

Tutorial 5: February 14, 12:00-12:45

Cascading Tipping

Notebook: Tutorial14-2.ipynb

In this exercise, we consider the dynamical system

$$\frac{dx}{dt} = a_1 x^3 + a_2 x + \phi$$

$$\frac{dy}{dt} = b_1 y^3 + b_2 y + cx$$

where $a_1 = -0.5$, $b_1 = -0.5$, $a_2 = 0.5$, $b_2 = 1.0$ and $c = 0.48$. Choose $\phi = \phi_0 + rt$ where $\phi_0 = 0.1$.

a.

For $r = 5 \times 10^{-4}$, determine the cascading behavior of this system. How could you determine the tipping times of both systems analytically?

b.

Determine the critical rate r for cascading tipping to appear?