

Accepted Manuscript

Classical quasi-steady state reduction—A mathematical characterization

Alexandra Goeke, Sebastian Walcher, Eva Zerz

PII: S0167-2789(16)30067-7

DOI: <http://dx.doi.org/10.1016/j.physd.2016.12.002>

Reference: PHYSD 31871

To appear in: *Physica D*

Received date: 20 February 2016

Revised date: 7 November 2016

Accepted date: 19 December 2016

Please cite this article as: A. Goeke, S. Walcher, E. Zerz, Classical quasi-steady state reduction—A mathematical characterization, *Physica D* (2016), <http://dx.doi.org/10.1016/j.physd.2016.12.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Classical quasi-steady state reduction – A mathematical characterization

Alexandra Goeke
Mathematik A, RWTH Aachen
52056 Aachen, Germany

Sebastian Walcher*
Mathematik A, RWTH Aachen
52056 Aachen, Germany

Eva Zerz
Mathematik D, RWTH Aachen
52056 Aachen, Germany

November 7, 2016

Abstract

We discuss parameter dependent polynomial ordinary differential equations that model chemical reaction networks. By *classical quasi-steady state (QSS) reduction* we understand the following familiar (heuristically motivated) mathematical procedure: Set the rate of change for certain (a priori chosen) variables equal to zero and use the resulting algebraic equations to obtain a system of smaller dimension for the remaining variables. This procedure will generally be valid only for certain parameter ranges. We start by showing that the reduction is accurate if and only if the corresponding parameter is what we call a QSS parameter value, and that the reduction is approximately accurate if and only if the corresponding parameter is close to a QSS parameter value. The QSS parameter values can be characterized by polynomial equations and inequations, hence parameter ranges for which QSS reduction is valid are accessible in an algorithmic manner. A defining characteristic of a QSS parameter value is that the algebraic variety

*Corresponding author. Email walcher@matha.rwth-aachen.de, Phone +49 241 809 8132, Fax +49 241 809 2212.

Download English Version:

<https://daneshyari.com/en/article/5500308>

Download Persian Version:

<https://daneshyari.com/article/5500308>

[Daneshyari.com](https://daneshyari.com)