Realizing reference frame / time scale for the Moon? Lessons learned from ITRF

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International Terrestrial Reference System (ITRS): Definition (IERS Conventions)

- **Origin**: Center of mass of the whole Earth, including oceans and atmosphere
- **Unit of length**: meter SI, consistent with **TCG** (Geocentric Coordinate Time)
- **Orientation**: consistent with BIH (Bureau International de l'Heure) orientation at 1984.0.
- **Orientation time evolution**: ensured by using a No-Net-Rotation-Condition w.r.t. horizontal tectonic motions over the whole Earth

$$h = \int_C X \times V dm = 0$$

- ITRF is consistent with TT, not TCG, for practical considerations
- (See next slide)

TT vs TCG (See Chapter 4 of the IERS Conventions)

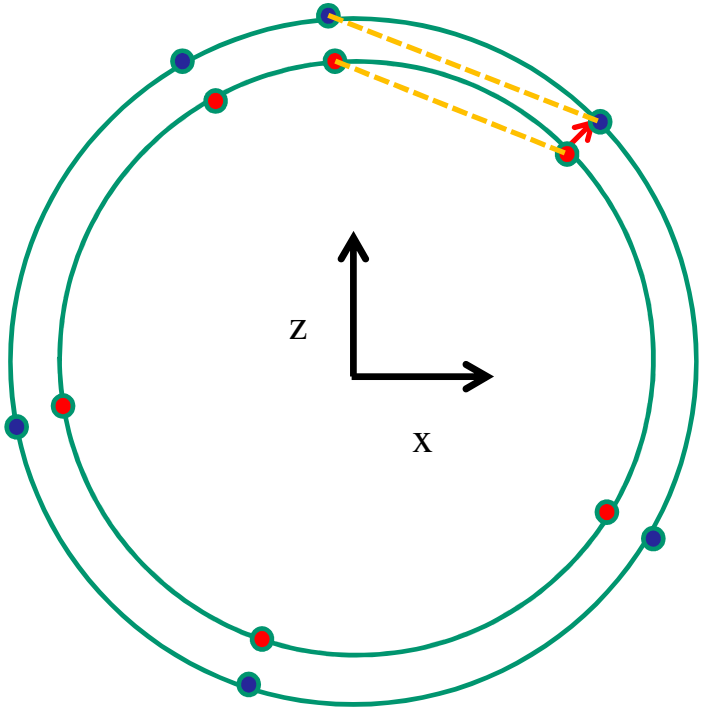
B) *Relativistic scale*

Individual analysis centers of all four techniques have adopted a scale consistent with Terrestrial Time (TT). The ITRF has also adopted this convention (except ITRF94, 96 and 97). It should be noted that the ITRS scale is specified to be consistent with Geocentric Coordinate Time (TCG). Consequently, if coordinates $\vec{X}$ consistent with TCG are needed, users need to apply the following formula:

$$\vec{X} = (1 + L_G)\vec{X}_{ITRF}, \tag{4.12}$$

where $L_G = 0.6969290134 \times 10^{-9}$ (IAU Resolution B1.9, 24th IAU General Assembly, Manchester 2000). Note that consistency between numerical constants should be ensured as described in Chapter 1.

Impact of a scale change



- **Changing the scale of the frame affect:**
  - **The vertical components**
  - **Lengths / distances between stations**