Mathematics > Classical Analysis and ODEs

Algebra properties for Sobolev spaces- Applications to semilinear PDE's on manifolds

Nadine Badr (ICJ), Frederic Bernicot (LPP), Emmanuel Russ (LATP, IF)

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In this work, we aim to prove algebra properties for generalized Sobolev spaces $W^{s,p} \cap L^\infty$ on a Riemannian manifold, where $W^{s,p}$ is of Bessel-type $W^{s,p}:=(1+L)^{-s/m}(L^p)$ with an operator L generating a heat semigroup satisfying off-diagonal decays. We don't require any assumption on the gradient of the semigroup. To do that, we propose two different approaches (one by a new kind of paraproducts and another one using functionals). We also give a chain rule and study the action of nonlinearities on these spaces and give applications to semi-linear PDEs. These results are new on Riemannian manifolds (with a non bounded geometry) and even in the Euclidean space for Sobolev spaces associated to second order uniformly elliptic operators in divergence form.

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