

Regularity of very weak time-periodic Poiseuille-type solutions

Rita Juodagalvytė, Kristina Kaulakytė, Konstantinas Pileckas

Faculty of Mathematics and Informatics, Vilnius University, Lithuania

rita.juodagalvyte@mif.vu.lt, kristina.kaulakyte@mif.vu.lt, konstantinas.pileckas@mif.vu.lt

Abstract

We present our results concerning the time-periodic very weak solutions of the heat equation with a side condition of the prescribed flux

$$F(t) = \int_{\sigma} U(x, t) dx$$

(see [3]). The regularity of very weak time-periodic Poiseuille-type solutions when $F \in W^{\beta,2}(-\pi, \pi)$, $0 \leq \beta \leq 1$, is investigated. Specifically, we provide an example of a given flux function F that belongs to $L^2(-\pi, \pi)$ but $F \notin W^{\beta,2}(-\pi, \pi)$ for $0 < \beta < 1$. The very weak solution corresponding to such F , has the regularity as stated in the definition (see [1],[2]) and it is not better. Furthermore, we discuss results that suggest a correlation between the improvement of solutions regularity and the increase in regularity of the given function F .

References

- [1] K. Pileckas, R. Čiegis, Existence of nonstationary Poiseuille type solutions under minimal regularity assumptions, *Z. Angew. Math. Phys.*, 71, 192, 2020 <https://doi.org/10.1007/s00033-020-01422-5>
- [2] K. Kaulakytė, N. Kozulinas and K. Pileckas, Time-periodic Poiseuille-type solution with minimally regular flow rate, *Non-linear analysis: modelling and control*, 26, 5, 947-968, 2021 <https://doi.org/10.15388/namc.2021.26.24502>
- [3] R. Juodagalvytė, K. Kaulakytė, K. Pileckas, Regularity of Very Weak Time-Periodic Poiseuille-Type Solutions (submitted)