International Union of Geodesy and Geophysics
Union Geodesique et Geophysique Internationale

The International Union of Geodesy and Geophysics (IUGG) and international time scales

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ITU/BIPM Meeting Geneva 2013

- About IUGG
- IUGG and international time scales
- IUGG position on some relevant issues
  - About UTC
  - UTC as recommended time scale
  - Role of GNSS
  - UT1 estimation
  - Redefinition of UTC
- Concluding remarks

About IUGG

- Created in 1919
- Member of the International council for Science (ICSU)
- Includes 8 associations related to various domains of the Earth sciences
  - Geodesy (IAG)
  - Sismology and physics of the Earth's interior (IASPEI)
  - Volcanology and geochemistry (IAVCEI)
  - Geomagnetism and aeronomy (IAGA)
  - Meteorology and atmospheric sciences (IAMAS)
  - Hydrology (IAHS)
  - Physical oceanography (IAPSO)
  - Cryospheric sciences (IACS)

IUGG and international time scales

- Double role with regards to international time scales:
  - User community
    - Time tagging of measurements and observations
    - Time parameter in models
  - Provider
    - Space geodesy (IAG): GNSS, VLBI, Laser ranging, DORIS
    - Related international services, in particular
      - International Earth rotation and reference system service (IERS) joint with IAU
      - International GNSS service (IGS)
- IUGG represented in the Consultative committee for time and frequency (CCTF)
  - Recent discussions about UTC
  - Letter from ITU
- Internal consultation to define an IUGG position about these issues (preliminary conclusions given here)

About UTC

- Defined by ITU texts
- Link with legal time scales
- Approximation of UT1 at 0.9 s level
- Exactly related to TAI

UTC as recommended time scale

- For non specialists, apparent multiplicity of time scales: TDB, TDT, TCB, TCG, TT, TAI, UTC, GPS Time…
- Need of a preferred time scale suitable for theoretical and operational aspects, similar to the adoption of ITRS for geodetic reference system
- Theoretical aspects
  - Main reference to IERS Conventions
  - Consistent with IAU resolutions
  - TCG, TT and TAI
- Operational aspects
  - UTC accessible
  - Link with legal hours
- Recommendation of UTC

Role of GNSS

- Dominating impact of GNSS (GPS, GLONASS, Galileo, Beidou…)
  - Positioning from meter to millimeter
  - Time dissemination at nanosecond level
- GNSS messages provide information to convert time to UTC
- Recommend the sustainability of GNSS services

UT1 estimation

- IERS currently provides (UT1-UTC) at better than 0.001 s
- Recommendation to use such estimates, wich make obsolete the UTC estimate
- Recommend the sustainability of this IERS service by a proper governance to be defined (to be discussed with BIPM and IAG)

Redefinition of UTC

- Considering
  - The present constrain of UTC to UT1 obsolete
  - The various problems caused by discontinuities of UTC due to leap seconds
- Recommend to abandon these leap seconds and consequently make UTC a continuous time scale

Concluding remarks

- Adoption of UTC as preferred time scale, in parallel of ITRS for geodetic system
- Abandon of leap seconds for UTC
- Need to ensure sustainability by proper governance