GOCE

Preparatory work

Task 1 : Standards

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REFERENCE SYSTEM

TIME		**TT (terrestrial time, ex-TDT) or TAI**
CCRS		**mean equator and equinox of J2000.0[1] (= ICRF)**
CDRS		**Planetary and lunar ephemerides JPL DE403/LE403[1] (or more recent), in TDB (this is IDRF)**
Precession		**IAU 1976[1]**
Nutation		**IAU 2000[1] + IERS (EOP05Cxx) [2]daily corrections, IERS 2000 (or newer) before 1984**
Earth rotation		**IERS (EOP05Cxx) daily Earth orientation parameters**
CTRS/F		**ITRF2000/GRIM5-S2**
axis		**IERS reference pole and reference meridian**
time evolution		**No global net rotation**
origin		**Earth's centre of mass[1]**
SCRF		**Spacecraft conventional refernece frame (F)**
GGRF	*	**Gravity gradiometer reference frame**
Velocity of light		**c = 299792458 m/s[1]**
Scale		**consistent with TT**

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[1] **values/models according to IERS Conventions (2000, or updated)**
[2] **IERS solution for 2005 and on, version Cxx-tbd**

DYNAMICAL MODEL

Earth

$R = 6378136, 46$ m[1] (Earth's equatorial radius)

$1/f = 298.25765$ (inverse flattening of reference ellipsoid)

$\omega = 0.7292115.10^{-4}$ rad s^{-1} (nominal 1994 Earth's mean angular velocity), $\dot{\omega} = -4.5\ 10^{-22}$ rad s^{-2}

$GM = 398600.4410$ km^3/s^2 [1] (or improved value)

* GRIM5-CHAMP initial gravity model (epoch tbd) + time variations (GRACE, tbd).

* $C_{00} = 1$[1]

$C_{10} = C_{11} = S_{11} = 0$

* solid tides[1] : anelastic Earth model (Mathews et al., 1995)[1], permanent tide not removed

* ocean tides : GRIM5-CHAMP (+ GRACE) long wavelength solution + FES 2000.1, (or more recent), completed by long period tides Mtm, Mf, Mm, Sa, Ssa (Lyard 2000 - or more recent), 9.3a, 18.6a equilibrium tides, admittance applied for 60 waves

non tidal atmosphere mass and load deformation potential (from ECMWF pressure data, every 6h).

* Pole tide ($\tilde{k}_2 = 0.3634$), Gegout, 1996

Third bodies

Sun, Moon and planets as point masses, indirect oblateness of Earth/Moon considered, DE403/LE403 ephemerides[1] (or more recent)

Relativity

Schwarzschild, Lense-Thirring and geodetic precession corrections[1]

DYNAMICAL MODEL (cont')

Surface forces (for checking common mode data from gradiometer + drag free info., and for interpolation in gaps)

atmospheric drag	*	**DTM 2000 density model (updated with CHAMP data)**
solar radiation	*	**solar constant $4.5605.10^{-6}$ Nm^{-2} at 1 AU[1], exponential regularising function**
Earth radiation		**albedo and infrared, monthly geographical mean values (ECMWF)**
		Lambert's law
thermal thrust	*	**tbd**
empirical accel.	*	**in data gaps**

Spacecraft geometry and thermo-optical properties :

* **macro-model (facets) and physical coefficients (for drag and pressure) : specular reflection coef., diffuse reflection coef., emissivity, temperature**

* **mass history**

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GEOMETRICAL MODEL

Station positions		**ITRF2000 (or updated)**
Station velocities	*	**horizontal : ITRF2000 (σ < 5 mm/a), NUVEL1A-NNR[1] (or updated)**
		vertical : ITRF2000 (σ < 5 mm/a), ICE4G-VM2[1] (or updated)

Site displacements :

geocentre	*	**empirical annual and semi-annual motions**
Earth tides	*	**anelastic Earth model Mathews et al. (1995)[1]**
ocean loading		**based on most recent ocean tide models**
atmosphere load.		**based on ECMWF pressure data**
pole tide	*	$\tilde{h}_2 = 0.5133$ **(Gegout 1996)**

Satellite centre of mass and other parameters (in SCRF) :

	*	**c.o.m.**
	*	**position of GPS antenna (phase center) and SLR retro-reflector array**
	*	**star trackers and thrusters (position + orientation in SCRS)**
Tropospheric refraction	*	**Laser : Marini and Murray (1973)[1] or update , GPS: CNET, Niellis (elevation $\geq$ 12°, or tbd)**
Ionospheric refraction		**GPS : eliminated in ionosphere-free combination**
Relativity		**range and Doppler correction (p.p.n. formulation, Sun-Earth-Moon)**
		clock correction : GPS-SST (Martin-Torrence-Misner)
GPS-SST	*	**ambiguities, clock offsets**

(* - initial values/models foreseen partly/entirely for adjustment)

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