Tutorial 4: February 12, 12:00-12:45

Rate induced Tipping

Notebook: Tutorial12-2.ipynb

In this exercise, we consider the dynamical system

$$\frac{dx}{dt} = -x((x - A - s\lambda(rt))^2 + \lambda(rt))$$

where

$$\lambda(rt) = \lambda_m + \Delta_\lambda \; a(rt)$$

with

$$a(rt) = \frac{1}{\cosh(r(t-T))}, t < T \;\; ; \;\; a(rt) = 1, t \geq T$$

represents the change in the forcing. As standard parameters we take $A = 3.2$, $s = 4$, $T = 500$, $\lambda_m = -0.5$.

a.
First consider the case $\Delta_\lambda = 0.505$ and $r = 0.05$. What type of tipping behaviour do you find?

b.
Next consider the case $\Delta_\lambda = 0.4$. What type of tipping behaviour do you find for $r = 1.0$ and $r = 3.0$?