

## Mathematical Modelling in Fluid Mechanics /Porous Media Flow

### Research Projects of Professor Leiv Storesletten

- **A Note on Free Convection in a Shallow Annular Cavity Filled with a Porous Medium (2002-2004)**

(Joint project with D.M. Leppinen, University of Cambridge, England, D.A.S. Rees, University of Bath, England and I. Pop, University of Cluj, Romania)

In this note we use asymptotic analysis to examine free convection in a shallow annular cavity filled with a fluid saturated porous medium. The sidewalls of the cavity are maintained at different temperatures and the upper and lower boundaries are insulating. Results are obtained in the limit as the aspect ratio,  $A$ , defined as the ratio of the height of the annular cavity to its width, goes to zero.

A paper is accepted for publication in *Journal of Porous Media* (2004).

- **The Onset of Convection in an Inclined Anisotropic Porous Layer with Oblique Principal Axes (2001-2004)**

(Joint project with D.A.S. Rees, University of Bath, England and A. Postelnicu, Transylvania University of Brasov, Romania)

We consider the onset of convection in an inclined anisotropic porous layer heated from below. To date the principle axes of the permeability and diffusivity tensors have been assumed to be aligned with the coordinate directions. Therefore particular emphasis is laid upon how the basic flow and criteria for the onset of convection are altered by the presence of oblique principal axes.

- **The Onset of Darcy –Forcheimer Convection in Inclined Porous Layers Heated from below (2003-2004)**

(Joint project with D.A.S. Rees, University of Bath, England and A. Postelnicu, Transylvania University of Brasov, Romania)

It is well known that the onset of convection in an inclined porous layer heated from below takes the form of longitudinal vortices when Darcy's law is valid. In the present problem we consider briefly how the onset criterion alters when form-drag, as modelled by Forcheimer terms, is significant.

- **Onset of Convection in an Inclined Porous Layer with Internal Heat Generation (2003-2004)**

(Joint project with D.A.S. Rees, University of Bath, England)

The onset of convection in an inclined porous layer which is heated internally by a uniform distribution of heat sources is considered. We investigate the combined effect of inclination, anisotropy and internal heat generation on the linear instability of the basic flow.

- **Onset of Convection in a Two-Layered Porous Medium with Anisotropic Permeability (2003-2005)**

(Joint project with D.A.S. Rees, University of Bath, England)

We consider a horizontal, fluid-saturated porous layer heated from below and composed of two homogenous sublayers with anisotropic permeability. The linear instability of the basic flow (conduction state) and the steady motion occurring at the onset of convection are investigated.