New Functions in exe_ppp

- -const
- -sec_start
- -sec_stop
- -batch
- -nar

New Functions in exe_ppp

-const:

```
visu02.sis.cnes.fr: /work/GRGS/users/guptam/ $ exe_ppp.sh -rin BRUX00BEL_R_20190820000_01D_30S_MO.rnx -static -const Ger
```

- Multi-GNSS option
  - g = PPP using GPS data
  - G = IPPP using GPS data
  - e = PPP using Galileo
  - E = IPPP using Galileo
  - r = PPP using GLONASS
- Argument E works only on RINEX 3 files after 7th October 2018

New Functions in exe_ppp

-sec_start: For changing the starting time

```
visu02.sis.cnes.fr: /work/GRGS/users/guptam/ $ exe_ppp.sh -rin BRUX00BEL_R_20190820000_01D_30S_MO.rnx -static -sec_start 800
```

-sec_stop: For changing the finishing time

```
visu02.sis.cnes.fr: /work/GRGS/users/guptam/ $ exe_ppp.sh -rin BRUX00BEL_R_20190820000_01D_30S_MO.rnx -static -sec_stop 25000
```

- Useful to remove bad DOP durations

```
date            :
  arc_start : [25300,  19.0000000]
  arc_stop  : [25300,  86389.0000000]
```

New Functions in exe_ppp

-batch:

```
visu02.sis.cnes.fr: /work/GRGS/users/guptam/ $ exe_ppp.sh -list_rin list_RNX -static -const E -batch
```

- Single GNSS processing on multiple RINEX
- Works only with –list_rin and –const options
- Useful for studying effect of GNSS products at day boundaries
- Useful to process multiple high-data rate RINEX files

New Functions in exe_ppp

-nar:

```
visu02.sis.cnes.fr: /work/GRGS/users/guptam/ $ exe_ppp.sh –rin BRUX00BEL_R_20190820000_01D_30S_MO.rnx –static –IPPP –nar defaut
```

- Daily bias file
- IPPP for selected stations/satellites
- Equivalent to adding LIBRESAT or LIBRESTA in reglage file
- Argument defaut looks for file in the database (/work/GRGS/users/geodexp/MIROIR_STAF/gnss_bias)
- Can be used only with –IPPP or –const option

nar file example:

```
*BIAS SVN_ PRN SITE_____ OBS1 OBS2 BIAS_START____ BIAS_END_____ UNIT __IS_FIXED_0_OR_1____ _PERCENT___
*NAR       E01                 2019:063:00000 2019:063:86370                      1.0000     95.9459
*NAR       E02                 2019:063:00000 2019:063:86370                      1.0000     95.7878
*NAR       E03                 2019:063:00000 2019:063:86370                      1.0000     94.9994
*NAR       E04                 2019:063:00000 2019:063:86370                      1.0000     97.2230
*NAR       E05                 2019:063:00000 2019:063:86370                      1.0000     95.5383
*NAR       E07                 2019:063:00000 2019:063:86370                      1.0000     94.2286
*NAR       E08                 2019:063:00000 2019:063:86370                      1.0000     93.0586
*NAR       E09                 2019:063:00000 2019:063:86370                      1.0000     96.1196
*NAR       E11                 2019:063:00000 2019:063:86370                      1.0000     96.1544
*NAR       E12                 2019:063:00000 2019:063:86370                      1.0000     96.5796
*NAR       E13                 2019:063:00000 2019:063:86370                      1.0000     95.9825
*NAR       E14                 2019:063:00000 2019:063:86370                      1.0000     96.7419
*NAR       E15                 2019:063:00000 2019:063:86370                      1.0000     94.0110
*NAR       E18                 2019:063:00000 2019:063:86370                      1.0000     99.5312
*NAR       E19                 2019:063:00000 2019:063:86370                      1.0000     98.1426
*NAR       E21                 2019:063:00000 2019:063:86370                      1.0000     96.4045
*NAR       E24                 2019:063:00000 2019:063:86370                      1.0000     96.0237
*NAR       E25                 2019:063:00000 2019:063:86370                      1.0000     95.7843
*NAR       E26                 2019:063:00000 2019:063:86370                      1.0000     96.1548
*NAR       E27                 2019:063:00000 2019:063:86370                      1.0000     95.3981
*NAR       E30                 2019:063:00000 2019:063:86370                      1.0000     94.9436
*NAR       E31                 2019:063:00000 2019:063:86370                      1.0000     95.9878
*NAR       E33                 2019:063:00000 2019:063:86370                      0.0000      0.0000
*NAR       E36                 2019:063:00000 2019:063:86370                      1.0000     94.9763
```

New Options in exe_gins

lance_ambigv2_v7.ksh ⟶ lance_ambigv2_v11.ksh

- reglages_0.in.defaut.ppp contains Galileo fixing options as well

$$\text{SEUILSBLOGAL} = \frac{\text{Phase weighting of Galileo}}{\text{Phase weighting of GPS}} \times \text{SEUILSBLO}$$

New Options in exe_gins

Phase weightings in directeur file

```
gps_phase_ponderation_law              : [0.0035, 0.15, 1.0]
gps_code_ponderation_law               : [0.6000, 0.15, 1.0]
glo_phase_ponderation_law              : [0.0035, 0.15, 1.0]
glo_code_ponderation_law               : [0.6000, 0.15, 1.0]
gal_phase_ponderation_law              : [0.0350, 0.15, 1.0]
gal_code_ponderation_law               : [0.6000, 0.15, 1.0]
```

SEUILSBLO in reglages_0.in.defaut.ppp

```
/ reglages pour blocage (cov. init. = 0.05 puis 0.06 pour ponderation en sin pui 0.038 pour pas 300 s)
/ general SEUILSBLO  sinon spécifier GPS ou GAL (interprete dans l'ordre de lecture)
SEUILSBLO    0.2  0.05         tolerance blocage, et covariance max (cycles)
```

$$\text{SEUILSBLOGAL} = \frac{0{,}0350}{0{,}0035} \times 0{,}05 = 0{,}50$$

```
SEUILSBLOGAL 0.2  0.50         tolerance blocage, et covariance max (cycles)
```

New Options in exe_gins

Standard orbit/clock products: IGS, GRG, COD, etc,

Possible to use non-standard orbit and clock products

```
model          :
  environment :
    earth_orientation_parameters    : pole/nominal_NRO
    gnss_antenna                    : ANTEX/igs14.atx
    gnss_clock                      : /work/GRGS/users/gnsexp/gin/batch/horloges/GRGBIS/hogps_braWWWWD
    ionex_files                     : ionosphere/defaut
    apriori_parameters              : EXE_PPP/valap_static
    gnss_preprocessing_options      : EXE_PPP/options_prairie_static
    macromodel                      : macromod/nominal
    gravity                         : unused
            observation     :
              removal           :
                minimum_gnss_data_per_pass         : 0
                nsigma_threshold                   : 5
                first_iteration_residual_threshold : 0
                minimum_elevation_threshold        : 0
                simulation_stepsize                : 30
                minimum_laser_raw_data             : 0
                minimum_doppler_data_per_pass      : 0
              interobject data :
              - file                   : /work/GRGS/users/gnsexp/gin/batch/orbite/GRGBIS/braWWWWD.gin
                name                   : GNSS_ephemeris
                objects                : [GNSS_GPS, unknown]
                type                   : fixed_ephemeris
                use_earth_ephemerides : yes
              - file                                : /work/GRGS/users/guptam/BRUX00BEL_R_20190820000_01D_30S_MO.rnx
```

New Format of listing_summarize

Listing for command: exe_ppp.sh -rin BRUX00BEL_R_20190820000_01D_30S_MO.rnx -static -const GEr

Separate Prairie for each constellation

Groups and data interruptions in each constellation

```
visu04.sis.cnes.fr: /work/GRGS/users/guptam/gin/batch/listing/ $ /home/eh/geodexp/scripts/listing_summarize DIR_MC0_BRUX_25283.yml.190613_081956

-----------------------------------
PRAIRIE: Observation pre-processing
-----------------------------------
COMMAND: exe_prairie BRUX00BEL_R_20190820000_01D_30S_MO.rnx -wsb /work/GRGS/users/geodexp/MIROIR_STAF/prairie/WSBREF.res.dat -cc2noncc /work/GRGS/users/geodexp/MIRO
R_STAF/prairie/p1c1bias.2000p -options /tmp/pbs.5327501.admin01/.guptam./options_prairie_static -selection /work/GRGS/users/geodexp/MIROIR_STAF/prairie/selection_ob
ervables12.dat -historik /work/GRGS/users/geodexp/MIROIR_STAF/constell/historik_glonass -ignore RE -f -out PDG_gps_out -listing PDG_gps_li -pas 30

         NAME GRE     epq  date_____deb  date_____fin   nsat  npass    ncy  nmsec npasseli nobs_phase_ecrit LONG_NAME
 BILAN :  BRUX G__    2874 25283     0.00 25283 86370.00     32     87     18      0      0          30973     BRUX00BEL

  Intervalle         :    30.0000 secondes (LU)
  Nombre de trous de mesure :       0
 Passages elim :      0 /     87

COMMAND: exe_prairie BRUX00BEL_R_20190820000_01D_30S_MO.rnx -wsb /work/GRGS/users/geodexp/MIROIR_STAF/prairie/WSBREF_GALILEO.res.dat -cc2noncc /work/GRGS/users/geod
xp/MIROIR_STAF/prairie/p1c1bias.2000p -options /tmp/pbs.5327501.admin01/.guptam./options_prairie_static -selection /work/GRGS/users/geodexp/MIROIR_STAF/prairie/sele
tion_observables15_fix.dat -historik /work/GRGS/users/geodexp/MIROIR_STAF/constell/historik_glonass -ignore GR -f -out PDG_gal_out -listing PDG_gal_li -pas 30

         NAME GRE     epq  date_____deb  date_____fin   nsat  npass    ncy  nmsec npasseli nobs_phase_ecrit LONG_NAME
 BILAN :  BRUX __E    2874 25283     0.00 25283 86370.00     24     48      2      0      0          23771     BRUX00BEL

  Intervalle         :    30.0000 secondes (LU)
  Nombre de trous de mesure :       0
 Passages elim :      0 /     48

COMMAND: exe_prairie BRUX00BEL_R_20190820000_01D_30S_MO.rnx -wsb /work/GRGS/users/geodexp/MIROIR_STAF/prairie/WSBREF.res.dat -cc2noncc /work/GRGS/users/geodexp/MIRO
R_STAF/prairie/p1c1bias.2000p -options /tmp/pbs.5327501.admin01/.guptam./options_prairie_static -selection /work/GRGS/users/geodexp/MIROIR_STAF/prairie/selection_ob
ervables12.dat -historik /work/GRGS/users/geodexp/MIROIR_STAF/constell/historik_glonass -ignore GE -f -out PDG_glo_out -listing PDG_glo_li -pas 30

         NAME GRE     epq  date_____deb  date_____fin   nsat  npass    ncy  nmsec npasseli nobs_phase_ecrit LONG_NAME
 BILAN :  BRUX _R_    2874 25283     0.00 25283 86370.00     22     60      5      0      0          23092     BRUX00BEL

  Intervalle         :    30.0000 secondes (LU)
  Nombre de trous de mesure :       0
 Passages elim :      0 /     60


 Groupes et interruptions |   DEB      FIN   |
 Groupe :               1 |     2     2875   |
 Groupes et interruptions |   DEB      FIN   |
 Groupe :               1 |     2     2875   |
 Groupes et interruptions |   DEB      FIN   |
 Groupe :               1 |     2     2875   |
```

New Format of listing_summarize

Parameters taken into account in first and last iteration

Loading effects

Listing residuals for each constellation

```
----------------
 GINS Processing
----------------

 CODE: $Name:  $
 CODE: PERSO

                                |   iter     iter   a comparer
                                |     1      sup.       a
-------------------------------------------------------------------
 1 nb mesures                   |  147656  147656    nbre_obs_max
 2 nb param. mesures            |     213     213     ipar1
 3 nb param. dynamiques liberes |       0       0    (isys-1)
 4 nb param. dynamiques         |     444     444     ipar1
 5 nb param. mes.+dyn. liberes  |     213     213     ipar1
 6 nb param. mesures+dynamiques |     657     657     ipar1
-------------------------------------------------------------------

date mil      numsta     nomsta    H,N,W   min / max solid    min / max ocean   min / max atmo   min / max poltid   min / max oce.poltid
25283.500     1310199    BRUX      LOAD_H   -0.158    0.078    0.000    0.000   -0.001    0.001    0.004    0.004    0.000    0.000
25283.500     1310199    BRUX      LOAD_N   -0.068   -0.002    0.000    0.000   -0.000    0.000    0.000    0.000    0.000    0.000
25283.500     1310199    BRUX      LOAD_W   -0.046    0.050    0.000    0.000   -0.001    0.001    0.000    0.000    0.000    0.000

  25283.50005 RANetPHA:01|       15.881169         15.803730    123170 mesures ( 24486 eliminees)   metre
  25283.50005 RAPH_GPS:01|       11.978073         11.763053     49736 mesures ( 10238 eliminees)   metre
  25283.50005 RAPH_GLO:01|       22.036788         22.008670     35676 mesures (  6174 eliminees)   metre
  25283.50005 RAPH_GAL:01|       13.456066         13.452919     37758 mesures (  8074 eliminees)   metre
  25283.50005 RANetPHA:CC|        0.532284          0.003244    122077 mesures ( 25579 eliminees)   metre
  25283.50005 RAPH_GPS:CC|        0.462751          0.002850     49285 mesures ( 10689 eliminees)   metre
  25283.50005 RAPH_GLO:CC|        0.783873          0.003920     35369 mesures (  6481 eliminees)   metre
  25283.50005 RAPH_GAL:CC|        0.265839          0.003038     37423 mesures (  8409 eliminees)   metre

number of iterations : 3
```

New Format of listing_summarize

Options used for integer ambiguity fixing

Ambiguity fixing percentages of each constellation

Phase windup corrections applied to each constellation

```
---------------------
Ambiguity resolution
---------------------
Reglages GPS: tolerance blocage       0.20   covariance maximale       0.05  duree minimale        0.0
Reglages GAL: tolerance blocage       0.20   covariance maximale       0.05  duree minimale        0.0
Statfix: Statistiques resultats :  total    non bloquees (<sigmax    >=sigmax)          % bloquees
Statfix:              global                    104        1           2             |       97.12 %
Statfix:              <sigmax                   102        1                         |       99.02 %
Statgps:              global                     67        1           1             |       97.01 %
Statgps:              <sigmax                    66        1                         |       98.48 %
Statgal:              global                     37        0           1             |       97.30 %
Statgal:              <sigmax                    36        0                         |      100.00 %
Warning: Integer ambiguity criteria is dependent on the number of observations, weighting of different constellations and elevation cutoff angle.
Nombre de passages: totaux/ok/consideres pour ambi wl:        87   87   87
 Nombre epoques consideres pour ambi wl:                   2874
Nombre de passages: totaux/ok/consideres pour ambi wl:        48   48   48
 Nombre epoques consideres pour ambi wl:                   2874
 *fichier ambis (ou NULL):  fix
   lignes considerees(P+R)  entre dates fichier PWU:  100.00 %  Details par type(s):
 ------------------------------------------------------------------------------------------
            GPh      GRa     GBlo         RPh      RRa     RBlo         EPh      ERa     EBlo
 ------------------------------------------------------------------------------------------
 1:       29987    29987        0       20925    20925        1       22915    22916        0
 2:           0        0        0           0        0        0           0        0        0
 3:       27579        0        0           0        0        0       21527        0        0
 4:        2408     2408    27579       20925    20925        0        1389     1389    21527
 5:         8 %      8 %     92 %        100 %    100 %      0 %         6 %      6 %     94 %
 ------------------------------------------------------------------------------------------
   1:En entree   2:Hors dates pwu(elim.)  3:Corrigees(NL)  4:En sortie  5:% 4/(1-2)
 ------------------------------------------------------------------------------------------
```

New Format of listing_summarize

Parameters taken into account in first and last iteration

Listing residuals for each constellation

Warnings generated during processing

```
------------------------------------
 GINS Processing : Integer Ambiguities
------------------------------------

                                |   iter     iter   a comparer
                                |     1      sup.       a
-------------------------------------------------------------------
 1 nb mesures                   |   98550   98550    nbre_obs_max
 2 nb param. mesures            |     112     112     ipar1
 3 nb param. dynamiques liberes |       0       0    (isys-1)
 4 nb param. dynamiques         |     444     444     ipar1
 5 nb param. mes.+dyn. liberes  |     112     112     ipar1
 6 nb param. mesures+dynamiques |     556     556     ipar1
-------------------------------------------------------------------

  25283.50005 RANetPHA:01|       0.805780          0.023609     80159 mesures ( 18391 elimin
  25283.50005 RAPH_GPS:01|       0.392866          0.035093     25600 mesures (  6795 elimin
  25283.50005 RAPH_GLO:01|       0.821883          0.004133     35676 mesures (  6174 elimin
  25283.50005 RAPH_GAL:01|       0.571684          0.012922     18883 mesures (  5422 elimin
  25283.50005 RANetPHA:CC|       0.769171          0.003509     79410 mesures ( 19140 elimin
  25283.50005 RAPH_GPS:CC|       0.401062          0.003331     25332 mesures (  7063 elimin
  25283.50005 RAPH_GLO:CC|       0.783885          0.003975     35378 mesures (  6472 elimin
  25283.50005 RAPH_GAL:CC|       0.568471          0.003272     18700 mesures (  5605 elimin
number of iterations : 3

----------
 WARNINGS
----------
Warning (exe_gins) : Forçage de la génération de l équation normale
   *** warning (G-choix_interv_ppp) : La periode de liberation demandee est superieure a la date de l'arc, on force a    86400 secs.
 *** warning (G-eqna) : Valeurs Diagonales Nulles pour    17 parametres du type MNA
 *** warning (G-eqna) : Valeurs Diagonales Nulles pour     2 parametres du type MNR
 *** warning (G-eqna) : Valeurs Diagonales Nulles pour     9 parametres du type MNE
Warning: Integer ambiguity criteria is dependent on the number of observations, weighting of different constellations and elevation cutoff angle.
 *** warning (P-ndiflec) : Pas de bulletin ou satellite éliminé dans directeur: E014 numéro 40014
 *** warning (P-ndiflec) : Pas de bulletin ou satellite éliminé dans directeur: G029 numéro 66629
 *** warning (P-ndiflec) : Pas de bulletin ou satellite éliminé dans directeur: R019 numéro 50019
 *** warning (P-ndiflec) : Pas de bulletin ou satellite éliminé dans directeur: R023 numéro 50023
```