Betreff: [IGSMAIL-6354] Upcoming switch to IGS08/igs08.atx
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Dear colleagues,

The IGS will soon adopt a new Reference Frame, called IGS08, as the
basis of its products. IGS08 is closely related to ITRF2008, released in
May 2010. An updated set of satellite and ground antenna calibrations,
igs08.atx, will also become effective at the same time and should be
used together with IGS08. The IGS intends to switch from (IGS05 +
igs05.atx) to (IGS08 + igs08.atx) starting with products of GPS week
1632 (17 April 2011).  The (IGS05 + igs05.atx) framework has been in
effect since GPS week 1400 (5 Nov 2006) and was also used for the IGS
reprocessing campaign (repro1) back to 1994.

The following files can already be downloaded from either
ftp://igs-rf.ign.fr/pub/IGS08 or ftp://igs-rf.ensg.eu/pub/IGS08:
- IGS08.snx                : IGS08 SINEX file
- IGS08.ssc                : IGS08.snx without covariance matrix
- soln_IGS08.snx           : discontinuity list to be used with IGS08
- IGS08_core.txt           : list of IGS08 core stations
- IGS08.png                : map of the full IGS08 network
- IGS08_core.png           : map of the IGS08 core network
- igs08_1604_woGLO_final.atx : preliminary version of igs08.atx
  *** Warning: This preliminary version does not contain correction ***
  ***          values for the GLONASS satellite antennas.          ***

You will find below some details about the definition, use and
consequences of IGS08 and igs08.atx. Please send any further questions
to:
- igs-rf@ign.fr for the reference frame aspects,
- schmid@bv.tum.de for the antenna calibration aspects.

Best regards,

Paul Rebischung, Ralf Schmid, Jim Ray



* What's new in igs08.atx?          (See also the header of igs08.atx.)

  - Ground antenna calibrations:
              Almost all ground antenna calibrations were updated.
              GLONASS-specific corrections were added for certain
              antenna types. More details will be given in a separate
              IGSMail.
  - Satellite antenna corrections:
              In the case of GNSS, the radial (Z) components of the
              satellite antenna phase center offsets (PCOs) are highly
              correlated with the scale of the terrestrial frame. As
              the IGS08 scale differs by ~-1 ppb from IGS05 (due to
              the ITRF2005 to ITRF2008 datum shift), the PCO radial
              components of all GPS and GLONASS satellites were
              re-estimated consistently with the IGS08 scale.

* How was IGS08 defined?

  - Station selection:
              IGS08 is essentially a subset of 232 stable,
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                      well-performing IGS stations from ITRF2008. Station
                      stabilities were assessed from ITRF2008 results
                      (velocity accuracies, RMS of residual time series,
                      numbers of discontinuities). To ensure a global
                      distribution of IGS08 stations, the strictness of the
                      selection was however variable with the regional density
                      of IGS stations.
        - Coordinate corrections due to ground antenna calibration updates:
                      While ITRF2008 coordinates are consistent with the
                      igs05.atx set of calibrations, IGS08 needs to be
                      consistent with the updated igs08.atx set. The impacts
                      of the igs05.atx to igs08.atx calibration updates on the
                      IGS08 station coordinates were thus assessed by
                      extensive analyses based on the PPP strategy. In some
                      cases, these impacts could not be neglected in view of
                      the precision of ITRF2008. (The following thresholds
                      were used: 1.2 mm in East/North or 3 mm in Up.)
                      Corrections derived from the PPP analyses were finally
                      applied to the ITRF2008 coordinates of 65 IGS08 stations
                      (87 solns) in order to make them consistent with
                      igs08.atx. Coordinates of the remaining 167 IGS08
                      stations are the same as in ITRF2008. A list of the
                      applied coordinate corrections can be found at
              ftp://igs-rf.ign.fr/pub/IGS08/ITRF2008_to_IGS08.txt and
              ftp://igs-rf.ensg.eu/pub/IGS08/ITRF2008_to_IGS08.txt.

    * Which IGS08 stations/coordinates should be used at a particular epoch?

       - Handling position/velocity discontinuities:
                      Unlike IGS05, IGS08 was designed not only in view of
                      future operational applications but also in view of
                      retrospective applications such as the next IGS
                      reprocessing. IGS08 may consequently contain several
                      sets of coordinates and velocities for the same station.
                      Each set is denoted by a solution number (soln) whose
                      validity period is given in the discontinuity file
                      soln_IGS08.snx. Please note that the SOLUTION/EPOCHS
                      block in IGS08.snx is not strictly related to
                      discontinuities or soln validity periods and should not
                      be used in place of soln_IGS08.snx.
       - Recent discontinuities:
                      Several IGS08 stations have been subjected to
                      discontinuities since the date of the latest ITRF2008
                      inputs. Even the last IGS08 coordinate sets of these
                      stations are consequently outdated, so that they cannot
                      be used as reference stations anymore. These recent
                      discontinuities are also listed in soln_IGS08.snx, which
                      will be continuously updated as new breaks occur.

    * What is the IGS08 core network?

       - Motivation:
                      In order to satisfy regional users of IGS08, many
                      reference stations were selected in areas with dense
                      GNSS coverage, such as Europe. This led to density
                      heterogeneities in the IGS08 network, making it
                      sub-optimal for the alignment of global frames. So a
                      well distributed sub-network of IGS08, known as the
                      IGS08 core network, was additionally defined.
       - Core network realization:
                      The IGS08 core network is made up of 91 primary
                      stations. Up to four substitute stations were also
                      chosen in order to replace each primary station in case
                      of unavailability. Primary and substitute stations are
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listed in the file IGS08_core.txt. Like IGS08, the IGS08
core network was defined in view of operational and
retrospective applications. The list of core stations
consequently includes historical stations as well as
stations which have been subjected to recent
discontinuities and should not be used as reference
stations anymore in operational applications.
- Recommended usage:
         The IGS08 core network is recommended for global
         applications and will be used to reference the IGS core
         products, rather than the full IGS08 network. It is
         ideally used in a minimally constrained sense to align
         the orientation of global frames (i.e., using
         no-net-rotation). Regional and other smaller scale
         applications may realize the IGS08 frame locally to
         adequate accuracy by using a selection of as many of the
         IGS08 stations as possible within the region of
         interest, with or without a priori constraints.

* How will the switch to IGS08/igs08.atx affect user results?

         The switch to IGS08/igs08.atx will affect station positions
         estimated using the IGS products in two ways: they will be
         subjected to global effects due to the ITRF2005 to ITRF2008
         datum changes and, for stations equipped with antennas whose
         calibrations were updated, to station-dependent effects due to
         the calibration updates.

- Reference frame changes:
         Helmert transformation parameters from IGS05 to IGS08
         are given in the next paragraph. The scale difference
         between IGS05 and IGS08 (due to the ITRF2005 to ITRF2008
         datum shift) will cause a mean decrease of station
         heights by ~6 mm. The Z translation will accentuate this
         effect in the Southern hemisphere and attenuate it in
         the Northern hemisphere. The Z translation will also
         cause positive North shifts, especially at low
         latitudes.
- Ground calibration updates:
         The igs05.atx to igs08.atx ground calibration updates
         will provoke additional coordinate changes for many
         stations. This effect will mainly be
         antenna-type-dependent, but will also depend on station
         location. For the convenience of users who would like to
         assess the impact of calibration updates for specific
         stations/antennas, a set of latitude-dependent
         coordinate change models is available at
      ftp://igs-rf.ign.fr/pub/IGS08/new_calib/lat_models.txt and
      ftp://igs-rf.ensg.eu/pub/IGS08/new_calib/lat_models.txt.

* Transformation from IGS05 to IGS08:

         Similarly, the "total" transformation from IGS05 to IGS08 should
         be considered as the sum of:
         - a global Helmert transformation due to the ITRF2005 to
         ITRF2008 datum changes (see Helmert parameters below),
         - station-specific corrections due to the igs05.atx to igs08.atx
         ground calibration updates (listed in ITRF2008_to_IGS08.txt).

         The following 14 transformation parameters from IGS05 to IGS08
         (IGS08 minus IGS05) were estimated using 118 common stations.
         They account for the datum change effects only (i.e., they were
         obtained using an IGS08 solution in which the station-specific
         corrections due to the ground antenna calibration updates had

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        NOT been applied).

    Transformation parameters at epoch 2005.0:
          TX     TY     TZ     SC      RX      RY      RZ
         (mm)   (mm)   (mm)   (ppb)   (mas)   (mas)   (mas)
       ----------------------------------------------------------
          1.5   -0.0    5.8   -1.04   -0.012   0.014   0.014
     ±    0.2    0.2    0.2    0.04    0.009   0.009   0.010


    Rates of transformation parameters:
          dTX    dTY    dTZ    dSC     dRX     dRY     dRZ
         (mm/y)(mm/y)(mm/y)(ppb/y)(mas/y) (mas/y) (mas/y)
       ----------------------------------------------------------
         -0.1   -0.0   -0.1    0.01   -0.002  -0.003   0.001
     ±    0.2    0.2    0.2    0.04    0.009   0.009   0.010
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* (Absence of) Transformation from ITRF2008 to IGS08:

        Even if the coordinates of some stations are different in IGS08
        and ITRF2008, the global Helmert transformation from ITRF2008 to
        IGS08 should be considered as zero. Both frames are indeed based
        on the same underlying datum. Differences between IGS08 and
        ITRF2008 should be considered as station-specific. They are only
        due to the fact that ITRF2008 is consistent with igs05.atx while
        IGS08 is consistent with igs08.atx.

* Recommendation to IGS08 station operators:

        As the IGS products will depend critically upon the set of IGS08
        reference frame stations, especially the 91 "core" stations, we
        urge that you take special care to ensure their continued
        operation and that every effort be made to avoid unnecessary
        changes that could reduce the data quality or introduce any
        position changes.


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