

Title: Ricci Flow in Milnor Frames

Abstract: In this talk, we are going to look at the Type I singularity on 4-dimensional manifolds foliated by homogeneous S^3 evolving under the Ricci flow. We review the study on rotationally symmetric manifolds done by Angenent and Isenberg as well as by Isenberg, Knopf and Sesum. In the latter, a global frame for the tangent bundle, called the Milnor frame, was used to set up the problem. We shall look at the symmetries of the manifold, derived from Lie groups and its ansatz metrics, and this global tangent bundle frame developed by Milnor and Bianchi. Numerical simulations of the Ricci flow on these manifolds are done, following the work by Garfinkle and Isenberg, providing insight and conjectures for the main problem. Some analytic results will be proven for the manifolds $S^1 \times S^3$ and S^4 using maximum principles from parabolic PDE theory and some sufficiency conditions for a neckpinch singularity will be provided. Finally, a problem from general relativity with similar metric symmetries but endowed on a manifold with different topology, the Taub-Bolt and Taub-Nut metrics, will be discussed.