

Title: Ricci solitons on four-dimensional Lorentzian Lie groups

(Joint work with Rosalía Rodríguez-Gigirey and Ramon Vazquez-Lorenzo)

Ricci solitons, being self-similar solutions of the Ricci flow are natural generalizations of Einstein metrics. Although a general classification is not available (even in low dimensions), Riemannian Ricci solitons are well-understood in the Riemannian homogeneous category. Apart from rigid gradient Ricci solitons, they reduce to algebraic Ricci solitons, which are realized on some solvable Lie groups. In this talk, we describe four-dimensional Lorentzian algebraic Ricci solitons. In sharp contrast with the Riemannian situation, any connected and simply connected four-dimensional Lie group admits a left-invariant Lorentz metric which is a Ricci soliton \cite{ref3}. Moreover, non-Einstein compact Lorentzian Ricci solitons are obtained from some left-invariant Ricci solitons on almost Abelian Lie groups \cite{ref1,ref2}.

\begin{thebibliography}{5}

\bibitem{ref1}

M. Brozos-Vazquez, G. Calvaruso, E. Garcia-Rio, and S. Gavino-Fernandez, Three-dimensional Lorentzian homogeneous Ricci solitons, \emph{Israel J. Math.} \textbf{188} (2012), 385--403. Corrigendum \emph{Israel J. Math.} \textbf{255} (2023), 975--984.

\bibitem{ref2}

M. Ferreiro-Subrido, E. Garcia-Rio, and R. Vazquez-Lorenzo, Ricci solitons on four-dimensional Lorentzian Lie groups, \emph{Anal. Math. Phys.} \textbf{12} (2022), Paper No. 61, 35 pp.

\bibitem{ref3}

E. Garcia-Rio, R. Rodríguez-Gigirey, and R. Vazquez-Lorenzo, Four-dimensional Lorentzian algebraic Ricci solitons, to appear.

\end{thebibliography}