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Regularization of the restricted three body problem on surfaces of constant curvature

We consider the restricted three body problem defined on a two-dimensional surface of nonzero constant curvature, which corresponds either to the sphere or the upper sheet of the hyperboloid. In this problem, a collision singularity occurs when the infinitesimal mass particle coincides with the position of one of the primaries. We prove that the singularities due to collision can be locally and globally regularized through the construction of Levi-Civita and Birkhoff type transformation, respectively. We study some general properties of the Hill regions and we determine sufficient conditions to obtain ejection-collision orbits for the symmetrical problem.