Title: The Lorenz attractor exists

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Abstract: Four decades ago, the meteorologist Edward Lorenz introduced a simplified model of atmospheric dynamics in his now famous article "Deterministic Non-periodic Flow" published in the Journal of Atmospheric Sciences. The simple system of differential equations produced amazingly complicated solutions. One stunning property was that solutions starting very close together were separated at an exponential rate. This gave rise to the concept of the "butterfly effect", and seriously undermined the idea of a deterministic world. Another feature of the system was that almost all solutions tend to an invariant set on which they move in a non-periodic fashion.

For over 35 years Lorenz' equations defied all attempts at proving that they really exhibit a so called "strange attractor". In this talk, I will present a proof of this fact; by using a combination of pure and applied mathematics, it is possible to prove that the equations do indeed give rise to a strange attractor. Moreover, the attractor is robust, i.e., all nearby systems will display similar strange attractors. The proof has two main ingredients: rigorous numerics - which produces information about the global behavior of the system, and normal form theory - which deals with subtle local properties of the solutions.