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Flow with $A\infty(\mathbb{R})$ density and transport equation in BMO($\mathbb{R}$). (English) Zbl 1428.42035

Summary: We show that, if $b \in L^1(0,T;L^1_{\text{loc}}(\mathbb{R}))$ has a spatial derivative in the John-Nirenberg space BMO($\mathbb{R}$), then it generates a unique flow $\phi(t,\cdot)$ which has an $A\infty(\mathbb{R})$ density for each time $t \in [0,T]$. Our condition on the map $b$ is not only optimal but also produces a sharp quantitative estimate for the density. As a killer application we achieve the well-posedness for a Cauchy problem of the transport equation in BMO($\mathbb{R}$).

MSC:
42B30 $H^p$-spaces
42B37 Harmonic analysis and PDEs
82C70 Transport processes in time-dependent statistical mechanics
30C65 Quasiconformal mappings in $\mathbb{R}^n$, other generalizations
35Q70 PDEs in connection with mechanics of particles and systems of particles

Keywords:
quasiconformal mapping; BMO functions

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References:

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