Lee, Jae Min; Park, Byungdo
On the smoothness of the geodesic spray for the Camassa-Holm equation. (English)

Summary: In this paper, we show that the geodesic spray associated with the Camassa-Holm equation on the real line is smooth. This improves the earlier $C^1$ result of J. M. Lee and S. C. Preston [Discrete Contin. Dyn. Syst. 37, No. 6, 3285–3299 (2017; Zbl 1361.35147)]. The main idea is to identify the second order vector field associated with the Camassa-Holm equation as a composition of smooth operations. We will also show that the covariant derivative associated with the spray is Riemannian, i.e., compatible with the Sobolev $H^1$ right invariant metric.

MSC:
35Q35 PDEs in connection with fluid mechanics
37K65 Hamiltonian systems on groups of diffeomorphisms and on manifolds of mappings and metrics
76B15 Water waves, gravity waves; dispersion and scattering, nonlinear interaction
53D35 Global theory of symplectic and contact manifolds
35D30 Weak solutions to PDEs

Keywords:
Camassa-Holm equation; geodesic spray; topological group; differential calculus on Banach manifold; Riemannian geometry

Full Text: DOI

References: