PIMS/AMI Seminar/IGR
(Institute for Geophysical Research)

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CAB 657

"Time-stepping schemes in weather and climate models"

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Abstract

The second-order centered (leapfrog) time-stepping scheme is commonly used in numerical models of weather and climate. The unstable computational mode is damped by applying a Robert–Asselin filter, which introduces first-order numerical errors. Despite its poor accuracy, this time-stepping scheme has been used in most weather and climate models for the past 50 years. In this seminar, I will discuss several simple and computationally inexpensive methods to improve the Robert-Asselin filtered leapfrog scheme. For example, the RAW filter eliminates the first-order amplitude errors and yields third-order amplitude accuracy. Other simple modifications yield up to seventh-order amplitude accuracy. These developments have recently been shown to improve climate models and to significantly increase the skill of medium-range weather forecasts. The proposed new schemes appear to be attractive alternatives to the filtered leapfrog schemes currently used in many weather and climate models.