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Title: Rigidity of free boundary surfaces

Abstract: In this lecture, we will present an analogue of Toponogov theorem in dimension 3 for compact manifolds M^3 with nonnegative Ricci curvature and strictly convex boundary ∂M. In fact, we will obtain a sharp upper bound for the length $L(\partial \Sigma)$ of the boundary $\partial \Sigma$ of a free boundary minimal surface Σ^2 in M^3 in terms of the genus of Σ and the number of connected components of $\partial \Sigma$, assuming Σ has index one. After, under a natural hypothesis on the geometry of M along ∂M, we will prove that if $L(\partial \Sigma)$ saturates the respective upper bound, then M^3 is isometric to the Euclidean 3-ball and Σ^2 is isometric to the Euclidean disk. In particular, we will get a sharp upper bound for the area of Σ, when M^3 is a strictly convex body in $\mathbb{R}^3$, which is saturated only on the Euclidean 3-balls (by the Euclidean disks). If time permits, we will also consider similar results for free boundary stable CMC surfaces.