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Numerical investigation of screened scalar-tensor theories in space-based experiments

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Scalar fields appear in most of the extensions beyond the standard models and are key ingredients in cosmology phenomenology to unveil the dark sector. Among the wide variety of scalar-tensor models proposed over the past decades, some are already ruled-out by lab experiments or astrophysical observations while others remain viable by means of screening mechanisms that dynamically suppress deviations from general relativity in classical fifth force searches. The hunt for such hypothetical scalar fields thus requires designing novel and intelligent experiments. Alas, this task is partly impeded by the difficulty to accurately model their effects in complex setups.

This talk will showcase *femtoscope* —a Python numerical tool based on the finite element method for solving Klein-Gordon-like equations that arise in particular in the symmetron or chameleon models. The novelty and most important feature of *femtoscope* is that it includes a careful treatment of asymptotic boundary conditions. I will then discuss some recent numerical studies conducted in order to ascertain fifth force detectability by means of space geodesy techniques in a realistic environment.

Auteur principal: LÉVY, Hugo (ONERA / IAP)

Co-auteurs: BERGÉ, Joel (ONERA); Dr UZAN, Jean-Philippe (IAP)

Orateur: LÉVY, Hugo (ONERA / IAP)

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