The Rorenz Attractor

The Lorenz attractor is a strange attractor that arises in a system of equations describing the 2-dimensional flow of fluid of uniform depth, with an imposed vertical temperature difference. In the early 1960s, Lorenz discovered the chaotic behavior of a simplified 3-dimensional system of this problem, now known as the Lorenz equations:

$$\frac{d}{dt}X = \sigma(Y - X) \tag{1}$$

$$\frac{d}{dt}Y = -XZ + rX - Y \tag{2}$$

$$\frac{d}{dt}Z = XY - bZ \tag{3}$$

The following figure shows the numerical solution of equations (1) to (3) calculated with $\sigma = 3$, r = 26.5 and b = 1. The complex 3-dimensional structure of this attractor is hard to see in a 2-dimensional plot. Therefore click on the image to start/stop a slow rotation.

Reference

• Lorenz, E. N. "Deterministic Nonperiodic Flow." J. Atmos. Sci. 20, 130-141, 1963.