多相流和计算流体力学

倾斜油水两相流复杂网络社团结构探寻

高忠科, 金宁德

天津大学电气与自动化工程学院

摘要　　提出一种基于延迟嵌入和模块度的复杂网络构建方法，并利用倾斜油水两相流电导波动信号构建了流型复杂网络。基于数据场理论的社团探寻算法对该网络的社团结构进行了分析，发现该网络存在分别对应于D O/W PS流型，D O/W CT流型和过渡流型的3个社团。基于复杂网络理论从全新的角度探讨了两相流流型辨识问题，并指出复杂网络是非线性时间序列分析的一个有效工具。
关键词

倾斜油水两相流　复杂网络　流型　社团结构

分类号

Complex network community structure detection in inclined oil-water two-phase flow

GAO Zhongke, JIN Ningde

Abstract

Flow pattern identification is an important issue in multiphase systems.　Because of the gravitational component normal to the flow direction，there exists complex water-dominated countercurrent flow patterns in the inclined oil-water two-phase flow，which is difficult to be discerned objectively with traditional nonlinear analysis methods. The inclined oil-water two-phase flow is studied using complex networks，and the flow pattern complex network is constructed with the conductance fluctuating signals measured from oil-water two-phase flow experiments. Hence，a new method based on time-delay embedding and modularity is proposed to construct the network from nonlinear time series. Through detecting the community structure of the resulting network using the community　detection algorithm based on data field theory，useful and interesting results are found，which can be used to identify three inclined oil-water flow patterns. From a new perspective，the complex network theory is introduced to the study of oil-water two-phase flow，and may be a powerful tool for exploring nonlinear time series in practice.

Key words

inclined oil-water two-phase flow　complex network　flow pattern　community structure

DOI:

通讯作者　金宁德　ndjin@tju.edu.cn

扩展功能

本文信息

- Supporting info
- PDF(2313KB)
- [HTML全文](0KB)
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 复制索引
- Email Alert
- 文章反馈
- 浏览反馈信息

相关信息

- 本刊中 包含"倾斜油水两相流"的 相关文章

本文作者相关文章

- 高忠科
- 金宁德