1145-65-1112 **Jay Gopalakrishnan**, **Philip Lukas Lederer*** (philip.lederer@tuwien.ac.at) and **Joachim Schöberl**. *A mass conserving mixed stress formulation for incompressible flows.*

One of the main difficulties in computational fluid dynamics lies in the proper treatment of the incompressibility condition. A weak treatment of this constraint can lead to a locking phenomena if the viscosity is small and results in bad velocity approximations. Recent developments show that H(div)-conforming finite elements for the approximation of the velocity provide major benefits such as exact mass conservation, pressure-independent (locking free) and polynomial robust error estimates. By introducing a new variable which approximates the gradient of an H(div)-conforming velocity we derive a new mixed stress formulation of the incompressible Stokes equations. For the analysis a new function space, the H(curldiv), is defined, in which we can show well posedness.

In the discrete setting two different approaches lead to a stable analysis. We present the construction of proper Finite elements, discuss solvability and verify our method with several numerical examples implemented in NGSolve (www.ngsolve.org) with the new NGS-Py interface. We conclude the talk by a further motivation of the new mass conserving mixed stress formulation: the numerical treatment of a linearized R13 model. (Received September 19, 2018)