Analysis of Bursting

Modify Morris-Lecar model to include a Ca²⁺-activated K⁺ current,

\[ I_{K,Ca} = g_K(Ca) \left( \frac{Ca^3}{Ca^3 + K_D^3} \right) (V - V_K) \]

First treat Ca as a parameter.

Example of a type 1 neural oscillator.

Next add Ca²⁺ dynamics:

\[ J_{in} = -\alpha I_{Ca} \quad \text{(influx through channel)} \]

\[ J_{out} = K_{pmCa} Ca \quad \text{(efflux through pumps)} \]

Then

\[ \frac{dCa}{dt} = F_C (J_{in} - J_{out}) \]

\[ = F_C (x F_C a + K_{pmCa} Ca) \]
Treat bifurcation diagram as a generalized V-nullcline and view in the V-Ca "phase plane".