

Nikolaevskii カオスへ至る分岐シナリオ Bifurcation scenario to Nikolaevskii turbulence

田中ダン

福井大学 工学部 知能システム工学科

〒 910-8507 福井県福井市文京 3-9-1

E-Mail d051860@icpc00.icpc.fukui-u.ac.jp

TEL 0776-27-8795

FAX 0776-27-8420

(講演当時は京都大学大学院理学研究科所属)

Dan Tanaka

Department of Human and Artificial Intelligent Systems (HART),

Faculty of Engineering, Fukui University

3-9-1 Bunkyo, Fukui, 910-8507, JAPAN

E-Mail d051860@icpc00.icpc.fukui-u.ac.jp

TEL +81-776-27-8795

FAX +81-776-27-8420

We show that Turing instability can lead oscillatory reaction-diffusion (RD) systems to spatiotemporal chaos instead of spatially periodic steady states. Similar onset of chaos was discovered in an equation that describes seismic waves (called Nikolaevskii turbulence) and observed experimentally in convective systems (called soft-mode turbulence).

We demonstrate that a certain class of oscillatory RD systems are reduced to an extended complex Ginzburg-Landau equation, whose uniformly oscillating solution possesses not

only Benjamin-Feir criticality but Turing criticality [1]. In the neighborhood of a codimension-two point of these criticality, we derive a phase equation equivalent to the seismic equation [2]. We also present numerical studies of reduced equations and a three-component RD model in this regime [2][3][6]. The numerical results support our argument and show robustness of this type of spatiotemporal chaos [6]. Finally, we derive critical exponents of chaotic fluctuations and study bifurcation scenario to this chaos [4][5].

References

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