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A Characterization of the Essential Pseudospectra and Application to a Transport Equation

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Abstract: In this paper, we introduce and study the essential pseudospectra of closed, densely defined linear operators in the Banach space. We start by giving the definition and we investigate the characterization, the stability and some properties of this essential pseudospectra. The obtained results are used to describe the essential pseudospectra of transport operators.

Key words: Pseudospectra, essential spectra, compact operators, Fredholm perturbations, transport operators.

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References

[1] F. Abdmouleh, A. Ammar, A. Jeribi, Pseudo-Browder essential spectra of linear operators and application to a transport equations, preprint (2011).

[2] E.B. Davies, "Spectral Theory and Differential Operators", Cambridge University Press, Cambridge, 1995.

[3] E.B. Davies, "Linear Operators and their Spectra", Cambridge University Press, Cambridge, 2007.

[4] R. Dautray, J.L. Lions, "Analyse Mathématique et Calcul Numérique pour les Sciences et les Techniques", Tome 9, Masson, Paris, 1988.

[5] D. Hinrichsen, A.J. Pritchard, Robust stability of linear evolution operators on Banach spaces, *SIAM J. Control Optim.* **32** (6) (1994), 1503 – 1541.

[6] A. Jeribi, Quelques remarques sur les opérateurs de Fredholm et application à l'équation de transport, *C. R. Acad. Sci. Paris Sér. I Math.* **325** (1) (1997), 43 – 48.

[7] A. Jeribi, Quelques remarques sur le spectre de Weyl et applications, *C. R. Acad. Sci. Paris Sér. I Math.* **327** (5) (1998), 485 – 490.

[8] A. Jeribi, A characterization of the essential spectrum and applications, *Boll. Unione Mat. Ital. Sez. B Artic. Ric. Mat. (8)* **5** (3) (2002), 805 – 825.

[9] A. Jeribi, A characterization of the Schechter essential spectrum on Banach spaces and applications, *J. Math. Anal. Appl.* **271** (2) (2002), 343 – 358.

[10] A. Jeribi, On the Schechter essential spectrum on Banach spaces and application, *Facta Univ. Ser. Math. Inform.* **17** (2002), 35 – 55.

[11] A. Jeribi, Fredholm operators and essential spectra, *Arch. Inequal. Appl.* **2** (2-3) (2004), 123 – 140.

[12] A. Jeribi, M. Mnif, Fredholm operators, essential spectra and application to transport equations, *Acta Appl. Math.* **89** (1-3) (2005), 155 – 176.

[13] A. Jeribi, N. Moalla, A characterization of some subsets of Schechter's essential spectrum and application to singular transport equation, *J. Math. Anal. Appl.* **358** (2) (2009), 434 – 444.

[14] T. Kato, Perturbation theory for nullity, deficiency and other quantities of linear operators, *J. Analyse Math.* **6** (1958), 261 – 322.

[15] H.J. Landau, On Szegö's eigenvalue distribution theorem and non-Hermitian kernels, *J. Analyse Math.* **28** (1975), 335 – 357.

[16] K. Latrach, Essential spectra on spaces with the Dunford-Pettis property, *J. Math. Anal. Appl.* **233** (2) (1999), 607 – 622.

[17] J. Lutgen, On essential spectra of operator-matrices and their Feshbach maps, *J. Math. Anal. Appl.* **289** (2) (2004), 419 – 430.

[18] M. Mokhtar-Kharroubi, Time asymptotic behaviour and compactness in transport theory, *European J. Mech. B Fluids* **11** (1) (1992), 39 – 68.

[19] V. Müller, "Spectral Theory of Linear Operators and Spectral System in Banach Algebras", Birkhäuser Verlag, Basel, 2003.

[20] M. Schechter, "Principles of Functional Analysis", second edition, American Mathematical Society, Providence, RI, 2002.

[21] M. Schechter, "Spectra of Partial Differential Operators", second edition, North-Holland Publishing Co., Amsterdam, 1986.

[22] L.N. Trefethen, Pseudospectra of matrices, in "Numerical Analysis 1991 (Dundee, 1991)", Longman Sci. Tech., Harlow, 1992, 234 – 266.

[23] L.N. Trefethen, M. Embree, "Spectra and Pseudospectra. The Behavior of Nonnormal Matrices and Operators" Princeton University Press, Princeton, NJ, 2005.

[24] J.M. Varah, "The Computation of Bounds for the Invariant Subspaces of a General Matrix Operator", Thesis (Ph.D.), Stanford University. 1967.

[25] I. Vidav, Existence and uniqueness of nonnegative eigenfunctions of the Boltzmann operator, *J. Math. Anal. Appl.* **22** (1968), 144 – 155.