ADVANCES IN COMPUTATIONAL BIOMECHANICS AND MECHANOBIOLOGY

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ABSTRACT

This thematic session welcomes contributions focused on the computational modelling of biological processes, particularly when the mechanical environment plays a defining role. It involves both physiological mechanisms and pathological alterations at different scales, from the sub-cellular level to the organ level. We aim to bring together researchers and engineers engaged on the development and application of computational and numerical methods to analyze, model, and predict the mechanical behavior of biological systems and biomaterials.

Special emphasis will be placed on multiscale and multiphysics modelling approaches that integrate biological, chemical, and mechanical phenomena, bridging the gap between cell-level processes and organ-level responses, as well as to the incorporation of artificial intelligence and machine learning into computational biomechanics. Studies involving predictive simulations for clinical decision-making, such as models based on medical imaging, are particularly encouraged.

The session will serve as a platform for experts in biomechanics, mechanobiology, tissue engineering, and biomedical engineering, to present innovative approaches to computational modelling, fostering discussion and exchange across a broad range of topics, including:

- Mechanobiological evolution of diseases
- Tissue regeneration and remodelling

- Hard and soft tissue mechanics

- Cell mechanobiology

- Tissue engineering, scaffold design and characterization

- Optimization of implants, orthotics, and prosthetics

- Human motion analysis and musculoskeletal modelling

- Hard and soft tissue mechanics

- Cell mechanobiology