Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Radial Temperature gradient effects on the Taylor-Couette flow stability INNOCENT MUTABAZI, VALERIE LEPILLER, ARNAUD PRIGENT, Le Havre University, KYUNG-SOO YANG, INHA University — A radial temperature gradient imposed on the vertical Taylor-Couette system induces an axial flow that modifies the flow stability. The flow is ascending near the hot cylindrical wall while it is descending near the cold one [1]. For a flow setup with a large aspect-ratio $\Gamma = 114$ and a radius ratio $\eta = 0.8$, the stability depends on the Taylor number Ta related to the rotation of the inner cylinder and on the Grashof number Gr related to the radial temperature gradient. We have shown that for small values of Gr, a convective instability is followed by an absolute instability both leading to traveling inclined vortices at Ta_c. For large values of Gr, the onset leads to an absolute instablilty with large traveling inclined vortices filling the whole system. We have established a state diagram in the parameter space Gr, Ta. The spatio-temporal properties of the different patterns observed in this parameter space are described. In particular we have found that the temperature gradient increases the size of vortices. The thermal effects disappear for large values for a value of the Richardson number $Ri = 0.33$. Numerical simulations of the corresponding Boussinesq-Oberbeck equations provide results in a good agreement with experiments.

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Date submitted: 04 Aug 2007 Electronic form version 1.4