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Temperature gradient reversals in Boussinesq fluid between Kelvin's Cat's eye critical layers[1] GRIGORI KOTOVSKY, MIKHAIL MALKOV, UCSD, PATRICK DIAMOND, UCSD, WCI/NFRI — We study a possibility that shear layers reverse local temperature gradient. First, we generalize a well known Kelvin's cat's eye nonlinear solution for a shear layer to the case of a Boussinesq fluid with temperature gradient and zero thermoconductivity. Next, we construct an approximate solution for a pair of shear layers (jet). The temperature gradient between the layers is opposite to that outside of them. From a given thermal flux across the fluid layer, a region with the negative thermal conductivity is formed between the shear layers. However, the flow within this region is likely to be unstable (for finite thermoconductivity) and should be replaced by a solution with the constant temperature. If the temperature contrast across the fluid layer is fixed, the entire fluid layer is split by the shear flow into a region with the flat temperature gradient and into adjacent regions with temperature gradients steeper than they would have in the flow-free case. We discuss the relevance of this flow configuration to the L-H phases of plasma confinement (core-pedestal adjacent domains) and to the temperature pinch effect.

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