Eigenvalue estimates and asymptotics of polynomially compact pseudodifferential operators and applications to the Neumann-Poincaré operator in 3D elasticity

Grigori Rozenblum
Chalmers University of Technology, Gothenburg, Sweden; St.Petersburg State University, Russia

An operator A is called polynomially compact $p(A)$ is compact for some polynomial p. For a polynomially compact zero order matrix pseudodifferential operator on a closed manifold Γ, the essential spectrum consists of zeros ω_ι of the polynomial p which coincide with eigenvalues of the principal symbol; the latter are automatically constant on $S^*\Gamma$. The discrete eigenvalues of such operator may converge only to these points . We find estimates and asymptotics of these discrete eigenvalues. As an application, we consider the Neumann-Poincaré operator in 3D linear elasticity, the double layer potential, which is known to be not compact, unlike the classical Laplace case, but polynomially compact, with 3 points of the essential spectrum. We find the dependence of the position of eigenvalues, their estimates, and asymptotics on the geometry of the surface and the Lamé constants of the material.

References

[1] G. Rozenblum. *Eigenvalue asymptotics for polynomially compact pseudodifferential operators.* **Algebra i Analiz** 33 (2021), no. 2, 215–232.(**St.Petersburg Math.Journal**, **33** (2) 2022).

[2] G. Rozenblum. *Asymptotics of eigenvalues of the Neumann–Poincaré operator in* $3D$ *elasticity.*
J. Pseudo-Differ. Oper. Appl. 14 (2023), no. 2, Paper No. 26, 36 pp.

[3] G. Rozenblum. *Discrete spectrum of zero order pseudodifferential operators.* **Opuscula Math.** 43, no. 2 (2023), 247–268.