



INVITATION

as part of the Gravitational Physics Literature Seminar

to the talk by

Walter SIMON

(University of Vienna)

on

***“Topology and singularities in cosmological spacetimes
satisfying the null energy condition”***

Abstract:

Inspired by the classical singularity theorems in General Relativity, Galloway and Ling (Commun. Math. Phys. 2017, 2024) have shown the following: If a globally hyperbolic spacetime satisfying the null energy condition contains a closed, spacelike Cauchy surface N which is strictly 2-convex (meaning that the sum of the lowest two eigenvalues of the future extrinsic curvature is positive), then N is either a spherical space or past null geodesically incomplete.

In recent work (with Eric Ling, Carl Rossdeutscher and Roland Steinbauer) we have relaxed the above convexity condition in essentially two respects. Firstly, we admit 2-convex extrinsic curvatures (for which the sum of the lowest two eigenvalues is non-negative). Secondly, if N admits a $U(1)$ isometry group, we can impose even less restrictive convexity conditions. In addition to spherical spaces and past null geodesically incompleteness, this allows for certain classes of surface bundles for N or a finite cover thereof, which we classify. While our results do not use Einstein's equations, we provide several classes of vacuum solutions (with or without cosmological constant) of these equations as examples.

In my talk I will give a brief overview of singularity theorems and then focus on explaining the above results via examples. The proofs will only be outlined.

Preview: In his talk on 21.5. on the same subject (details t.b.a.) Carl Rossdeutscher will focus on selected aspects of the proofs.

Time: Wednesday, 14 May 2025, 2:15 p.m.

Location: Seminarraum A, Währinger Straße 17, 1090 Vienna, 2nd floor

sgd.: D. Fajman