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Abstract

1 UT_1 from UTC

To calculate TT from UTC, we use

$$TT = TAI + 32.184s = UTC + leap(UTC) + 32.184s \tag{1}$$

where $leap(UTC)$ are the cumulative leap seconds up to UTC. Document tai-utc.dat contains values for

$$TAI - UTC = leap(UTC) \tag{2}$$

from 1961 to 2017.

We also find

$$TT = UT_1 + \Delta T \tag{3}$$

where UT_1 is corrected UT. ΔT is provided by NASA for historical periods.

In order to calculate UT_1, we set equ. 1 and equ. 3 equal, i.e.

$$UT_1 + \Delta T = UTC + leap(UTC) + 32.184s \tag{4}$$

and solve for UT_1,

$$UT_1 = UTC + leap(UTC) + 32.184s - \Delta T \tag{5}$$

$$= UTC - (\Delta T - leap(UTC) - 32.184s) \tag{6}$$

2 Calculate ΔT from ΔUT

Relation

$$\Delta UT = UT_1 - UTC \tag{7}$$

corrects for variations in UTC. NASA file finals2000A.all contains ΔUT for various dates. We need to calculate ΔT from ΔUT to calculate TT from UTC. From equ. 5 and equ. 7 we find

$$\Delta UT = -\Delta T + leap(UTC) + 32.184s \tag{8}$$

and finally

$$\Delta T = -\Delta UT + leap(UTC) + 32.184s \tag{9}$$