Position of Reflecting Points in Bistatic Satellite Altimetry: Theoretical Solutions for Ellipsoid

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This paper deals with satellite bistatic altimetry and namely with computation of the position of the theoretical specular reflecting point on the sea surface. While geometry and accuracy studies may use a spherical Earth as a good first approximation, the actual precise computation of the position of the reflecting points for scientific use requires a relationship to geoid and sea surface topography; we present here an attempt to solve this problem for a geocentric reference ellipsoid. Three different tasks and their solutions are presented. Depending on different input data sets, we have made different geometric solutions. (i) If we have full input data set (positions of both satellites, parameters of the reference ellipsoid, length of the reflected signal, velocity vector of receiving satellite and incidence angle between the velocity vector and reflected ray), it leads to the intersection of three quadrics (two rotational ellipsoids and one rotational cone). (ii) Partial input data sets (positions of both satellites, parameters of the reference ellipsoid, length of the reflected signal) may lead to computing minimal distance of two ellipsoids or ellipsoid homothetic to the reference ellipsoid.