Geometric properties of surfaces with the same mean curvature in $\mathbb{R}^3$ and $\mathbb{L}^3$

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ABSTRACT

Spacelike surfaces in the Lorentz-Minkowski space $\mathbb{L}^3$ can be endowed with two different Riemannian metrics, the metric inherited from $\mathbb{L}^3$ and the one induced by the Euclidean metric of $\mathbb{R}^3$. It is well known that the only surfaces with zero mean curvature with respect to both metrics are open pieces of the helicoid and of spacelike planes, [2]. We consider the general case of spacelike surfaces with the same mean curvature with respect to both metrics. Our central result states that those surfaces have non-positive Gaussian curvature in $\mathbb{R}^3$, and if the mean curvature does not vanish at a point, then the surface is locally non-convex at that point. As an application of this result, jointly with an argument on the existence of elliptic points, we present two geometric consequences for those surfaces, and a uniqueness result.
This talk is based on a joint work with Alma L. Albujer [1].

References

[1] A. L. Albujer and M. Caballero, *Geometric properties of surfaces with the same mean curvature in $\mathbb{R}^3$ and $\mathbb{L}^3$*, preprint.

[2] O. Kobayashi, *Maximal Surfaces in the 3-Dimensional Minkowski Space $\mathbb{L}^3$*, Tokyo J. Math. Vol. 6, No. 2, 1983.