options Buffers Help
#####
#
# This file specifies the grammar to which a GINS YAML Directeur file must
# conform with.
#
#####
#
# version
#
# The 'version' section specify the version of grammar to use
VERSION version
#####
#
# date
#
# The 'date' section gathers all dates relative to the whole computation. Dates
# are expressed as two values -- CNES julian day and seconds in the day --
# separated by a comma and grouped together in square brackets
#
DATE date START STOP BUL_DATE TRUNC
# Start date of the arc - [ day, seconds ]
START    arc_start
# End date of the arc - [ day, seconds ]
STOP     arc_stop
# The satellite initial state vector - This date is not necessarily
# equal to the start date of the arc but has to be the same for all
# satellites specified - [ day, seconds ]
BUL_DATE initial_state_vector_date
# Time interval in days and seconds to remove from the start and end dates of
# the arc, in order to reduce the number of measurements kept at the new
# iteration - [ day, seconds ]
TRUNC    trunc
#####
#
# model
#
# The 'model' section specifies which models are used for the computation, in
# terms of central body, mean pole and environment
#
# MODEL model CC ENV MPOL
# Name of the central body (the Earth by default)
--**-XEmacs: gram_14_1.txt  (Text PenDel)---L37--C72--Top-----
```

The grammar file gathers all possible keys allowed in the YAML format of the directive file :

- internal keys and
- literal keys (keys we have into the directive file),

Moreover grammar file contains :

- documentation for each paragraph, and
- possible tree structure in GINS directive file.

# Descriptive file (advanced use)

To generate descriptive file for a specific grammar use the command :

```
yaml_gram_prettyprint $GS_HOME/CONFIG/YAMLGRAM/gram_15_2.txt
```

This generate text in the standard output from interpretation of the grammar file.

