Radial Temperature gradient effects on the Taylor-Couette flow
stability INNOCENT MUTABAZI, VALERIE LEPILLER, ARNAUD PRIGENT,
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ture 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 travel-
ing inclined vortices at \( Ta_c \). For large values of \( Gr \), the onset leads to an absolute instablility with large traveling inclined vortices filling the whole system. We have es-
tablished a state diagram in the parameter space \( Gr, Ta \). The spatio-temporal prop-
terties 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 num-
ber \( Ri = 0.33 \). Numerical simulations of the corresponding Boussinesq-Oberbeck
equations provide results in a good agreement with experiments.

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