

2026 10th International Conference on RELIABILITY ENGINEERING

Hangzhou, China July 19-21, 2026

<http://icre.org/>

Special Session 24

Reliability and Fragility Assessment of Micro-Reactor Systems and Components under Seismic and Multi-Physics Loads

Goal >>>>

Micro-reactors are compact, transportable, and designed for long-term unattended operation, which imposes stringent reliability and safety requirements. Their failures may originate from multiple levels, including system-level functional dependencies, equipment-level degradation, and component-level failure mechanisms in control rod drive systems, pump impellers, core internals, heat exchangers, narrow flow channels, fasteners, and support structures. These systems and components are subjected to coupled environmental and operational loads, such as seismic excitation, vibration induced by fluid-structure interaction, erosion and wear degradation, fretting wear, fatigue, and thermal cycling.

Reliability research for micro-reactors therefore requires cross-scale approaches that integrate system-level probabilistic safety assessment, seismic probabilistic risk assessment and fragility analysis, equipment-level degradation and life prediction, and component-level failure physics. Emerging artificial intelligence and machine-learning methods also provide new opportunities for seismic response prediction, condition monitoring, anomaly detection, surrogate modeling, and digital-twin-enabled real-time reliability assessment. Different from general nuclear power reliability topics, this special session focuses specifically on micro-reactor systems and components, emphasizing their cross-scale reliability challenges under seismic and coupled multi-physics loads. Contributions based on experimental, analytical, numerical, and data-driven approaches are welcome.

Topics >>>>

Topics of interest include, but are not limited to:

- Seismic probabilistic safety assessment and fragility analysis of micro-reactor structures, systems, and components
- Reliability of control rod drop/insertion mechanisms under seismic and normal operating conditions
- Flow-induced vibration and fretting wear of core components
- Erosion and wear degradation of pump impellers and narrow flow channels
- Vibration reliability and fretting fatigue under fluid-structure interaction
- Reliability analysis under coupled thermal-mechanical-fluid-seismic loads
- Integration of component-level failure mechanisms into probabilistic safety assessment models
-

Chairs >>>>



Zhongchang Zhang, Hefei Institutes of Physical Science, Chinese Academy of Sciences, China.



Meihua Zeng, Hefei Institutes of Physical Science, Chinese Academy of Sciences, China.



Daochuan Ge, Hefei Institutes of Physical Science, Chinese Academy of Sciences, China.



Zhiguang Zhou, Tongji University, China



Fan Kong, Hefei University of Technology, China

Publication >>>>

We provide a good opportunity by presenting your updated research knowledge and also by publishing it in the conference proceedings. submitted paper will be peer reviewed by conference committees, and accepted papers will be included into conference proceedings which will be indexed by SCOPUS and Ei compendex.

Submission >>>>

1. Full paper (presentation and publication)

- The paper must be written in English.
- All submissions will undergo a peer-review process by the conference committee.
- The paper should be at least FIVE pages including all figures, tables, and references.
- The paper should be submitted as a PDF document in .pdf format.
- submitted paper must be unpublished.
- Accepted papers will be invited for oral presentation or poster presentation and will be included in the conference proceedings.

2. Abstract (presentation only)

- Abstracts will be considered for presentation (oral/poster) only without publication.
- The abstract must be written in English.
- Abstracts should be no more than 300 words and clearly outline the title, purpose, methods, and outcomes of the research or practice being described.
- All submissions will undergo a peer-review process by the conference committee.

* Welcome to submit the paper or abstract by Electronic submission system: <https://www.wzmeeting.org/submit/icre2026>

More details about submission, please visit at: <https://www.icre.org/sub.html>

Conference Program >>>>

July 19, 2026 | CONFERENCE + SHORT COURSE

July 20, 2026 | TECHNICAL EXCELLENCE & TRIBUTE

July 21, 2026 | INNOVATION & FUTURE OUTLOOK

July 12-25, 2026 | Young Scholar Symposium + 2026 Beihang International Summer School

Conference Venue >>>>

Conference Venue:

Hangzhou International Innovation Institute of Beihang University

Address:

No. 166, Shuanghongqiao Street, Pingyao Town, Yuhang District, Hangzhou City

Hangzhou, China

Hangzhou, a renowned Jiangnan city blending millennia of heritage and poetic scenery, boasts three world cultural heritage sites, west Lake ripples with romance; Liangzhu Ruins hold ancient wisdom; the Grand canal carries folk vibes. Timeless song Dynasty elegance meets trendy fun, and delicious local cuisine delights the taste buds. A perfect mix of classic and modern, it awaits visitors from all over the world.

Important Dates >>>>

Submission Deadline (Final Call): June 10, 2026

Notification Deadline: June 25, 2026

Camera-ready Date: June 30, 2026



Technical Support



杭州市北京航空航天大学国际创新研究院
HANGZHOU INTERNATIONAL INNOVATION INSTITUTE OF BEIHANG UNIVERSITY



哈尔滨工业大学
HARBIN INSTITUTE OF TECHNOLOGY

Contact

conference secretary: Ms. Lesley
Email: icre_conf@outlook.com
web: <http://www.icre.org>

2026 10th International Conference on RELIABILITY ENGINEERING

Hangzhou, China July 19-21, 2026

<http://icre.org/>

特别专题 24

地震与多物理场载荷下微型反应堆系统及部件的可靠性与易损性评估

专题目标 >>>>

微型反应堆具有结构紧凑、可运输、长周期无人值守运行等特点，对系统、设备和关键部件的可靠性与安全性提出了严格要求。其失效可能来源于多个层级，包括系统级功能依赖关系、设备级退化过程，以及控制棒驱动系统、泵叶轮、堆芯内部构件、换热器、窄流道、紧固件和支承结构等关键部件的失效机理。这些系统和部件在服役过程中可能承受多种耦合的环境与运行载荷，例如地震激励、流固耦合诱导的振动、冲蚀与磨损退化、微动磨损、疲劳以及热循环等。

因此，微型反应堆可靠性研究需要发展跨尺度分析方法，将系统级概率安全评价、地震概率风险评价与易损性分析、设备级退化与寿命预测，以及部件级失效物理建模有机结合。同时，人工智能和机器学习方法的发展也为地震响应预测、状态监测、异常检测、代理模型构建以及基于数字孪生的实时可靠性评估提供了新的研究途径。

不同于一般核电系统可靠性或数字孪生专题，本专题聚焦微型反应堆系统及部件在地震与多物理场耦合载荷作用下的跨尺度可靠性问题，强调从系统级安全评价、设备级退化预测到部件级失效机理分析的融合研究。诚邀从事试验研究、理论分析、数值模拟和数据驱动方法研究的学者投稿交流。

专题主题 >>>>

征稿主题包括但不限于：

- 微型反应堆结构、系统及部件的地震概率安全评价与易损性分析
- 地震及正常运行工况下控制棒落棒/插入机构的可靠性评估
- 堆芯部件的流致振动与微动磨损
- 泵叶轮及窄流道的冲蚀与磨损退化
- 流固耦合作用下的振动可靠性与微动疲劳
- 热-力-流-地震等多物理场耦合载荷下的可靠性分析
- 部件级失效机理向概率安全评价模型的集成方法
-

专题主席 >>>>



张仲昌, 中国科学院合肥物质科学研究院, 中国



管梅花, 中国科学院合肥物质科学研究院, 中国



戈道川, 中国科学院合肥物质科学研究院, 中国



周志光, 同济大学, 中国



孔凡, 合肥工业大学, 中国

会议出版 >>>>

录用文章将被收录至ICRE 2026会议论文集，由IEEE出版，并被EI Compendex 和 Scopus 检索。

投稿方式 >>>>

- 1). 上传文章到电子投稿系统: <https://www.zmeeting.org/submission/icre2026>
- 2). 或发送文章至会议邮箱: icre_conf@outlook.com

提示:

1. 全文投稿 (含报告与出版)

- 稿件须以英文撰写。
- 所有投稿均由会议委员会进行同行评审。
- 稿件篇幅不少于 5 页，包含所有图表及参考文献。
- 稿件须以 PDF 格式提交。
- 投稿稿件须为未发表的原创新果。
- 录用稿件将受邀进行口头报告或海报展示，并收录至会议论文集。

2. 摘要投稿 (仅作报告)

- 摘要仅用于申请报告资格 (口头报告 / 海报展示)，不纳入出版范围。
- 摘要须以英文撰写。
- 摘要字数不超过 300 词，须清晰阐明所涉研究或实践的标题、研究目的、研究方法以及研究成果。
- 所有投稿均由会议委员会进行同行评审。
- 详细信息请见——<https://icre.org/sub.html>

会议日程 >>>>

2026年7月19日- 签到注册
2026年7月20日- 开幕式+主旨报告+作者报告
2026年7月21日- 开幕式+主旨报告+作者报告
2026年7月12-25日- 青年学者论坛 + 2026北航国际暑期学校

会议地址 >>>>

杭州市北京航空航天大学国际创新研究院 (北京航空航天大学国际创新学院)
地址: 杭州市余杭区瓶窑镇双红桥街166号

中国杭州

杭州，一座融千年文脉与诗画风光的江南名城，三大世界文化遗产勾勒其独特魅力。西湖碧波漾诗意，良渚遗址藏远古智慧，大运河流淌南北烟火。宋韵风雅浸润红墙古社，新潮玩法解锁别样体验，鲜醇杭帮菜抚慰味蕾。古典与现代交织，漫步街巷皆是惊喜，正静待八方游客前来探寻。

重要日期 >>>>

投稿截止日期 (最后一轮征稿): 2026年6月10日
审稿通知日期: 2026年6月25日
注册截止日期: 2026年6月30日

Sponsors  Co-sponsors

技术支持 



北京市北京航空航天大学国际创新研究院
(北京航空航天大学国际创新学院)



哈尔滨工业大学
HARBIN INSTITUTE OF TECHNOLOGY

Contact

conference secretary: Ms. Lesley
Email: icre_conf@outlook.com
web: <http://www.icre.org>