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Temperature sensitivity of PO/AH neurons

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Thermoregulatory responses are partially controlled by the preoptic area and anterior hypothalamus (PO/AH), which contains a mixed population of temperature-sensitive and insensitive neurons. In [1] based on physiological data, a Hodgkin-Huxley-like conductance based model was constructed. This model suggests that most PO/AH neurons have the same types of ionic channels, but different levels of channel expression can explain the inherent properties of the various types of temperature-sensitive and insensitive neurons which is encoded in their frequency sensitivity relative to temperature.

Here we present a detailed bifurcation analysis of this model to confirm these observations. We focus on three main physiological bifurcation parameters, the temperature T and the maximum conductances of two specific background potassium leak channels, g_{task} and g_{trek}, that are known to be expressed in these PO/AH neurons. These three bifurcation parameters are sufficient to explain the dynamics of PO/AH neurons observed in experiments.

If time permits, we also discuss the multiple timescales inherent in this model and explain the creation of action potentials based on a geometric singular perturbation analysis.

[1] Wechselberger *et al.*, 2006

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