

Abstract Submitted
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Multiscale modeling of the cardiovascular deconditioning during spaceflight STEFANIA SCARSOGLIO, CATERINA GALLO, LUCA RIDOLFI, Politecnico di Torino, Torino, Italy — Permanence in microgravity characterizing long-term spaceflights causes a general deconditioning of the cardiovascular system. A constellation of hemodynamic mechanisms - such as fluid shift, blood volume reduction, vessel elasticity changes, and cardiac atrophy - concurs to define a 0G adaptation point, which is identified by an overall relaxation of the cardiovascular system. This scenario promotes orthostatic intolerance on reentry and poses open questions on re-adaptation for spaceflights beyond 1 year. We here present a computational approach to compare the cardiovascular response in supine position on Earth and at 0G adaptation point during spaceflight. The proposed aim is twofold: (i) understand the underlying mechanisms leading to cardiovascular deconditioning; (ii) describe the hemodynamics of districts for which clinical data are not always feasible and accurate even on Earth. The present approach relies on a validated multiscale modeling of the cardiovascular system combining a 1D description of the arterial tree together with a lumped parameterization of the remaining regions (i.e., venous return, heart chambers, pulmonary circulation, baroreceptor regulation).

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