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Persistence of regularity for solutions of the Boussinesq equations in Sobolev spaces.

We address the global regularity of solutions to the Boussinesq equations with zero diffusivity in two spatial dimensions. Previously, the persistence in the space $H^{1+s}(\mathbb{R}^2) \times H^s(\mathbb{R}^2)$ for all $s \geq 0$ has been obtained. In this paper we address the persistence in general Sobolev spaces, establishing the local persistence on a time interval which is almost independent of the size of the initial data. Namely, we prove that if $(u_0, \rho_0) \in W^{1+s,q}(\mathbb{R}^2) \times W^{s,q}(\mathbb{R}^2)$ for $s \in (0, 1)$ and $q \in [2, \infty)$, then the solution $(u(t), \rho(t))$ of the Boussinesq system stays in $W^{1+s,q}(\mathbb{R}^2) \times W^{s,q}(\mathbb{R}^2)$ for $t \in [0, T^*]$, where T^* depends logarithmically on the size of initial data. Furthermore, we prove the global persistence in the space $W^{1+s,q}(\mathbb{R}^2) \times W^{s,q}(\mathbb{R}^2)$ for the initial data with compact support. (Received February 07, 2017)