New Time Scales: Removing Ambiguities

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The new (1991) IAU recommendations on reference systems and time scales are based completely on general relativity. But the metric forms determining the corresponding reference systems are specified in these recommendations not sufficiently definitive to take into account non-geodesic accelerations in the motion of the geocentre or topocentre, to distinguish between relativistic dynamically or kinematically non-rotating systems and to exclude a possible ambiguity in the time scales due to the relativistic coordinate gauge. There is a hidden ambiguity in the relativistic definition of the geocentre due to the difference bewteen Newtonian-type and Blanchet-Damour multipole moments used, respectively, in Brumberg-Kopejkin (Brumberg and Kopejkin, 1989; Kopejkin, 1991a; Brumberg et al., 1993; Klioner, 1993; Klioner and Voinov, 1993) and Damour-Soffel-Xu (1991-1994) approach to construct relativistic hierarchy of reference systems. In using TAI as physical realization of TT one should specify the constant L_G (Fukushima, 1994) once for ever not introducing the relativistic ill-defined notion of the geoid (Kopejkin, 1991b). It might be reasonable not to separate this constant at all (as having no sense for moving clocks on the surface of the Earth or in the circumterrestrial space) and to use TAIM as physical realization of TCG itself relating TCG directly with the observer's proper time avoiding the intermediate scale TT (Brumberg, 1992).

To avoid any relativistic ambiguities in future, present IAU recommendations should be complemented by further specification of reference systems and time scales. The ambiguities considered here give contributions to the problem of time scales t 10^{-17} level at least so that they may be ignored now in pratice but they are of importance for better understanding of relativity effects in this problem.

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