

# **Incomplete Uzawa methods applied to both FEM and SPH solutions of the Navier-Stokes equations.**

*A. N. Stokes*

CSIRO Mathematical and Information Sciences, Melbourne, Australia

Incomplete Uzawa methods are a versatile general formulation for constructing solutions to saddle-point problems in systems of differential equations, of which the Navier-Stokes equations for incompressible flow are a prime example. They also provide a basis for analysing convergence of most of the well-known algorithms. A key requirement is the development of an approximate inverse, much as one seeks a preconditioner for other iterative methods. This paper will describe some physically based preconditioners, their performance, and their suitability for meshfree methods such as Smoothed Particle Hydrodynamics (SPH).