

A SEMI-CLASSICAL RELATIVISTIC MOTION INTEGRATOR (SCRMD), TO MODEL THE ORBITS OF SPACE PROBES AROUND THE EARTH AND OTHER PLANETS.

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Today, the motion of spacecrafts is still described according to the classical Newtonian equations plus the so-called « relativistic corrections », computed with the required precision using the Post-(Post-...) Newtonian formalism. The current approach, with the increase of tracking precision (Ka-Band Doppler, interplanetary lasers) and clock stabilities (atomic fountains) is reaching its limits in terms of complexity, and is furthermore error prone. Those problems are especially relevant when modeling tiny geophysical effects through orbitography, like for example the waxing-waning mechanism of the Martian polar caps, with temporal frequencies in the same band as relativistic effects. In the more appropriate frame of General Relativity, we study a method to numerically integrate the native relativistic equations of motion for a weak gravitational field, taking into account not only gravitational forces, but also non gravitational forces (atmospheric drag, solar radiation pressure, albedo pressure, thermal emission...). The latter are treated as perturbations, in the sense that we assume that both the local structure of space-time is not modified by these forces, and that the unperturbed satellite motion follows the geodesics of the local space-time. We also use a symplectic integrator to compute the unperturbed geodesic motion, in order to insure the constancy of the norm of the proper velocity quadrivector.

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