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Computational algorithms dealing with the classical and statistical mechanics of celestial scale polymers in space elevator technology STEVEN KNUDSEN, LEONARDO GOLUBOVIC, West Virginia University — Prospects to build Space Elevator (SE) systems have become realistic with ultra-strong materials such as carbon nano-tubes and diamond nano-threads. At cosmic length-scales, space elevators can be modeled as polymer like floppy strings of tethered mass beads. A new venue in SE science has emerged with the introduction of the Rotating Space Elevator (RSE) concept [1,2] supported by novel algorithms discussed in this presentation. An RSE is a loopy string reaching into outer space. Unlike the classical geostationary SE concepts of Tsiolkovsky, Artsutanov, and Pearson, our RSE exhibits an internal rotation. Thanks to this, objects sliding along the RSE loop spontaneously oscillate between two turning points, one of which is close to the Earth whereas the other one is in outer space. The RSE concept thus solves a major problem in SE technology which is how to supply energy to the climbers moving along space elevator strings. The investigation of the classical and statistical mechanics of a floppy string interacting with objects sliding along it required development of subtle computational algorithms described in this presentation. [1] L. Golubovic and S. Knudsen, Europhys. Lett. 86, 34001 (2009); [2] S. Knudsen and L. Golubovic, Eur. Phys. J. Plus 129, 242 (2014).

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