Abstract Submitted
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Thermal convection in a horizontal duct with strong axial magnetic field[1] XUAN ZHANG, OLEG ZIKANOV, University of Michigan - Dearborn — The work is motivated by design of liquid metal blankets of nuclear fusion reactors. The effect of convection on the flow within a toroidally oriented duct is analyzed. Non-uniform strong heating arising from capture of high-speed neutrons is imposed internally, while the walls are assumed to be isothermal. Very strong heating (the Grashof number up to 10^{11}) and strong magnetic field (the Hartmann number up to 10^4) corresponding to the realistic fusion reactor conditions are considered. Stability of two-dimensional flow states is analyzed using numerical simulations. The unstable modes at high Hartmann and Grashof number are found to have large wavelengths. The integral properties of developed three-dimensional flows are close to those of two-dimensional flows at the typical parameters of a fusion reactor. We also consider the effect of the weak transverse component of the magnetic field on the flow.

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