

# Traveling between the Earth and the Moon through the Lagrangian Equilibrium Points L1 and L2

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The sphere of lunar influence, whose radius is of the order of 66300 km, has some regions of direct stable orbits around the Moon and regions that include paths that escape and, later, are recaptured by the lunar gravitational field through the Lagrangian equilibrium points L1 and L2. In the first stage of this work, we mapped these regions considering as dynamical systems the restricted three-body problem and the full four-body problem, and we represented them through diagrams of the type eccentricity versus the semi-major axis of the initial lunar osculating orbit. The paths that pass through L1 define routes of escape and capture that link the sphere of lunar influence to the region around of the Earth delimited by the zero speed curve found for  $C_j = C_j(L2)$ . The paths that escape through L2 form a route that links the sphere of lunar influence to the space beyond the Earth-Moon System. These three routes and the region of stable orbits cross each other inside the sphere of lunar influence. It is for this reason that at a second stage, we studied ways to use them in low cost transfer missions between the Earth and the Moon, taking advantage of the phenomenon of gravitational capture and eliminating, in this manner, the need for insertion impulses in the lunar orbit.