CONVECTONS

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Recent simulations [1] of convection in binary fluid mixtures with a negative separation ratio reveal the presence at slightly supercritical Rayleigh numbers of multiple numerically stable spatially localized steady states we have called 'convectons'. These states consist of a finite number of rolls embedded in a nonconvecting background, and in water-ethanol mixtures emerge out of a small amplitude state called dispersive chaos[1]. Numerical branch following shows that the convectons are organized in a characteristic 'snaking' fashion within a well-defined interval of Rayleigh numbers. Below this interval the convectons are replaced by dramatic relaxation oscillations in which the localized state is gradually eroded until no rolls are present (the slow phase), whereupon a new localized state regrows abruptly from the resulting small amplitude dispersive chaos (the fast phase) and the process repeats. For Rayleigh numbers above the convecton regime the fronts bounding the convectons at either end 'unpin' and the convectons expand until they fill the whole domain. Related behavior is found in ^{3}He-^{4}He mixtures [2,3] and much of it can be understood with reference to the much simpler Swift-Hohenberg equation [4].

References

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