Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Dynamics of poroelastic foams YOEL FORTERRE, BENJAMIN SOBAC, IUSTI CNRS-Universite de Provence, Marseille, France — Soft poroelastic structures are widespread in biological tissues such as cartilaginous joints in bones, blood-filled placentae or plant organs. Here we investigate the dynamics of open elastic foams immersed in viscous fluids, as model soft poroelastic materials. The experiment consists in slowly compacting blocs of polyurethane solid foam embedded in silicon oil-tanks and studying their relaxation to equilibrium when the confining stress is suddenly released. Measurements of the local fluid pressure and foam velocity field are compared with a simple two-phase flow approach. For small initial compactions, the results show quantitative agreement with the classical diffusion theory of soil consolidation (Terzaghi, Biot). On the other hand, for large initial compactions, the dynamics exhibits long relaxation times and decompaction fronts, which are mainly controlled by the highly non-linear mechanical response of the foam. The analogy between this process and the evaporation of a polymer melt close to the glass transition will be briefly discussed.

Yoel Forterre
IUSTI CNRS-Universite de Provence, Marseille, France

Date submitted: 04 Aug 2010 Electronic form version 1.4