
Contribution ID: **48** Type: **talk**

# Dynamics of Brane-world models

*Tuesday 2 September 2025 17:00 (20 minutes)*

We present our work on a class of brane-world models that consist of a flat 3-brane embedded in a five-dimensional bulk space filled with a fluid that satisfies a non-linear equation of state of the form $p = \gamma\rho^{\lambda}$, where $p$ is the 'pressure'and $\rho$ is the 'density'depending on the fifth space coordinate, and $\gamma$, $\lambda$ are parameters. We show that for $\gamma < 0$ and $\lambda > 1$, it is possible to obtain a regular and physically plausible solution that satisfies the null energy condition and successfully localizes gravity on the brane. Such regular behavior was not feasible in the framework of previous studies where we modelled the bulk content by a fluid satisfying a simple linear equation of state. The importance of the regular solution derived from a non-linear fluid lies in the fact that it can serve to revive the so-called self-tuning mechanism as an approach to the cosmological constant problem. We also present current work that explores the possibility of finding a field-theory realization of the non-linear equation of state.

[1] Regular braneworlds with nonlinear bulk-fluids, I. Antoniadis, S. Cotsakis, I. Klaoudatou, The European Physical Journal C 81, 771, 2021.
[2] Brane-world singularities and asymptotics of five-dimensional bulk fluids, I. Antoniadis, S. Cotsakis, I. Klaoudatou, Philosophical Transactions of the Royal Society A 380 (2230), 20210180, 2022.
[3] Brane-world asymptotics in a nonlinear fluid bulk, I. Antoniadis, S. Cotsakis, I. Klaoudatou, The Sixteenth Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Astrophysics and Relativistic Field Theories: Proceedings of the MG16 Meeting on General Relativity Online; 5–10 July 2021, pp. 2645-2656, 2023.

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**Session Classification:** Parallel Session A