

**DEPS**地球與行星科學系
Earth & Planetary Sciences

Seminar Programme

Time-symmetry, Solar System Chaos, and Earth's Climate History



Prof. David M. Hernandez

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11:00am-12:00noon, Monday, May 4th, 2026**Room 105, James Lee Science Building**

To first approximation, the structure of large scale astronomical systems is governed by gravity, which is described by time-reversible ordinary differential equations. I present novel time-symmetric numerical methods for simulations of structure formation which respect this time-symmetry and show they can be significantly more accurate than non-reversible numerical methods in studying gravitational dynamics. One of these methods is being implemented as TRACE in the REBOUND software package, and we find for interesting planetary dynamics problems it offers a speed advantage of an order magnitude or more compared to other codes.

Next, I focus on the effects of stellar flybys on Earth's climate history. Stellar flybys can have notable effects on the solar system's long-term dynamical evolution, injection of Oort cloud comets into the solar system, properties of trans-Neptunian objects, and more. Using a state-of-the-art solar system model, including a lunar contribution and the J_2 solar quadrupole, and random stellar parameters, we find no influence of passing stars on paleoclimate reconstructions over the past 56 Myr, in contrast to recent results from other authors who did not include some of these physical effects.

Finally, I tackle the problem of the stability of the Solar System, which can be traced to subdiffusive evolution in its secular frequencies.

For additional information, please contact Prof. Man Hoi LEE, mhlee@hku.hk.