Riemannian maps whose base manifolds admit a Ricci soliton

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Abstract. In this paper, we study Riemannian maps whose base manifolds admit a Ricci soliton, and give a non-trivial example of such a Riemannian map. First, we find the Riemannian curvature tensor for the base manifolds of the Riemannian map F. Further, we obtain the Ricci tensor and calculate the scalar curvature of the base manifold. Moreover, we obtain necessary conditions for the leaves of range F_* to be Ricci soliton, almost Ricci soliton, and Einstein. We also obtain necessary conditions for the leaves of (range $F_*)^{\perp}$ to be Ricci soliton and Einstein. Also, we calculate the scalar curvatures of range F_* and (range $F_*)^{\perp}$ by using Ricci soliton. Finally, we study the harmonicity and biharmonicity of such a Riemannian map. We obtain a necessary and sufficient condition for such a Riemannian map between Riemannian manifolds to be harmonic. We also obtain necessary and sufficient conditions for a Riemannian map from a Riemannian manifold to a space form that admits Ricci soliton to be harmonic and biharmonic.

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