

# On streamline-diffusion methods for inf-sup stable discretisations of the generalised Oseen Problem

Gunar Matthies<sup>1</sup> Gert Lube<sup>2</sup>

We consider stabilised finite element methods for the generalised Oseen problem with homogeneous Dirichlet boundary conditions. The unique solvability based on a modified stability condition and an error estimate are proved for inf-sup stable discretisations of velocity and pressure. We will show that it is possible to separate the stabilisation terms of streamline-diffusion type (SUPG) and the pressure stabilisation terms (PSPG). This extends a recent result in [1] on quasi-uniform meshes and continuous pressure approximations to general shape-regular meshes and to discontinuous pressure interpolation. Numerical examples which show the influence of the different stabilisation parameters will be presented.

## References:

- [1] T. Gelhard, G. Lube, M. A. Olshanskii, and J.-H. Starcke Stabilized finite element schemes with LBB-stable elements for incompressible flows, *J. Comput. Appl. Math.*, 177 (2005), pp. 243–267.
- [2] G. Matthies and G. Lube, On streamline-diffusion methods of inf-sup stable discretisations of the generalised Oseen problem, Preprint 2007-02, Institut für Numerische und Angewandte Mathematik, Georg-August-Universität Göttingen, 2007.

---

<sup>1</sup>Ruhr-Universität Bochum, Fakultät für Mathematik, Universitätsstraße 150, 44780 Bochum, Germany,

[Gunar.Matthies@ruhr-uni-bochum.de](mailto:Gunar.Matthies@ruhr-uni-bochum.de)

<sup>2</sup>Georg-August-Universität Göttingen, Institut für Numerische und Angewandte Mathematik (NAM), Lotzestraße 16-18, 37083 Göttingen, Germany,  
[lube@math.uni-goettingen.de](mailto:lube@math.uni-goettingen.de)