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Eliminating resonances in the Galerkin-truncated Burgers and Euler equations using wavelet filtering KAI SCHNEIDER, M2P2-CNRS & Aix Marseille University, 38 rue F. Joliot-Curie, 13451 Marseille Cedex 20, France, RODRIGO PEREIRA, Inmetro & Instituto de Fisica, Universidade Federal do Rio de Janeiro, CP 68528, 21945-970, Rio de Janeiro, RJ, Brazil, ROMAIN NGUYEN VAN YEN, Fachbereich Mathematik und Informatik, Freie Universitaet Berlin, Arnimallee 6, D-14195 Berlin, Germany, MARIE FARGE, LMD-CNRS-IPSL, Ecole Normale Superieure, 24 rue Lhomond, 75231 Paris Cedex 5, France — It is well known that solutions to the Fourier-Galerkin truncation of the inviscid Burgers equation (and other hyperbolic conservation laws) do not converge to the physically relevant entropy solution after the formation of the first shock. This loss of convergence was recently studied in detail in [S.S. Ray et al., Phys. Rev. E 84, 016301 (2011)], and traced back to the appearance of a spatially localized resonance phenomenon perturbing the solution. In this work, we propose a way to cure this resonance by filtering a wavelet representation of the Galerkin-truncated equations. A method previously developed with a complex-valued wavelet frame is applied and expanded to embrace the use of real-valued orthogonal wavelet basis, which we show to yield satisfactory results only under the condition of adding a safety zone in wavelet space. We also apply the complex-valued wavelet based method to the 2D Euler equation problem, showing that it is able to filter the resonances in this case as well. For details we refer to R. Pereira et al., Phys. Rev. E 87, 033017, 2013.

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