Refined stability estimates for mixed problems by exploiting semi norm arguments

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Refined stability estimates are derived for classical mixed problems. The novel emphasis is on the importance of semi norms on data functionals, inspired by recent progress on pressure-robust discretizations for the incompressible Navier–Stokes equations. In fact, kernels of these semi norms are shown to be connected to physical regimes in applications and are related to some well-known consistency errors in classical discretizations of mixed problems. Consequently, significantly sharper stability estimates for solutions close to these physical regimes are obtained. Some applications in adaptivity, optimal control and steady and time-dependent problems will be presented.

References:

[1] https://arxiv.org/pdf/2506.11566

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