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**Linearized analysis of barotropic perturbations around spherically symmetric gaseous stars governed by the Euler-Poisson equations.** (English) [Zbl 1444.76057](#)

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Summary: The hydrodynamic evolution of self-gravitating gaseous stars is governed by the Euler-Poisson equations. We study the structure of the linear approximation of barotropic perturbations around spherically symmetric equilibria based on functional analytic tools. In contrast to folklore, we show that the spectrum of the linearized operator for general perturbations is not of the Sturm-Liouville type unless the perturbations are restricted. Among others, we prove that it is of the Sturm-Liouville type for irrotational perturbations.

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**MSC:**

**76E20** Stability and instability of geophysical and astrophysical flows

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**85A30** Hydrodynamic and hydromagnetic problems in astronomy and astrophysics

**35Q35** PDEs in connection with fluid mechanics

**Keywords:**

elliptic regularity; eigenvalue; Sturm-Liouville spectrum; weighted Sobolev space; irrotational perturbation

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