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Relative equilibria of the gravitational 2-body problem
in spaces of constant curvature

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We consider the gravitational 2-body problem on 2-dimensional surfaces of constant curvature. For non-zero curvature the problem is no longer integrable and numerical experiments indicate that its dynamics is chaotic. We perform the Poisson reduction of the equations and classify all relative equilibria (RE) with respect to the action of the group of isometries of the corresponding constant curvature space. These RE are the simplest solutions of the problem and have the property that the distance between the bodies remains constant throughout the motion. We also establish the stability of these RE and consider their behaviour as a function of the curvature of the space.