



UC3M-ICMAT Seminar – 2014/2015

Applied Probability and Statistics

Chandler wobble: Stochastic and deterministic dynamics

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11h30, ICMAT, Aula Naranja

The discovery in 1891 of the free precession of the Earth's rotational axis (the Chandler wobble), with a period of fourteen months, raised the question of how it is sustained against the internal friction that should damp it away. Solutions proposed thus far have relied either on stochastic perturbations to the Earth's mass distribution, or on marine and atmospheric circulations that might force it near its resonance.

After reviewing why such explanations have never been very convincing, I will offer a simple model of the Chandler wobble as a self-oscillation driven by positive feedback between the precession and the displacement of the Earth's axis of symmetry. I will explain why extensive data analysis has failed to produce sensible estimates of the quality factor for the wobble, or an explanation of its extinctions and phase shifts. I will conclude with some general remarks on how a deterministic self-oscillatory dynamic that can be turned on or off (Hopf bifurcation) by stochastic perturbations may resolve puzzles surrounding other complex systems, including some with heavy-tailed distributions.

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