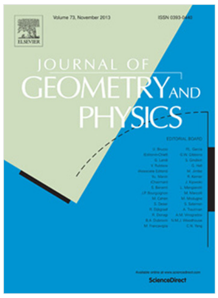
Accepted Manuscript



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PII: S0393-0440(17)30189-4
DOI: http://dx.doi.org/10.1016/j.geomphys.2017.07.020
Reference: GEOPHY 3044

To appear in: *Journal of Geometry and Physics*

Received date : 5 August 2015
Accepted date : 31 July 2017

Please cite this article as: B.L. Neto, K. Tenenblat, On gradient Yamabe solitons conformal to a pseudo-Euclidian space, *Journal of Geometry and Physics* (2017), http://dx.doi.org/10.1016/j.geomphys.2017.07.020

ON GRADIENT YAMABE SOLITONS CONFORMAL TO A PSEUDO-EUCLIDIAN SPACE

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Abstract. We consider gradient Yamabe solitons, conformal to an n-dimensional pseudo-Euclidean space. We characterize all such solitons which are invariant under the action of an $(n-1)$-dimensional translation group and we obtain the steady solitons. Applications provide an explicit example of a complete steady gradient Yamabe soliton, conformal to the Lorentzian space.

Keywords: Yamabe solitons, Lorentzian metrics, Conformal metrics
2010 Mathematics Subject Classification: 35C06, 53C44, 53C50, 30F45.

1. Introduction and main results

Much progress has been done in recent years in the study of soliton solutions of the Ricci flow, the mean curvature flow and the Yamabe flow. Soliton solutions correspond to self-similar solutions of the corresponding flow.

The Yamabe flow,

$$\frac{\partial g(t)}{\partial t} = -Rg(t),$$

was introduced by R. Hamilton [16], as an approach to solve the Yamabe problem. A complete Riemannian metric g on a smooth manifold M^n is called a *gradient Yamabe soliton* if there exists a smooth function f such that its Hessian satisfies the equation

$$Hess_g(f) = (R-\lambda)g,$$

where R is the scalar curvature of the metric g and λ is a constant. The Yamabe soliton is said to be shrinking, steady or expanding if $\lambda > 0$, $\lambda = 0$ or $\lambda < 0$ respectively. The function f is called a *potential function* of the gradient Yamabe soliton. When f is constant, we call it a trivial Yamabe soliton.

Daskalopoulos and Sesum [13] proved that every compact Yamabe soliton is of constant scalar curvature (see also [18]), hence trivial since f is harmonic and thus is constant.

Ricci solitons are self-similar solutions of the Ricci flow [16] and they have been studied by several authors [9]-[14], [20] . Motivated by the results on Ricci solitons, the theory of Yamabe solitons started to be investigated more recently [7], [12], [13], [17], [18]. Daskalopoulos and Sesum [13] proved that all complete locally conformally flat gradient Yamabe solitons, with positive sectional curvature, are rotationally symmetric and Cao, Sun, Zhang [12] showed that every complete nontrivial gradient Yamabe soliton admits a special global warped product structure. Moreover, they obtained a general classification theorem for complete nontrivial locally conformally flat gradient Yamabe solitons.

Although most of the work has been done in the Riemannian setting, Ricci solitons and Yamabe solitons have been also considered in the Lorentzian category (see [1], [2], [6], [7] and [21]).

[1] Supported by CNPq/Brazil Proc. No. 149896/2012-3. Ministry of Science and Technology Brazil.
[2] Partially supported by CNPq/Brazil Proc. No. 312462/2014-0 Ministry of Science and Technology Brazil.