

[Li, Min; Yao, Xianzhong](#)

Time-periodic solutions for the full quantum Euler equation. (English) Zbl 07442108

[Math. Methods Appl. Sci. 44, No. 17, 13146-13169 \(2021\)](#)

Summary: In this paper, we establish the existence and uniqueness of a time-periodic solution to the full compressible quantum Euler equations. First, we prove the existence of time-periodic solutions under some smallness assumptions imposed on the external force in a periodic domain by a regularized approximation scheme and the Leray-Schauder degree theory. Then the result is generalized to \mathbb{R}^3 by adapting a limiting method and a diagonal argument. The uniqueness of the time-periodic solutions is also given. Compared to classical Euler equations, the third-order quantum spatial derivatives are considered which need some elaborated treatments thereof in obtaining the highest-order energy estimates.

MSC:

[47H11](#) Degree theory for nonlinear operators

[35B10](#) Periodic solutions to PDEs

[76Y05](#) Quantum hydrodynamics and relativistic hydrodynamics

[35Q35](#) PDEs in connection with fluid mechanics

[35G25](#) Initial value problems for nonlinear higher-order PDEs

[76N10](#) Existence, uniqueness, and regularity theory for compressible fluids and gas dynamics

Keywords:

[full quantum Euler equations; Leray-Schauder degree theory; time-periodic solutions](#)

Full Text: [DOI](#)