

# 数学与系统科学研究院

## 计算数学所学术报告

报告人: **Dr. Jie Xu**

*(Purdue University)*

报告题目:

**The scalar auxiliary variable approach  
for gradient flows**

邀请人: 周爱辉研究员

报告时间: 2018年5月22日(周二)

上午 10:00--11:00

报告地点: 数学院南楼N702 教室

报告摘要:

We introduce the scalar auxiliary variable (SAV) approach for a large class of gradient flows.

The SAV approach is built upon the invariant energy quadratization (IEQ) method. The SAV scheme is, like the IEQ scheme, unconditionally stable with respect to a modified energy, when built in the first-

**and second-order schemes.**

**Moreover, it has some unique advantages:**

**(1) The resulting linear systems have constant coefficients, thus are remarkably easy to implement.**

**For multi-component gradient flows, the SAV scheme leads to decoupled linear systems, one for each component.**

**(2) The SAV scheme applies to gradient flows with energy that is lower-bounded but cannot be written as the integral of a lower-bounded function.**

**Numerical examples are presented to show that besides the simplicity and efficiency, the SAV scheme has better accuracy than other schemes.**

**It also has good performance when coupled with high-order BDF schemes and adaptive time stepping.**

**With some further assumptions on the gradient flows, we carry out the convergence and error analysis, which covers many gradient flows.**

**Finally, we discuss some criteria on the range of application, and present alternative approaches for some cases where SAV is not suitable.**

**欢迎大家参加！**