Maximal L^p-regularity and H^∞-calculus forblock operator matrices and applications

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Abstract: Many coupled evolution equations can be described via 2×2-block operator matrices of the form$\mathcal{A} = \begin{bmatrix} A & B \\ C & D \end{bmatrix}$in a product space $X = X_1 \times X_2$ with possibly unbounded entries. Here, the case of diagonally dominant block operator matrices is considered, that is, the case where the full operator$\mathcal{A}$ can be seen as a relatively bounded perturbation of its diagonal part though with possibly large relative bound. For such operators the properties of sectoriality, $\mathcal{R}$-sectoriality and the boundedness of theH^∞-calculus are studied, and for these properties perturbation results for possibly large but structured perturbations are derived. Thereby, the time dependent parabolic problem associated with $\mathcal{A}$ can be analyzed in maximal L^p_t-regularity spaces, and this is applied to a wide range of problems such as different theories for liquid crystals, an artificial Stokes system, strongly damped wave and plate equations, and a Keller-Segel model.

The presentation is based on a joint work with Antonio Agresti, see https://arxiv.org/abs/2108.01962