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Instability in geophysical flows. (English) Zbl 1427.76077

Cambridge: Cambridge University Press (ISBN 978-1-108-70301-7/pbk). xiii, 328 p., open access (2019).

Publisher's description: Instabilities are present in all natural fluids from rivers to atmospheres. This book considers the physical processes that generate instability. Part I describes the normal mode instabilities most important in geophysical applications, including convection, shear instability and baroclinic instability. Classical analytical approaches are covered, while also emphasising numerical methods, mechanisms such as internal wave resonance, and simple 'rules of thumb' that permit assessment of instability quickly and intuitively. Part II introduces the cutting edge: nonmodal instabilities, the relationship between instability and turbulence, self-organised criticality, and advanced numerical techniques. Featuring numerous exercises and projects, the book is ideal for advanced students and researchers wishing to understand flow instability and apply it to their own research. It can be used to teach courses in oceanography, atmospheric science, coastal engineering, applied mathematics and environmental science. Exercise solutions and MATLAB examples are provided online. Also available as Open Access on Cambridge Core.

MSC:

[76E20](#) Stability and instability of geophysical and astrophysical flows

[86A05](#) Hydrology, hydrography, oceanography

Cited in **3** Documents

Software:

[Matlab](#)

Full Text: [DOI](#)