

Orbit determination errors for a new concept of geopositioning and navigation

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A brief description of a new concept for remote geopositioning, time dissemination and navigation, applicable over regional areas, currently being developed in Brazil, is presented. It aims at an independent Brazilian wide location system using concepts different from conventional GPS, Galileo, or GLONASS systems. Its implementation becomes particularly important to allow independent comparisons, validate measurements, taken by other systems, and assess the proposed system. The new system utilizes at least three reference bases on the ground, with precisely determined geodetic positions, carrying synchronized clocks, a transmitter in one central base (master base) emitting time coded marks, and one repeater (a satellite) in the sky. An algorithm and a digital telecommunication set up demonstrate its operation. It is shown that in the master base it is necessary the knowledge of the satellite orbit with consistent precision. Assuming a repeater put aboard an artificial satellite and a favorable geometry, errors in the instantaneous determination of the position were studied. Orbit propagation errors for one orbit or more are also presented. One of the error sources which affects the orbit determination accuracy comes from the measurement system, involving the ground segment, geometry between the orbit and the bases, and equipment. For the sake of this work, three measurement error sources were considered here: the station location error, the oscillator stability, and miscellaneous additional sources.