

Routes to absolute instability in porous media

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Abstrak

This book addresses the concepts of unstable flow solutions, convective instability and absolute instability, with reference to simple (or toy) mathematical models, which are mathematically simple despite their purely abstract character. Within this paradigm, the book introduces the basic mathematical tools, Fourier transform, normal modes, wavepackets and their dynamics, before reviewing the fundamental ideas behind the mathematical modelling of fluid flow and heat transfer in porous media.

The author goes on to discuss the fundamentals of the Rayleigh-Benard instability and other thermal instabilities of convective flows in porous media, and then analyses various examples of transition from convective to absolute instability in detail, with an emphasis on the formulation, deduction of the dispersion relation and study of the numerical data regarding the threshold of absolute instability. The clear descriptions of the analytical and numerical methods needed to obtain these parametric threshold data enable readers to apply them in different or more general cases.