

FAR FUTURE (D4)
Space Elevators and Tethers (2)

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DYNAMICS AND STABILITY OF SPACE ELEVATOR DURING INITIAL DEPLOYMENT

Abstract

Initial deployment is the most critical phase for successful construction of a space elevator system. It is generally recognized that the whole system is launched to geostationary altitude, and then the tether is deployed both down-ward and up-ward. The deployment sequence was confirmed through numerical simulations utilizing mass-spring models. The whole process will be visually displayed. Various parameters were introduced to express dynamic characteristics of the system, and the most influential was found to be the damping coefficients associated with the material properties and active control purposes. In the preliminary analyses, non-linear behavior of gravity is not accurately considered. In actuality, because of the very large length of the system, the center of mass and the center of gravity are no more equal. The center of gravity goes down as the deployment proceeds, while the center of mass remains at the original altitude, resulting in alternation of orbital angular velocity. The simulation takes this effect into account, and the system is designed so that the system synchronizes with the earth rotation at the moment of deployment completion.