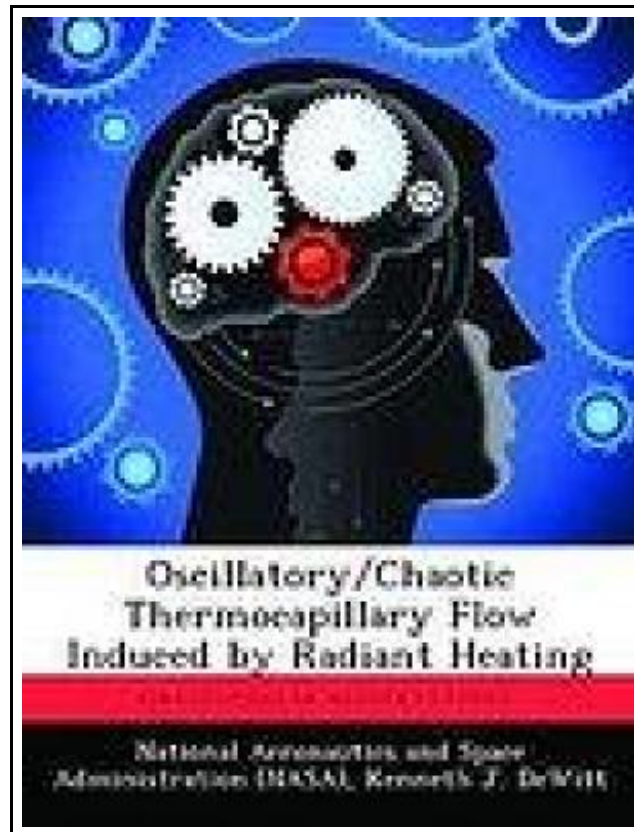


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OSCILLATORY/CHAOTIC THERMOCAPILLARY FLOW INDUCED BY RADIANT HEATING



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Biblioscholar Mrz 2013, 2013. Taschenbuch. Book Condition: Neu. 246x189x9 mm. This item is printed on demand - Print on Demand Neuware - There is a continuing need to understand the fluid physics occurring under low gravity conditions in processes such as crystal growth, materials processing, and the movement of bubbles or droplets. The fluid flow in such situations is often caused by a gradient in interfacial tension. If a temperature gradient is created due to a heat source, the resulting flow is called thermocapillary flow, a special case of Marangoni Convection. In this study, an experimental investigation was conducted using silicone oil in cylindrical containers with a laser heat source at the free surface. It was desired to determine the conditions under which steady, axisymmetrical thermocapillary flow becomes unstable and oscillatory three-dimensional flow states develop. The critical Marangoni number for each observed oscillatory state was measured as a function of the container aspect ratio and the dynamic Bond number, a measure of buoyant force versus thermocapillary force. Various oscillatory modes were observed during three-dimensional convection, and chaotic flow was reached in one test condition. The critical Marangoni numbers are compared with those measured in previous studies, and the power spectra and phase trajectories of the instantaneous surface temperature distributions are used to characterize the routes of transitions to the chaotic flow state. Results show that only superharmonic modes appear in the routes to chaos while infinite number of subharmonic modes occur in flow transitions for pure Rayleigh convection. 154 pp. Englisch.



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