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C. M. Guenther* (guenther@pacificu.edu). *Second order renormalization group flow of three-dimensional homogeneous geometries.*

The second order nonlinear sigma model renormalization group flow from quantum field theory is given by

$$\frac{\partial}{\partial t}g = -2\text{Rc} - \frac{\alpha}{2}\text{Rm}^2,$$

where g is a Riemannian metric, Rc is Ricci curvature, Rm is Riemannian curvature, and $\alpha > 0$ is a parameter. We determine the asymptotic behavior of the flow on closed three-dimensional locally homogeneous manifolds, and in particular its dependence on α and the initial data. We find that for \mathbb{R}^3 , $\text{SO}(3) \times \mathbb{R}$, and $\text{SU}(2)$ the flow is qualitatively similar to the Ricci flow for all α . In each of the other cases we find an explicit partition of the phase space into two regions: if the initial conditions lie in one of the regions the behavior is similar to that of the Ricci flow, while if they lie in the other all directions shrink and a finite time singularity forms. (Received September 10, 2012)