

## SBML Model Report

**Model name:**  
**“Singh2006\_IL6\_Signal\_Transduction”**



May 6, 2016

### 1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following two authors: Harish Dharuri<sup>1</sup> and Vijayalakshmi Chelliah<sup>2</sup> at August 31<sup>st</sup> 2007 at 3:36 p. m. and last time modified at October tenth 2014 at 11:06 a. m. Table 1 gives an overview of the quantities of all components of this model.

Table 1: Number of components in this model, which are described in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	2
species types	0	species	68
events	0	constraints	0
reactions	72	function definitions	0
global parameters	105	unit definitions	1
rules	0	initial assignments	0

### Model Notes

The model reproduces Fig 2 , Fig3A and Fig 3B of the paper. The ODE for x1(gp180) and x3 (gp 130) is wrong and the authors have communicated to the curator that the species ought to have a constant value. There are a few other differences from the paper and these were made in

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consultation with the authors. Model was successfully tested on MathSBML.

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To cite BioModels Database, please use: [Li C, Donizelli M, Rodriguez N, Dharuri H, Endler L, Chelliah V, Li L, He E, Henry A, Stefan MI, Snoep JL, Hucka M, Le Novre N, Laibe C \(2010\) BioModels Database: An enhanced, curated and annotated resource for published quantitative kinetic models. BMC Syst Biol., 4:92.](#)

## 2 Unit Definitions

This is an overview of five unit definitions of which four are predefined by SBML and not mentioned in the model.

### 2.1 Unit `substance`

**Name** nano mole

**Definition** nmol

### 2.2 Unit `volume`

**Notes** Litre is the predefined SBML unit for `volume`.

**Definition** l

### 2.3 Unit `area`

**Notes** Square metre is the predefined SBML unit for `area` since SBML Level 2 Version 1.

**Definition** m<sup>2</sup>

### 2.4 Unit `length`

**Notes** Metre is the predefined SBML unit for `length` since SBML Level 2 Version 1.

**Definition** m

## 2.5 Unit `time`

**Notes** Second is the predefined SBML unit for time.

**Definition** s

## 3 Compartments

This model contains two compartments.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial	Size	Unit	Constant	Outside
			Dimensions				
cytosol	cytosol		3	1	litre	<input checked="" type="checkbox"/>	
nucleus	nucleus		3	1	litre	<input checked="" type="checkbox"/>	cytosol

### 3.1 Compartment `cytosol`

This is a three dimensional compartment with a constant size of one litre.

**Name** cytosol

### 3.2 Compartment `nucleus`

This is a three dimensional compartment with a constant size of one litre, which is surrounded by cytosol (cytosol).

**Name** nucleus

## 4 Species

This model contains 68 species. The boundary condition of two of these species is set to true so that these species' amount cannot be changed by any reaction. Section 7 provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
x1	gp80	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
x2	IL6-gp80	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x6	IL6-gp80-gp130-JAK	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x5	gp130-JAK	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x7	(IL6-gp80-gp130-JAK)2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x8	(IL6-gp80-gp130-JAK)_ast2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x16	(IL6-gp80-gp130-JAK)ast2-JAK	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x15	SHP2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x9	STAT3C	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x11	(IL6-gp80-gp130-JAK)ast2-STAT3C	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x10	STAT3Cast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x12	(IL6-gp80-gp130-JAK)ast2-STAT3Cast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x29	SOCS3	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x30	(IL6-gp80-gp130-JAK)ast2-SOCS3	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x39	(IL6-gp80-gp130-JAK)ast2-SHP2ast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x46	SHP2ast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x40	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x45	SHP2ast-Grb2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x44	SHP2ast-Grb2-SOS	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

Id	Name	Compartment	Derived Unit	Constant	Boundary Condi- tion
x18	PP1-STAT3Cast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x17	PP1	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x14	STAT3C-STAT3Cast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x22	STAT3N	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x32	(IL6-gp80-gp130-JAK)ast2-STAT3C- SOCS3-SHP2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x13	STAT3Cast-STAT3Cast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x20	STAT3Nast-STAT3Nast	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x21	STAT3Nast	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x23	PP2	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x27	PP2-STAT3Nast-STAT3Nast	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x24	STAT3N-STAT3Nast	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x25	Mrna-SOCS3N	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x34	Grb2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x36	Ras-GDP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x42	(IL6-gp80-gp130-JAK)ast2-SHP2ast- Grb2-SOS-Ras-GDP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x37	Ras-GTP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x47	Raf	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x48	Raf-Ras-GTP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x52	Rafast-Phosp1	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x51	Rafast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x50	Phosp1	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x53	MEK	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x54	MEK-Rafast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x55	MEK-P	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x60	MEK-P-Phosp2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
x59	Phosp2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x57	MEK-PP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x61	ERK	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x62	ERK-MEK-PP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x63	ERK-P	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x65	ERK-PP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x68	ERK-P-Phosp3	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x35	SOS	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x28	PP2-STAT3Nast	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x31	(IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x56	MEK-P-Rafast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x43	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GTP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x3	gp130	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
x58	MEK-PP-Phosp2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x4	JAK	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x26	Mrna-SOCS3C	nucleus	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x49	Ras-GTPast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x33	(IL6-gp80-gp130-JAK)ast2-STAT3C-SHP2	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x64	ERK-P-MEK-PP	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x19	PP1-STAT3Cast-STAT3Cast	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x38	Grb2-SOS	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x66	Phosp3	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
x67	ERK-PP-Phosp3	cytosol	$\text{nmol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

## 5 Parameters

This model contains 105 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
IL6			0.380		<input checked="" type="checkbox"/>
kf0			0.100		<input checked="" type="checkbox"/>
kr0			0.050		<input checked="" type="checkbox"/>
kf1			0.100		<input checked="" type="checkbox"/>
kr1			0.050		<input checked="" type="checkbox"/>
kf2			0.020		<input checked="" type="checkbox"/>
kr2			0.020		<input checked="" type="checkbox"/>
kf3			0.040		<input checked="" type="checkbox"/>
kr3			0.200		<input checked="" type="checkbox"/>
k4			0.005		<input checked="" type="checkbox"/>
k10			0.003		<input checked="" type="checkbox"/>
kf5			0.008		<input checked="" type="checkbox"/>
kr5			0.800		<input checked="" type="checkbox"/>
k6			0.400		<input checked="" type="checkbox"/>
kf7			0.005		<input checked="" type="checkbox"/>
kr7			0.500		<input checked="" type="checkbox"/>
kf9			0.001		<input checked="" type="checkbox"/>
kr9			0.200		<input checked="" type="checkbox"/>
kf21			0.020		<input checked="" type="checkbox"/>
kr21			0.100		<input checked="" type="checkbox"/>
kf37			0.300		<input checked="" type="checkbox"/>
kr37			$9 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kf39			0.300		<input checked="" type="checkbox"/>
kr39			$9 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kf32			0.100		<input checked="" type="checkbox"/>
kr32			$2.45 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
k12			0.003		<input checked="" type="checkbox"/>
kf13			$2 \cdot 10^{-7}$		<input checked="" type="checkbox"/>
kr13			0.200		<input checked="" type="checkbox"/>
k17			0.050		<input checked="" type="checkbox"/>
kf8			0.020		<input checked="" type="checkbox"/>
kr8			0.100		<input checked="" type="checkbox"/>
kf11			0.001		<input checked="" type="checkbox"/>
kr11			0.200		<input checked="" type="checkbox"/>
k14			0.005		<input checked="" type="checkbox"/>
Vm			1.700		<input checked="" type="checkbox"/>
Km			340.000		<input checked="" type="checkbox"/>

Id	Name	SBO	Value	Unit	Constant
kf34			6.000		<input checked="" type="checkbox"/>
kr34			0.060		<input checked="" type="checkbox"/>
kf60			0.500		<input checked="" type="checkbox"/>
kr60			0.005		<input checked="" type="checkbox"/>
kf15			0.001		<input checked="" type="checkbox"/>
kr15			0.200		<input checked="" type="checkbox"/>
kf61			0.200		<input checked="" type="checkbox"/>
kr61			$2 \cdot 10^{-7}$		<input checked="" type="checkbox"/>
k16			0.005		<input checked="" type="checkbox"/>
k18a			0.010		<input checked="" type="checkbox"/>
k18b			400.000		<input checked="" type="checkbox"/>
k19			0.001		<input checked="" type="checkbox"/>
k22			$5 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
k20			0.010		<input checked="" type="checkbox"/>
k23			$5 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kf38			0.010		<input checked="" type="checkbox"/>
kr38			0.550		<input checked="" type="checkbox"/>
kf35			0.002		<input checked="" type="checkbox"/>
kr35			0.005		<input checked="" type="checkbox"/>
kf24			0.010		<input checked="" type="checkbox"/>
kr24			0.550		<input checked="" type="checkbox"/>
kf25			0.010		<input checked="" type="checkbox"/>
kr25			0.021		<input checked="" type="checkbox"/>
kf40			0.030		<input checked="" type="checkbox"/>
kr40			0.064		<input checked="" type="checkbox"/>
kf26			0.015		<input checked="" type="checkbox"/>
kr26			1.300		<input checked="" type="checkbox"/>
kf31			0.023		<input checked="" type="checkbox"/>
kr31			$2.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kf27			0.500		<input checked="" type="checkbox"/>
kr27			$10^{-4}$		<input checked="" type="checkbox"/>
kf28			0.001		<input checked="" type="checkbox"/>
kr28			0.005		<input checked="" type="checkbox"/>
kf41			0.030		<input checked="" type="checkbox"/>
kr41			0.043		<input checked="" type="checkbox"/>
kf33			0.300		<input checked="" type="checkbox"/>
kr33			0.021		<input checked="" type="checkbox"/>
kf30			0.008		<input checked="" type="checkbox"/>
kr30			0.400		<input checked="" type="checkbox"/>
k43			1.000		<input checked="" type="checkbox"/>
kf29			1.000		<input checked="" type="checkbox"/>
kr29			$7 \cdot 10^{-4}$		<input checked="" type="checkbox"/>



Id	Name	SBO	Value	Unit	Constant
kf42			0.072		<input checked="" type="checkbox"/>
kr42			0.200		<input checked="" type="checkbox"/>
kf44			0.011		<input checked="" type="checkbox"/>
kr44			0.002		<input checked="" type="checkbox"/>
k45			3.500		<input checked="" type="checkbox"/>
kf46			0.011		<input checked="" type="checkbox"/>
kr46			0.002		<input checked="" type="checkbox"/>
k51			0.058		<input checked="" type="checkbox"/>
k49			0.058		<input checked="" type="checkbox"/>
kf50			$2.5 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kr50			0.500		<input checked="" type="checkbox"/>
k47			2.900		<input checked="" type="checkbox"/>
kf48			0.014		<input checked="" type="checkbox"/>
kr48			0.800		<input checked="" type="checkbox"/>
kf52			$1.1 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kr52			0.033		<input checked="" type="checkbox"/>
k53			16.000		<input checked="" type="checkbox"/>
kr54			0.033		<input checked="" type="checkbox"/>
kf54			$1.1 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
k55			6.700		<input checked="" type="checkbox"/>
k59			0.300		<input checked="" type="checkbox"/>
k57			0.270		<input checked="" type="checkbox"/>
kf58			0.005		<input checked="" type="checkbox"/>
kr58			0.500		<input checked="" type="checkbox"/>
kf56			0.014		<input checked="" type="checkbox"/>
kr56			0.600		<input checked="" type="checkbox"/>

## 6 Reactions

This model contains 72 reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by a modifier, the identifier of this species is written above the reaction arrow.

Table 5: Overview of all reactions

Nº	Id	Name	Reaction Equation	SBO
1	R1	IL6-gp80 complex formation	$\emptyset \xrightarrow{x1} x2$	
2	R2	IL6-gp80 complex dissociation	$x2 \longrightarrow \emptyset$	
3	R3	IL6-gp80-gp130-JAK dissociation	$x6 \longrightarrow x5 + x2$	
4	R5	gp130-JAK complex formation	$x4 \xrightarrow{x3} x5$	
5	R7	IL6-gp80-gp130-JAK dimerization	$2 x6 \longrightarrow x7$	
6	R8	IL6-gp80-gp130-JAK dimer dissociation	$x7 \longrightarrow 2 x6$	
7	R9	IL6-gp80-gp130-JAK dimer phosphorylation	$x7 \longrightarrow x8$	
8	R10	IL6-gp80-gp130-JAK dimer-SHP2 dissociation	$x16 \longrightarrow x15 + x7$	
9	R11	IL6-gp80-gp130-JAK -STAT3C complex formation	$x9 + x8 \longrightarrow x11$	
10	R12	IL6-gp80-gp130-JAK -STAT3C dissociation	$x11 \longrightarrow x10 + x8$	
11	R13	IL6-gp80-gp130-JAK-STAT3Cast complex formation	$x10 + x8 \rightleftharpoons x12$	
12	R14	IL6-gp80-gp130-JAK -SHP2 complex formation	$x15 + x8 \rightleftharpoons x16$	
13	R15	IL6-gp80-gp130-JAK -SOCS3 complex formation	$x29 + x8 \rightleftharpoons x30$	
14	R16	IL6-gp80-gp130-JAK -SHP2 dimer dissociation	$x39 \rightleftharpoons x46 + x8$	
15	R16a	IL6-gp80-gp130-JAK SHP2 Grb2 dissociation	$x40 \rightleftharpoons x45 + x8$	

Nº	Id	Name	Reaction Equation	SBO
16	R17	IL6-gp80-gp130-JAK-SHP2-Grb2-SOS dis- sociation	$x_{41} \rightleftharpoons x_{44} + x_8$	
17	R18	PP1-STAT3Cast dissociation	$x_{18} \longrightarrow x_{17} + x_9$	
18	R19	STAT3C dimerization	$x_{10} + x_9 \rightleftharpoons x_{14}$	
19	R20	STAT3N transport	$x_{22} \longrightarrow x_9$	
20	R21	IL6-gp80-gp130-JAK-SOCS2-STAT3C com- plex formation	$x_{30} + x_9 \rightleftharpoons x_{31}$	
21	R22	IL6-gp80-gp130-JAK-STAT3C-SOCS3- SHP2 dissociation	$x_{32} \longrightarrow x_{29} + x_{15} + x_9 + x_7$	
22	R23	STAT3C dimerization	$x_{10} \rightleftharpoons 0 \cdot 5 x_{13}$	
23	R24	IL6-gp80-gp130-JAK STAT3Cast complex formation	$x_{17} + x_{10} \rightleftharpoons x_{18}$	
24	R25	PP1-STAT3C dimer complex formation	$x_{17} + x_{13} \rightleftharpoons x_{19}$	
25	R26	STAT3C dimer phosphorylation	$x_{13} \longrightarrow x_{20}$	
26	R27	PP1-STAT3C dimer dissociation	$x_{19} \longrightarrow x_{17} + x_{14}$	
27	R28	Complex formation	$x_{31} + x_{15} \longrightarrow x_{32}$	
28	R29	SHP2 dephosphorylation	$x_{46} \longrightarrow x_{15}$	
29	R30	IL6-gp80-gp130-JAK-SHP2 phosphorylation	$x_{16} \rightleftharpoons x_{39}$	
30	R31	STAT3N dimer dissociation	$x_{20} \rightleftharpoons 2 x_{21}$	
31	R32	PP2-STAT3N dimer complex formation	$x_{23} + x_{20} \rightleftharpoons x_{27}$	
32	R33	PP2-STAT3N complex formation	$x_{23} + x_{21} \rightleftharpoons x_{28}$	
33	R34	STAT3N dimer dissociation	$x_{24} \rightleftharpoons x_{22} + x_{21}$	
34	R35	PP2-STAT3N dissociation	$x_{28} \longrightarrow x_{23} + x_{22}$	
35	R36	PP2-STAT3N dimer dissociation	$x_{27} \longrightarrow x_{24} + x_{23}$	
36	R37	SOCS3N transcription	$\emptyset \xrightarrow{x_{20}} x_{25}$	
37	R38	SOCS3 mRNA translocation	$x_{25} \longrightarrow x_{26}$	
38	R39	SOCS3 mRNA degradation	$x_{26} \longrightarrow \emptyset$	
39	R40	SOCS3 translation	$\emptyset \xrightarrow{x_{26}} x_{29}$	

Nº	Id	Name	Reaction Equation	SBO
40	R41	SOCS3 degradation	$x_{29} \longrightarrow \emptyset$	
41	R42	Complex dissociation	$x_{32} \longrightarrow x_{33} + x_{29}$	
42	R43	SHP2-Grb2 complex formation	$x_{46} + x_{34} \rightleftharpoons x_{45}$	
43	R44	Grb2-SOS dissociation	$x_{38} \rightleftharpoons x_{35} + x_{34}$	
44	R45	Complex formation	$x_{39} + x_{34} \rightleftharpoons x_{40}$	
45	R46	Complex formation	$x_{40} + x_{35} \rightleftharpoons x_{41}$	
46	R47	SHP2Grb2-SOS complex formation	$x_{45} + x_{35} \rightleftharpoons x_{44}$	
47	R48	Complex formation	$x_{41} + x_{36} \rightleftharpoons x_{42}$	
48	R49	Complex dissociation	$x_{43} \rightleftharpoons x_{41} + x_{36}$	
49	R50	Complex dissociation	$x_{42} \rightleftharpoons x_{41} + x_{37}$	
50	R51	Ras-GTP-Raf complex formation	$x_{47} + x_{37} \rightleftharpoons x_{48}$	
51	R52	Complex formation	$x_{39} + x_{38} \rightleftharpoons x_{41}$	
52	R53	SHP2-Grb2-SOS dissociation	$x_{44} \rightleftharpoons x_{46} + x_{38}$	
53	R54	Complex formation	$x_{49} + x_{41} \rightleftharpoons x_{43}$	
54	R55	Raf-Phosp1 dissociation	$x_{52} \longrightarrow x_{47} + x_{50}$	
55	R56	Raf-Ras-GTP dissociation	$x_{48} \rightleftharpoons x_{51} + x_{49}$	
56	R57	Raf-Phosp1 complex formation	$x_{51} + x_{50} \rightleftharpoons x_{52}$	
57	R58	MEK-Raf complex formation	$x_{53} + x_{51} \rightleftharpoons x_{54}$	
58	R59	MEK-Raf complex dissociation	$x_{54} \longrightarrow x_{55} + x_{51}$	
59	R60	MEK-P-Raf complex formation	$x_{55} + x_{51} \rightleftharpoons x_{56}$	
60	R61	MEK-P-Phosp2 dissociation	$x_{60} \longrightarrow x_{59} + x_{53}$	
61	R62	MEK-PP-Phosp2 dissociation	$x_{58} \longrightarrow x_{59} + x_{55}$	
62	R63	MEK-P-Phosp2 complex formation	$x_{59} + x_{55} \rightleftharpoons x_{60}$	
63	R64	MEK-P-Raf complex dissociation	$x_{56} \longrightarrow x_{51} + x_{57}$	
64	R65	MEK-PP-Phosp2 complex formation	$x_{59} + x_{57} \rightleftharpoons x_{58}$	
65	R66	ERK-MEK-PP complex formation	$x_{61} + x_{57} \rightleftharpoons x_{62}$	
66	R67	ERK-MEK-PP complex dissociation	$x_{62} \longrightarrow x_{63} + x_{57}$	
67	R68	ERK-P-MEK-PP complex dissociation	$x_{64} \rightleftharpoons x_{63} + x_{57}$	
68	R69	ERK-PP formation	$x_{64} \longrightarrow x_{65} + x_{57}$	

Nº	Id	Name	Reaction Equation	SBO
69	R70	ERK-P-Phosp3 complex dissociation	$x68 \longrightarrow x66 + x61$	
70	R71	ERK-PP-Phosp3 dissociation	$x67 \longrightarrow x66 + x63$	
71	R72	ERK-P-Phosp3 formation	$x66 + x63 \rightleftharpoons x68$	
72	R73	ERK-PP-Phosp3 formation	$x66 + x65 \rightleftharpoons x67$	

## 6.1 Reaction R1

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

**Name** IL6-gp80 complex formation

### Reaction equation



### Modifier

Table 6: Properties of each modifier.

Id	Name	SBO
x1	gp80	

### Product

Table 7: Properties of each product.

Id	Name	SBO
x2	IL6-gp80	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_1 = \text{vol}(\text{cytosol}) \cdot \text{kf0} \cdot [x1] \cdot \text{IL6} \quad (2)$$

## 6.2 Reaction R2

This is an irreversible reaction of one reactant forming no product.

**Name** IL6-gp80 complex dissociation

### Reaction equation



### Reactant

Table 8: Properties of each reactant.

Id	Name	SBO
x2	IL6-gp80	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_2 = \text{vol}(\text{cytosol}) \cdot \text{kr0} \cdot [\text{x2}] \quad (4)$$

### 6.3 Reaction R3

This is an irreversible reaction of one reactant forming two products.

**Name** IL6-gp80-gp130-JAK dissociation

### Reaction equation



### Reactant

Table 9: Properties of each reactant.

Id	Name	SBO
x6	IL6-gp80-gp130-JAK	

### Products

Table 10: Properties of each product.

Id	Name	SBO
x5	gp130-JAK	
x2	IL6-gp80	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_3 = \text{vol}(\text{cytosol}) \cdot (\text{kr2} \cdot [\text{x6}] - \text{kf2} \cdot [\text{x2}] \cdot [\text{x5}]) \quad (6)$$

## 6.4 Reaction R5

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** gp130-JAK complex formation

### Reaction equation



### Reactant

Table 11: Properties of each reactant.

Id	Name	SBO
x4	JAK	

### Modifier

Table 12: Properties of each modifier.

Id	Name	SBO
x3	gp130	

### Product

Table 13: Properties of each product.

Id	Name	SBO
x5	gp130-JAK	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_4 = \text{vol}(\text{cytosol}) \cdot (kf1 \cdot [x3] \cdot [x4] - kr1 \cdot [x5]) \quad (8)$$

## 6.5 Reaction R7

This is an irreversible reaction of one reactant forming one product.

**Name** IL6-gp80-gp130-JAK dimerization



### Reaction equation



### Reactant

Table 14: Properties of each reactant.

Id	Name	SBO
x6	IL6-gp80-gp130-JAK	

### Product

Table 15: Properties of each product.

Id	Name	SBO
x7	(IL6-gp80-gp130-JAK)2	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_5 = \text{vol}(\text{cytosol}) \cdot \text{kf3} \cdot [\text{x6}]^2 \quad (10)$$

## 6.6 Reaction R8

This is an irreversible reaction of one reactant forming one product.

**Name** IL6-gp80-gp130-JAK dimer dissociation

### Reaction equation



### Reactant

Table 16: Properties of each reactant.

Id	Name	SBO
x7	(IL6-gp80-gp130-JAK)2	

## Product

Table 17: Properties of each product.

Id	Name	SBO
x6	IL6-gp80-gp130-JAK	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_6 = \text{vol}(\text{cytosol}) \cdot \text{kr3} \cdot [\text{x7}] \quad (12)$$

## 6.7 Reaction R9

This is an irreversible reaction of one reactant forming one product.

**Name** IL6-gp80-gp130-JAK dimer phosphorylation

## Reaction equation



## Reactant

Table 18: Properties of each reactant.

Id	Name	SBO
x7	(IL6-gp80-gp130-JAK) <sub>2</sub>	

## Product

Table 19: Properties of each product.

Id	Name	SBO
x8	(IL6-gp80-gp130-JAK) <sub>ast2</sub>	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_7 = \text{vol}(\text{cytosol}) \cdot \text{k4} \cdot [\text{x7}] \quad (14)$$

## 6.8 Reaction R10

This is an irreversible reaction of one reactant forming two products.

**Name** IL6-gp80-gp130-JAK dimer-SHP2 dissociation

### Reaction equation



### Reactant

Table 20: Properties of each reactant.

Id	Name	SBO
x16	(IL6-gp80-gp130-JAK)ast2-JAK	

### Products

Table 21: Properties of each product.

Id	Name	SBO
x15	SHP2	
x7	(IL6-gp80-gp130-JAK)2	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_8 = \text{vol}(\text{cytosol}) \cdot k10 \cdot [x16] \quad (16)$$

## 6.9 Reaction R11

This is an irreversible reaction of two reactants forming one product.

**Name** IL6-gp80-gp130-JAK -STAT3C complex formation

### Reaction equation



### Reactants

Table 22: Properties of each reactant.

Id	Name	SBO
x9	STAT3C	
x8	(IL6-gp80-gp130-JAK) <sub>ast2</sub>	

## Product

Table 23: Properties of each product.

Id	Name	SBO
x11	(IL6-gp80-gp130-JAK) <sub>ast2</sub> -STAT3C	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_9 = \text{vol}(\text{cytosol}) \cdot (k_{f5} \cdot [x8] \cdot [x9] - k_{r5} \cdot [x11]) \quad (18)$$

## 6.10 Reaction R12

This is an irreversible reaction of one reactant forming two products.

**Name** IL6-gp80-gp130-JAK -STAT3C dissociation

## Reaction equation



## Reactant

Table 24: Properties of each reactant.

Id	Name	SBO
x11	(IL6-gp80-gp130-JAK) <sub>ast2</sub> -STAT3C	

## Products

Table 25: Properties of each product.

Id	Name	SBO
x10	STAT3Cast	

Id	Name	SBO
x8	(IL6-gp80-gp130-JAK)_ast2	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{10} = \text{vol}(\text{cytosol}) \cdot k_6 \cdot [x_{11}] \quad (20)$$

### 6.11 Reaction R13

This is a reversible reaction of two reactants forming one product.

**Name** IL6-gp80-gp130-JAK-STAT3Cast complex formation

### Reaction equation



### Reactants

Table 26: Properties of each reactant.

Id	Name	SBO
x10	STAT3Cast	
x8	(IL6-gp80-gp130-JAK)_ast2	

### Product

Table 27: Properties of each product.

Id	Name	SBO
x12	(IL6-gp80-gp130-JAK)ast2-STAT3Cast	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{11} = \text{vol}(\text{cytosol}) \cdot (k_7 \cdot [x_8] \cdot [x_{10}] - k_{r7} \cdot [x_{12}]) \quad (22)$$

### 6.12 Reaction R14

This is a reversible reaction of two reactants forming one product.

**Name** IL6-gp80-gp130-JAK -SHP2 complex formation

### Reaction equation



### Reactants

Table 28: Properties of each reactant.

Id	Name	SBO
x15	SHP2	
x8	(IL6-gp80-gp130-JAK)_ast2	

### Product

Table 29: Properties of each product.

Id	Name	SBO
x16	(IL6-gp80-gp130-JAK)ast2-JAK	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{12} = \text{vol}(\text{cytosol}) \cdot (k_{f9} \cdot [x8] \cdot [x15] - k_{r9} \cdot [x16]) \quad (24)$$

## 6.13 Reaction R15

This is a reversible reaction of two reactants forming one product.

**Name** IL6-gp80-gp130-JAK -SOCS3 complex formation

### Reaction equation



### Reactants

Table 30: Properties of each reactant.

Id	Name	SBO
x29	SOCS3	

Id	Name	SBO
x8	(IL6-gp80-gp130-JAK)_ast2	

## Product

Table 31: Properties of each product.

Id	Name	SBO
x30	(IL6-gp80-gp130-JAK)ast2-SOCS3	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{13} = \text{vol}(\text{cytosol}) \cdot (\text{kf21} \cdot [\text{x29}] \cdot [\text{x8}] - \text{kr21} \cdot [\text{x30}]) \quad (26)$$

## 6.14 Reaction R16

This is a reversible reaction of one reactant forming two products.

**Name** IL6-gp80-gp130-JAK -SHP2 dimer dissociation

## Reaction equation



## Reactant

Table 32: Properties of each reactant.

Id	Name	SBO
x39	(IL6-gp80-gp130-JAK)ast2-SHP2ast	

## Products

Table 33: Properties of each product.

Id	Name	SBO
x46	SHP2ast	
x8	(IL6-gp80-gp130-JAK)_ast2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{14} = \text{vol}(\text{cytosol}) \cdot (\text{kf37} \cdot [\text{x39}] - \text{kr37} \cdot [\text{x8}] \cdot [\text{x46}]) \quad (28)$$

## 6.15 Reaction R16a

This is a reversible reaction of one reactant forming two products.

**Name** IL6-gp80-gp130-JAK SHP2 Grb2 dissociation

### Reaction equation



### Reactant

Table 34: Properties of each reactant.

Id	Name	SBO
x40	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2	

### Products

Table 35: Properties of each product.

Id	Name	SBO
x45	SHP2ast-Grb2	
x8	(IL6-gp80-gp130-JAK)_ast2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{15} = \text{vol}(\text{cytosol}) \cdot (\text{kf39} \cdot [\text{x40}] - \text{kr39} \cdot [\text{x45}] \cdot [\text{x8}]) \quad (30)$$

## 6.16 Reaction R17

This is a reversible reaction of one reactant forming two products.

**Name** IL6-gp80-gp130-JAK-SHP2-Grb2-SOS dissociation



### Reaction equation



### Reactant

Table 36: Properties of each reactant.

Id	Name	SBO
x41	(IL6-gp80-gp130-JAK) <sub>ast2</sub> -SHP2-Grb2	

### Products

Table 37: Properties of each product.

Id	Name	SBO
x44	SHP2 <sub>ast</sub> -Grb2-SOS	
x8	(IL6-gp80-gp130-JAK) <sub>ast2</sub>	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{16} = \text{vol}(\text{cytosol}) \cdot (k_{f32} \cdot [x41] - k_{r32} \cdot [x44] \cdot [x8]) \quad (32)$$

### 6.17 Reaction R18

This is an irreversible reaction of one reactant forming two products.

**Name** PP1-STAT3Cast dissociation

### Reaction equation



### Reactant

Table 38: Properties of each reactant.

Id	Name	SBO
x18	PP1-STAT3Cast	

## Products

Table 39: Properties of each product.

Id	Name	SBO
x17	PP1	
x9	STAT3C	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{17} = \text{vol}(\text{cytosol}) \cdot k_{12} \cdot [\text{x18}] \quad (34)$$

## 6.18 Reaction R19

This is a reversible reaction of two reactants forming one product.

**Name** STAT3C dimerization

## Reaction equation



## Reactants

Table 40: Properties of each reactant.

Id	Name	SBO
x10	STAT3Cast	
x9	STAT3C	

## Product

Table 41: Properties of each product.

Id	Name	SBO
x14	STAT3C-STAT3Cast	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{18} = \text{vol}(\text{cytosol}) \cdot (k_{f13} \cdot [x_9] \cdot [x_{10}] - k_{r13} \cdot [x_{14}]) \quad (36)$$

### 6.19 Reaction R20

This is an irreversible reaction of one reactant forming one product.

**Name** STAT3N transport

#### Reaction equation



#### Reactant

Table 42: Properties of each reactant.

Id	Name	SBO
x22	STAT3N	

#### Product

Table 43: Properties of each product.

Id	Name	SBO
x9	STAT3C	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{19} = \text{vol}(\text{nucleus}) \cdot k_{17} \cdot [x_{22}] \quad (38)$$

### 6.20 Reaction R21

This is a reversible reaction of two reactants forming one product.

**Name** IL6-gp80-gp130-JAK-SOCS2-STAT3C complex formation

#### Reaction equation



#### Reactants

Table 44: Properties of each reactant.

Id	Name	SBO
x30	(IL6-gp80-gp130-JAK)ast2-SOCS3	
x9	STAT3C	

## Product

Table 45: Properties of each product.

Id	Name	SBO
x31	(IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{20} = \text{vol}(\text{cytosol}) \cdot (k_f5 \cdot [x9] \cdot [x30] - k_r5 \cdot [x31]) \quad (40)$$

## 6.21 Reaction R22

This is an irreversible reaction of one reactant forming four products.

**Name** IL6-gp80-gp130-JAK-STAT3C-SOCS3-SHP2 dissociation

## Reaction equation



## Reactant

Table 46: Properties of each reactant.

Id	Name	SBO
x32	(IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3-SHP2	

## Products

Table 47: Properties of each product.

Id	Name	SBO
x29	SOCS3	

Id	Name	SBO
x15	SHP2	
x9	STAT3C	
x7	(IL6-gp80-gp130-JAK)2	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{21} = \text{vol}(\text{cytosol}) \cdot k_{10} \cdot [x_{32}] \quad (42)$$

## 6.22 Reaction R23

This is a reversible reaction of one reactant forming one product.

**Name** STAT3C dimerization

### Reaction equation



### Reactant

Table 48: Properties of each reactant.

Id	Name	SBO
x10	STAT3Cast	

### Product

Table 49: Properties of each product.

Id	Name	SBO
x13	STAT3Cast-STAT3Cast	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{22} = \text{vol}(\text{cytosol}) \cdot (2 \cdot k_{f8} \cdot [x_{10}]^2 - 2 \cdot k_{r8} \cdot [x_{13}]) \quad (44)$$

### 6.23 Reaction R24

This is a reversible reaction of two reactants forming one product.

**Name** IL6-gp80-gp130-JAK STAT3Cast complex formation

#### Reaction equation



#### Reactants

Table 50: Properties of each reactant.

Id	Name	SBO
x17	PP1	
x10	STAT3Cast	

#### Product

Table 51: Properties of each product.

Id	Name	SBO
x18	PP1-STAT3Cast	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{23} = \text{vol}(\text{cytosol}) \cdot (kf11 \cdot [x10] \cdot [x17] - kr11 \cdot [x18]) \quad (46)$$

### 6.24 Reaction R25

This is a reversible reaction of two reactants forming one product.

**Name** PP1-STAT3C dimer complex formation

#### Reaction equation



#### Reactants

Table 52: Properties of each reactant.

Id	Name	SBO
x17	PP1	
x13	STAT3Cast-STAT3Cast	

## Product

Table 53: Properties of each product.

Id	Name	SBO
x19	PP1-STAT3Cast-STAT3Cast	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{24} = \text{vol}(\text{cytosol}) \cdot (k_{f11} \cdot [x13] \cdot [x17] - k_{r11} \cdot [x19]) \quad (48)$$

## 6.25 Reaction R26

This is an irreversible reaction of one reactant forming one product.

**Name** STAT3C dimer phosphorylation

## Reaction equation



## Reactant

Table 54: Properties of each reactant.

Id	Name	SBO
x13	STAT3Cast-STAT3Cast	

## Product

Table 55: Properties of each product.

Id	Name	SBO
x20	STAT3Nast-STAT3Nast	

Id	Name	SBO
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### Kinetic Law

**Derived unit** contains undeclared units

$$v_{25} = \text{vol}(\text{cytosol}) \cdot k_{14} \cdot [x_{13}] \quad (50)$$

### 6.26 Reaction R27

This is an irreversible reaction of one reactant forming two products.

**Name** PP1-STAT3C dimer dissociation

### Reaction equation



### Reactant

Table 56: Properties of each reactant.

Id	Name	SBO
x19	PP1-STAT3Cast-STAT3Cast	

### Products

Table 57: Properties of each product.

Id	Name	SBO
x17	PP1	
x14	STAT3C-STAT3Cast	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{26} = \text{vol}(\text{cytosol}) \cdot k_{12} \cdot [x_{19}] \quad (52)$$

### 6.27 Reaction R28

This is an irreversible reaction of two reactants forming one product.

**Name** Complex formation



### Reaction equation



### Reactants

Table 58: Properties of each reactant.

Id	Name	SBO
x31	(IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3	
x15	SHP2	

### Product

Table 59: Properties of each product.

Id	Name	SBO
x32	(IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3-SHP2	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{27} = \text{vol}(\text{cytosol}) \cdot (\text{kf9} \cdot [x15] \cdot [x31] - \text{kr9} \cdot [x32]) \quad (54)$$

### 6.28 Reaction R29

This is an irreversible reaction of one reactant forming one product.

**Name** SHP2 dephosphorylation

### Reaction equation



### Reactant

Table 60: Properties of each reactant.

Id	Name	SBO
x46	SHP2ast	

## Product

Table 61: Properties of each product.

Id	Name	SBO
x15	SHP2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{28} = \frac{\text{vol}(\text{cytosol}) \cdot V_m \cdot [x46]}{K_m + [x46]} \quad (56)$$

## 6.29 Reaction R30

This is a reversible reaction of one reactant forming one product.

**Name** IL6-gp80-gp130-JAK-SHP2 phosphorylation

## Reaction equation



## Reactant

Table 62: Properties of each reactant.

Id	Name	SBO
x16	(IL6-gp80-gp130-JAK)ast2-JAK	

## Product

Table 63: Properties of each product.

Id	Name	SBO
x39	(IL6-gp80-gp130-JAK)ast2-SHP2ast	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{29} = \text{vol}(\text{cytosol}) \cdot (k_f34 \cdot [x16] - k_r34 \cdot [x39]) \quad (58)$$

6.30 Reaction R31

This is a reversible reaction of one reactant forming one product.

**Name** STAT3N dimer dissociation

Reaction equation



Reactant

Table 64: Properties of each reactant.

Id	Name	SBO
x20	STAT3Nast-STAT3Nast	

Product

Table 65: Properties of each product.

Id	Name	SBO
x21	STAT3Nast	

Kinetic Law

**Derived unit** contains undeclared units

$$v_{30} = \text{vol}(\text{nucleus}) \cdot \left( \text{kr8} \cdot [x20] - \text{kf8} \cdot [x21]^2 \right)$$

(60)

6.31 Reaction R32

This is a reversible reaction of two reactants forming one product.

**Name** PP2-STAT3N dimer complex formation

Reaction equation



Reactants

Table 66: Properties of each reactant.

Id	Name	SBO
x23	PP2	
x20	STAT3Nast-STAT3Nast	

## Product

Table 67: Properties of each product.

Id	Name	SBO
x27	PP2-STAT3Nast-STAT3Nast	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{31} = \text{vol}(\text{nucleus}) \cdot (k_{f15} \cdot [x_{23}] \cdot [x_{20}] - k_{r15} \cdot [x_{27}]) \quad (62)$$

## 6.32 Reaction R33

This is a reversible reaction of two reactants forming one product.

**Name** PP2-STAT3N complex formation

## Reaction equation



## Reactants

Table 68: Properties of each reactant.

Id	Name	SBO
x23	PP2	
x21	STAT3Nast	

## Product

Table 69: Properties of each product.

Id	Name	SBO
x28	PP2-STAT3Nast	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{32} = \text{vol}(\text{nucleus}) \cdot (\text{kf15} \cdot [\text{x23}] \cdot [\text{x21}] - \text{kr15} \cdot [\text{x28}]) \quad (64)$$

**6.33 Reaction R34**

This is a reversible reaction of one reactant forming two products.

**Name** STAT3N dimer dissociation**Reaction equation****Reactant**

Table 70: Properties of each reactant.

Id	Name	SBO
x24	STAT3N-STAT3Nast	

**Products**

Table 71: Properties of each product.

Id	Name	SBO
x22	STAT3N	
x21	STAT3Nast	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{33} = \text{vol}(\text{nucleus}) \cdot (\text{kr13} \cdot [\text{x24}] - \text{kf13} \cdot [\text{x21}] \cdot [\text{x22}]) \quad (66)$$

### 6.34 Reaction R35

This is an irreversible reaction of one reactant forming two products.

**Name** PP2-STAT3N dissociation

#### Reaction equation



#### Reactant

Table 72: Properties of each reactant.

Id	Name	SBO
x28	PP2-STAT3Nast	

#### Products

Table 73: Properties of each product.

Id	Name	SBO
x23	PP2	
x22	STAT3N	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{34} = \text{vol}(\text{nucleus}) \cdot k_{16} \cdot [x28] \quad (68)$$

### 6.35 Reaction R36

This is an irreversible reaction of one reactant forming two products.

**Name** PP2-STAT3N dimer dissociation

#### Reaction equation



#### Reactant

Table 74: Properties of each reactant.

Id	Name	SBO
x27	PP2-STAT3Nast-STAT3Nast	

## Products

Table 75: Properties of each product.

Id	Name	SBO
x24	STAT3N-STAT3Nast	
x23	PP2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{35} = \text{vol}(\text{nucleus}) \cdot k_{16} \cdot [x_{27}] \quad (70)$$

## 6.36 Reaction R37

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

**Name** SOCS3N transcription

## Reaction equation



## Modifier

Table 76: Properties of each modifier.

Id	Name	SBO
x20	STAT3Nast-STAT3Nast	

## Product

Table 77: Properties of each product.

Id	Name	SBO
x25	Mrna-SOCS3N	

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{36} = \text{vol}(\text{nucleus}) \cdot \frac{k_{18a} \cdot [x20]}{k_{18b} + [x20]} \tag{72}$$

**6.37 Reaction R38**

This is an irreversible reaction of one reactant forming one product.

**Name** SOCS3 mRNA translocation

**Reaction equation**



**Reactant**

Table 78: Properties of each reactant.

Id	Name	SBO
x25	Mrna-SOCS3N	

**Product**

Table 79: Properties of each product.

Id	Name	SBO
x26	Mrna-SOCS3C	

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{37} = \text{vol}(\text{nucleus}) \cdot k_{19} \cdot [x25] \tag{74}$$



6.38 Reaction R39

This is an irreversible reaction of one reactant forming no product.

**Name** SOCS3 mRNA degradation

Reaction equation



Reactant

Table 80: Properties of each reactant.

Id	Name	SBO
x26	Mrna-SOCS3C	

Kinetic Law

**Derived unit** contains undeclared units

$$v_{38} = \text{vol}(\text{nucleus}) \cdot k22 \cdot [x26]$$

(76)

6.39 Reaction R40

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

**Name** SOCS3 translation

Reaction equation



Modifier

Table 81: Properties of each modifier.

Id	Name	SBO
x26	Mrna-SOCS3C	

Product

Table 82: Properties of each product.

Id	Name	SBO
x29	SOCS3	

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{39} = \text{vol}(\text{nucleus}) \cdot k_{20} \cdot [x_{26}] \tag{78}$$

**6.40 Reaction R41**

This is an irreversible reaction of one reactant forming no product.

**Name** SOCS3 degradation

**Reaction equation**



**Reactant**

Table 83: Properties of each reactant.

Id	Name	SBO
x29	SOCS3	

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{40} = \text{vol}(\text{cytosol}) \cdot k_{23} \cdot [x_{29}] \tag{80}$$

**6.41 Reaction R42**

This is an irreversible reaction of one reactant forming two products.

**Name** Complex dissociation

**Reaction equation**



**Reactant**

Table 84: Properties of each reactant.

Id	Name	SBO
x32	(IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3-SHP2	

## Products

Table 85: Properties of each product.

Id	Name	SBO
x33	(IL6-gp80-gp130-JAK)ast2-STAT3C-SHP2	
x29	SOCS3	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{41} = \text{vol}(\text{cytosol}) \cdot k_{23} \cdot [x_{32}] \quad (82)$$

## 6.42 Reaction R43

This is a reversible reaction of two reactants forming one product.

**Name** SHP2-Grb2 complex formation

## Reaction equation



## Reactants

Table 86: Properties of each reactant.

Id	Name	SBO
x46	SHP2ast	
x34	Grb2	

## Product

Table 87: Properties of each product.

Id	Name	SBO
x45	SHP2ast-Grb2	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{42} = \text{vol}(\text{cytosol}) \cdot (\text{kf38} \cdot [\text{x34}] \cdot [\text{x46}] - \text{kr38} \cdot [\text{x45}]) \quad (84)$$

#### 6.43 Reaction R44

This is a reversible reaction of one reactant forming two products.

**Name** Grb2-SOS dissociation

#### Reaction equation



#### Reactant

Table 88: Properties of each reactant.

Id	Name	SBO
x38	Grb2-SOS	

#### Products

Table 89: Properties of each product.

Id	Name	SBO
x35	SOS	
x34	Grb2	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{43} = \text{vol}(\text{cytosol}) \cdot (\text{kf35} \cdot [\text{x38}] - \text{kr35} \cdot [\text{x34}] \cdot [\text{x35}]) \quad (86)$$

#### 6.44 Reaction R45

This is a reversible reaction of two reactants forming one product.

**Name** Complex formation

##### Reaction equation



##### Reactants

Table 90: Properties of each reactant.

Id	Name	SBO
x39	(IL6-gp80-gp130-JAK)ast2-SHP2ast	
x34	Grb2	

##### Product

Table 91: Properties of each product.

Id	Name	SBO
x40	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2	

##### Kinetic Law

**Derived unit** contains undeclared units

$$v_{44} = \text{vol}(\text{cytosol}) \cdot (\text{kf24} \cdot [x39] \cdot [x34] - \text{kr24} \cdot [x40]) \quad (88)$$

#### 6.45 Reaction R46

This is a reversible reaction of two reactants forming one product.

**Name** Complex formation

##### Reaction equation



##### Reactants

Table 92: Properties of each reactant.

Id	Name	SBO
x40	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2	
x35	SOS	

## Product

Table 93: Properties of each product.

Id	Name	SBO
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{45} = \text{vol}(\text{cytosol}) \cdot (k_{f25} \cdot [x_{35}] \cdot [x_{40}] - k_{r25} \cdot [x_{41}]) \quad (90)$$

## 6.46 Reaction R47

This is a reversible reaction of two reactants forming one product.

**Name** SHP2Grb2-SOS complex formation

## Reaction equation



## Reactants

Table 94: Properties of each reactant.

Id	Name	SBO
x45	SHP2ast-Grb2	
x35	SOS	

## Product

Table 95: Properties of each product.

Id	Name	SBO
x44	SHP2ast-Grb2-SOS	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{46} = \text{vol}(\text{cytosol}) \cdot (\text{kf40} \cdot [\text{x35}] \cdot [\text{x45}] - \text{kr40} \cdot [\text{x44}]) \quad (92)$$

**6.47 Reaction R48**

This is a reversible reaction of two reactants forming one product.

**Name** Complex formation**Reaction equation****Reactants**

Table 96: Properties of each reactant.

Id	Name	SBO
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	
x36	Ras-GDP	

**Product**

Table 97: Properties of each product.

Id	Name	SBO
x42	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GDP	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{47} = \text{vol}(\text{cytosol}) \cdot (\text{kf26} \cdot [\text{x36}] \cdot [\text{x41}] - \text{kr26} \cdot [\text{x42}]) \quad (94)$$



#### 6.48 Reaction R49

This is a reversible reaction of one reactant forming two products.

**Name** Complex dissociation

#### Reaction equation



#### Reactant

Table 98: Properties of each reactant.

Id	Name	SBO
x43	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GTP	

#### Products

Table 99: Properties of each product.

Id	Name	SBO
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	
x36	Ras-GDP	

#### Kinetic Law

**Derived unit** contains undeclared units

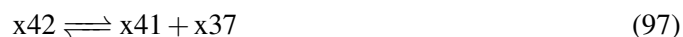
$$v_{48} = \text{vol}(\text{cytosol}) \cdot (\text{kf}31 \cdot [x43] - \text{kr}31 \cdot [x36] \cdot [x41]) \quad (96)$$

#### 6.49 Reaction R50

This is a reversible reaction of one reactant forming two products.

**Name** Complex dissociation

#### Reaction equation



#### Reactant

Table 100: Properties of each reactant.

Id	Name	SBO
x42	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GDP	

## Products

Table 101: Properties of each product.

Id	Name	SBO
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	
x37	Ras-GTP	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{49} = \text{vol}(\text{cytosol}) \cdot (\text{kf27} \cdot [\text{x42}] - \text{kr27} \cdot [\text{x37}] \cdot [\text{x41}]) \quad (98)$$

## 6.50 Reaction R51

This is a reversible reaction of two reactants forming one product.

**Name** Ras-GTP-Raf complex formation

## Reaction equation



## Reactants

Table 102: Properties of each reactant.

Id	Name	SBO
x47	Raf	
x37	Ras-GTP	

## Product

Table 103: Properties of each product.

Id	Name	SBO
x48	Raf-Ras-GTP	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{50} = \text{vol}(\text{cytosol}) \cdot (\text{kf28} \cdot [\text{x37}] \cdot [\text{x47}] - \text{kr28} \cdot [\text{x48}]) \quad (100)$$

**6.51 Reaction R52**

This is a reversible reaction of two reactants forming one product.

**Name** Complex formation**Reaction equation****Reactants**

Table 104: Properties of each reactant.

Id	Name	SBO
x39	(IL6-gp80-gp130-JAK)ast2-SHP2ast	
x38	Grb2-SOS	

**Product**

Table 105: Properties of each product.

Id	Name	SBO
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	

**Kinetic Law****Derived unit** contains undeclared units

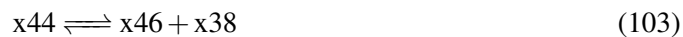
$$v_{51} = \text{vol}(\text{cytosol}) \cdot (\text{kf41} \cdot [\text{x38}] \cdot [\text{x39}] - \text{kr41} \cdot [\text{x41}]) \quad (102)$$

## 6.52 Reaction R53

This is a reversible reaction of one reactant forming two products.

**Name** SHP2-Grb2-SOS dissociation

### Reaction equation



### Reactant

Table 106: Properties of each reactant.

Id	Name	SBO
x44	SHP2ast-Grb2-SOS	

### Products

Table 107: Properties of each product.

Id	Name	SBO
x46	SHP2ast	
x38	Grb2-SOS	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{52} = \text{vol}(\text{cytosol}) \cdot (\text{kf33} \cdot [x44] - \text{kr33} \cdot [x38] \cdot [x46]) \quad (104)$$

## 6.53 Reaction R54

This is a reversible reaction of two reactants forming one product.

**Name** Complex formation

### Reaction equation



### Reactants

Table 108: Properties of each reactant.

Id	Name	SBO
x49	Ras-GTPast	
x41	(IL6-gp80-gp130-JAK)ast2-SHP2-Grb2	

## Product

Table 109: Properties of each product.

Id	Name	SBO
x43	(IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GTP	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{53} = \text{vol}(\text{cytosol}) \cdot (\text{kf30} \cdot [\text{x49}] \cdot [\text{x41}] - \text{kr30} \cdot [\text{x43}]) \quad (106)$$

## 6.54 Reaction R55

This is an irreversible reaction of one reactant forming two products.

**Name** Raf-Phosp1 dissociation

## Reaction equation



## Reactant

Table 110: Properties of each reactant.

Id	Name	SBO
x52	Rafast-Phosp1	

## Products

Table 111: Properties of each product.

Id	Name	SBO
x47	Raf	

Id	Name	SBO
x50	Phosp1	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{54} = \text{vol}(\text{cytosol}) \cdot k_{43} \cdot [x_{52}] \quad (108)$$

### 6.55 Reaction R56

This is a reversible reaction of one reactant forming two products.

**Name** Raf-Ras-GTP dissociation

### Reaction equation



### Reactant

Table 112: Properties of each reactant.

Id	Name	SBO
x48	Raf-Ras-GTP	

### Products

Table 113: Properties of each product.

Id	Name	SBO
x51	Rafast	
x49	Ras-GTPast	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{55} = \text{vol}(\text{cytosol}) \cdot (k_{f29} \cdot [x_{48}] - k_{r29} \cdot [x_{49}] \cdot [x_{51}]) \quad (110)$$

### 6.56 Reaction R57

This is a reversible reaction of two reactants forming one product.

**Name** Raf-Phosp1 complex formation

### Reaction equation



### Reactants

Table 114: Properties of each reactant.

Id	Name	SBO
x51	Rafast	
x50	Phosp1	

### Product

Table 115: Properties of each product.

Id	Name	SBO
x52	Rafast-Phosp1	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{56} = \text{vol}(\text{cytosol}) \cdot (k_{f42} \cdot [x50] \cdot [x51] - k_{r42} \cdot [x52]) \quad (112)$$

## 6.57 Reaction R58

This is a reversible reaction of two reactants forming one product.

**Name** MEK-Raf complex formation

### Reaction equation



### Reactants

Table 116: Properties of each reactant.

Id	Name	SBO
x53	MEK	

Id	Name	SBO
x51	Rafast	

## Product

Table 117: Properties of each product.

Id	Name	SBO
x54	MEK-Rafast	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{57} = \text{vol}(\text{cytosol}) \cdot (\text{kf44} \cdot [\text{x51}] \cdot [\text{x53}] - \text{kr44} \cdot [\text{x54}]) \quad (114)$$

## 6.58 Reaction R59

This is an irreversible reaction of one reactant forming two products.

**Name** MEK-Raf complex dissociation

## Reaction equation



## Reactant

Table 118: Properties of each reactant.

Id	Name	SBO
x54	MEK-Rafast	

## Products

Table 119: Properties of each product.

Id	Name	SBO
x55	MEK-P	
x51	Rafast	



### Kinetic Law

**Derived unit** contains undeclared units

$$v_{58} = \text{vol}(\text{cytosol}) \cdot k_{45} \cdot [x_{54}] \quad (116)$$

### 6.59 Reaction R60

This is a reversible reaction of two reactants forming one product.

**Name** MEK-P-Raf complex formation

### Reaction equation



### Reactants

Table 120: Properties of each reactant.

Id	Name	SBO
x55	MEK-P	
x51	Rafast	

### Product

Table 121: Properties of each product.

Id	Name	SBO
x56	MEK-P-Rafast	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{59} = \text{vol}(\text{cytosol}) \cdot (k_{f46} \cdot [x_{55}] \cdot [x_{51}] - k_{r46} \cdot [x_{56}]) \quad (118)$$

### 6.60 Reaction R61

This is an irreversible reaction of one reactant forming two products.

**Name** MEK-P-Phosp2 dissociation

### Reaction equation



### Reactant

Table 122: Properties of each reactant.

Id	Name	SBO
x60	MEK-P-Phosp2	

### Products

Table 123: Properties of each product.

Id	Name	SBO
x59	Phosp2	
x53	MEK	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{60} = \text{vol}(\text{cytosol}) \cdot k51 \cdot [x60] \quad (120)$$

## 6.61 Reaction R62

This is an irreversible reaction of one reactant forming two products.

**Name** MEK-PP-Phosp2 dissociation

### Reaction equation



### Reactant

Table 124: Properties of each reactant.

Id	Name	SBO
x58	MEK-PP-Phosp2	

## Products

Table 125: Properties of each product.

Id	Name	SBO
x59	Phosp2	
x55	MEK-P	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{61} = \text{vol}(\text{cytosol}) \cdot k_{49} \cdot [\text{x58}] \quad (122)$$

## 6.62 Reaction R63

This is a reversible reaction of two reactants forming one product.

**Name** MEK-P-Phosp2 complex formation

## Reaction equation



## Reactants

Table 126: Properties of each reactant.

Id	Name	SBO
x59	Phosp2	
x55	MEK-P	

## Product

Table 127: Properties of each product.

Id	Name	SBO
x60	MEK-P-Phosp2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{62} = \text{vol}(\text{cytosol}) \cdot (k_{f50} \cdot [x55] \cdot [x59] - k_{r50} \cdot [x60]) \quad (124)$$

### 6.63 Reaction R64

This is an irreversible reaction of one reactant forming two products.

**Name** MEK-P-Raf complex dissociation

#### Reaction equation



#### Reactant

Table 128: Properties of each reactant.

Id	Name	SBO
x56	MEK-P-Rafast	

#### Products

Table 129: Properties of each product.

Id	Name	SBO
x51	Rafast	
x57	MEK-PP	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{63} = \text{vol}(\text{cytosol}) \cdot k_{47} \cdot [x56] \quad (126)$$

### 6.64 Reaction R65

This is a reversible reaction of two reactants forming one product.

**Name** MEK-PP-Phosp2 complex formation

#### Reaction equation



#### Reactants

Table 130: Properties of each reactant.

Id	Name	SBO
x59	Phosp2	
x57	MEK-PP	

## Product

Table 131: Properties of each product.

Id	Name	SBO
x58	MEK-PP-Phosp2	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{64} = \text{vol}(\text{cytosol}) \cdot (kf48 \cdot [x57] \cdot [x59] - kr48 \cdot [x58]) \quad (128)$$

## 6.65 Reaction R66

This is a reversible reaction of two reactants forming one product.

**Name** ERK-MEK-PP complex formation

## Reaction equation



## Reactants

Table 132: Properties of each reactant.

Id	Name	SBO
x61	ERK	
x57	MEK-PP	

## Product

Table 133: Properties of each product.

Id	Name	SBO
x62	ERK-MEK-PP	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{65} = \text{vol}(\text{cytosol}) \cdot (k_{f52} \cdot [x57] \cdot [x61] - k_{r52} \cdot [x62]) \quad (130)$$

### 6.66 Reaction R67

This is an irreversible reaction of one reactant forming two products.

**Name** ERK-MEK-PP complex dissociation

### Reaction equation



### Reactant

Table 134: Properties of each reactant.

Id	Name	SBO
x62	ERK-MEK-PP	

### Products

Table 135: Properties of each product.

Id	Name	SBO
x63	ERK-P	
x57	MEK-PP	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{66} = \text{vol}(\text{cytosol}) \cdot k_{53} \cdot [x62] \quad (132)$$

### 6.67 Reaction R68

This is a reversible reaction of one reactant forming two products.

**Name** ERK-P-MEK-PP complex dissociation

#### Reaction equation



#### Reactant

Table 136: Properties of each reactant.

Id	Name	SBO
x64	ERK-P-MEK-PP	

#### Products

Table 137: Properties of each product.

Id	Name	SBO
x63	ERK-P	
x57	MEK-PP	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{67} = \text{vol}(\text{cytosol}) \cdot (\text{kr54} \cdot [x64] - \text{kf54} \cdot [x57] \cdot [x63]) \quad (134)$$

### 6.68 Reaction R69

This is an irreversible reaction of one reactant forming two products.

**Name** ERK-PP formation

#### Reaction equation



#### Reactant

Table 138: Properties of each reactant.

Id	Name	SBO
x64	ERK-P-MEK-PP	

## Products

Table 139: Properties of each product.

Id	Name	SBO
x65	ERK-PP	
x57	MEK-PP	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{68} = \text{vol}(\text{cytosol}) \cdot k_{55} \cdot [x_{64}] \quad (136)$$

## 6.69 Reaction R70

This is an irreversible reaction of one reactant forming two products.

**Name** ERK-P-Phosp3 complex dissociation

## Reaction equation



## Reactant

Table 140: Properties of each reactant.

Id	Name	SBO
x68	ERK-P-Phosp3	

## Products

Table 141: Properties of each product.

Id	Name	SBO
x66	Phosp3	



Id	Name	SBO
x61	ERK	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{69} = \text{vol}(\text{cytosol}) \cdot k_{59} \cdot [x_{68}] \quad (138)$$

### 6.70 Reaction R71

This is an irreversible reaction of one reactant forming two products.

**Name** ERK-PP-Phosp3 dissociation

### Reaction equation



### Reactant

Table 142: Properties of each reactant.

Id	Name	SBO
x67	ERK-PP-Phosp3	

### Products

Table 143: Properties of each product.

Id	Name	SBO
x66	Phosp3	
x63	ERK-P	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{70} = \text{vol}(\text{cytosol}) \cdot k_{57} \cdot [x_{67}] \quad (140)$$

### 6.71 Reaction R72

This is a reversible reaction of two reactants forming one product.

**Name** ERK-P-Phosp3 formation

### Reaction equation



### Reactants

Table 144: Properties of each reactant.

Id	Name	SBO
x66	Phosp3	
x63	ERK-P	

### Product

Table 145: Properties of each product.

Id	Name	SBO
x68	ERK-P-Phosp3	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{71} = \text{vol}(\text{cytosol}) \cdot (k_{f58} \cdot [x63] \cdot [x66] - k_{r58} \cdot [x68]) \quad (142)$$

## 6.72 Reaction R73

This is a reversible reaction of two reactants forming one product.

**Name** ERK-PP-Phosp3 formation

### Reaction equation



### Reactants

Table 146: Properties of each reactant.

Id	Name	SBO
x66	Phosp3	

Id	Name	SBO
x65	ERK-PP	

## Product

Table 147: Properties of each product.

Id	Name	SBO
x67	ERK-PP-Phosp3	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{72} = \text{vol}(\text{cytosol}) \cdot (\text{kf56} \cdot [\text{x65}] \cdot [\text{x66}] - \text{kr56} \cdot [\text{x67}]) \quad (144)$$

## 7 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each species.

Identifiers for kinetic laws highlighted in gray cannot be verified to evaluate to units of SBML substance per time. As a result, some SBML interpreters may not be able to verify the consistency of the units on quantities in the model. Please check if

- parameters without an unit definition are involved or
- volume correction is necessary because the `hasOnlySubstanceUnits` flag may be set to `false` and `spacialDimensions`  $> 0$  for certain species.

### 7.1 Species x1

**Name** gp80

**Initial concentration**  $8 \text{ nmol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a modifier in [R1](#)), which does not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{d}{dt}x1 = 0 \quad (145)$$

## 7.2 Species x2

**Name** IL6-gp80

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R2 and as a product in R1, R3).

$$\frac{d}{dt}x2 = v_1 + v_3 - v_2 \quad (146)$$

## 7.3 Species x6

**Name** IL6-gp80-gp130-JAK

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R3, R7 and as a product in R8).

$$\frac{d}{dt}x6 = 2 v_6 - v_3 - 2 v_5 \quad (147)$$

## 7.4 Species x5

**Name** gp130-JAK

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a product in R3, R5).

$$\frac{d}{dt}x5 = v_3 + v_4 \quad (148)$$

## 7.5 Species x7

**Name** (IL6-gp80-gp130-JAK)<sub>2</sub>

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in five reactions (as a reactant in R8, R9 and as a product in R7, R10, R22).

$$\frac{d}{dt}x7 = v_5 + v_8 + v_{21} - v_6 - v_7 \quad (149)$$

## 7.6 Species x8

**Name** (IL6-gp80-gp130-JAK)<sub>ast2</sub>

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in nine reactions (as a reactant in R11, R13, R14, R15 and as a product in R9, R12, R16, R16a, R17).

$$\frac{d}{dt}x8 = v_7 + v_{10} + v_{14} + v_{15} + v_{16} - v_9 - v_{11} - v_{12} - v_{13} \quad (150)$$

### 7.7 Species x16

**Name** (IL6-gp80-gp130-JAK)ast2-JAK

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R10, R30 and as a product in R14).

$$\frac{d}{dt}x_{16} = v_{12} - v_8 - v_{29} \quad (151)$$

### 7.8 Species x15

**Name** SHP2

**Initial concentration** 100 nmol · l<sup>-1</sup>

This species takes part in five reactions (as a reactant in R14, R28 and as a product in R10, R22, R29).

$$\frac{d}{dt}x_{15} = v_8 + v_{21} + v_{28} - v_{12} - v_{27} \quad (152)$$

### 7.9 Species x9

**Name** STAT3C

**Initial concentration** 1000 nmol · l<sup>-1</sup>

This species takes part in six reactions (as a reactant in R11, R19, R21 and as a product in R18, R20, R22).

$$\frac{d}{dt}x_9 = v_{17} + v_{19} + v_{21} - v_9 - v_{18} - v_{20} \quad (153)$$

### 7.10 Species x11

**Name** (IL6-gp80-gp130-JAK)ast2-STAT3C

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R12 and as a product in R11).

$$\frac{d}{dt}x_{11} = v_9 - v_{10} \quad (154)$$

### 7.11 Species x10

**Name** STAT3Cast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in five reactions (as a reactant in [R13](#), [R19](#), [R23](#), [R24](#) and as a product in [R12](#)).

$$\frac{d}{dt}x_{10} = v_{10} - v_{11} - v_{18} - v_{22} - v_{23} \quad (155)$$

### 7.12 Species x12

**Name** (IL6-gp80-gp130-JAK)ast2-STAT3Cast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in one reaction (as a product in [R13](#)).

$$\frac{d}{dt}x_{12} = v_{11} \quad (156)$$

### 7.13 Species x29

**Name** SOCS3

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in five reactions (as a reactant in [R15](#), [R41](#) and as a product in [R22](#), [R40](#), [R42](#)).

$$\frac{d}{dt}x_{29} = v_{21} + v_{39} + v_{41} - v_{13} - v_{40} \quad (157)$$

### 7.14 Species x30

**Name** (IL6-gp80-gp130-JAK)ast2-SOCS3

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in [R21](#) and as a product in [R15](#)).

$$\frac{d}{dt}x_{30} = v_{13} - v_{20} \quad (158)$$

### 7.15 Species x39

**Name** (IL6-gp80-gp130-JAK)ast2-SHP2ast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in [R16](#), [R45](#), [R52](#) and as a product in [R30](#)).

$$\frac{d}{dt}x_{39} = v_{29} - v_{14} - v_{44} - v_{51} \quad (159)$$

### 7.16 Species x46

**Name** SHP2ast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in [R29](#), [R43](#) and as a product in [R16](#), [R53](#)).

$$\frac{d}{dt}x_{46} = v_{14} + v_{52} - v_{28} - v_{42} \quad (160)$$

### 7.17 Species x40

**Name** (IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in [R16a](#), [R46](#) and as a product in [R45](#)).

$$\frac{d}{dt}x_{40} = v_{44} - v_{15} - v_{45} \quad (161)$$

### 7.18 Species x45

**Name** SHP2ast-Grb2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in [R47](#) and as a product in [R16a](#), [R43](#)).

$$\frac{d}{dt}x_{45} = v_{15} + v_{42} - v_{46} \quad (162)$$

### 7.19 Species x41

**Name** (IL6-gp80-gp130-JAK)ast2-SHP2-Grb2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in seven reactions (as a reactant in [R17](#), [R48](#), [R54](#) and as a product in [R46](#), [R49](#), [R50](#), [R52](#)).

$$\frac{d}{dt}x_{41} = v_{45} + v_{48} + v_{49} + v_{51} - v_{16} - v_{47} - v_{53} \quad (163)$$

## 7.20 Species x44

**Name** SHP2ast-Grb2-SOS

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R53 and as a product in R17, R47).

$$\frac{d}{dt}x44 = v_{16} + v_{46} - v_{52} \quad (164)$$

## 7.21 Species x18

**Name** PP1-STAT3Cast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R18 and as a product in R24).

$$\frac{d}{dt}x18 = v_{23} - v_{17} \quad (165)$$

## 7.22 Species x17

**Name** PP1

**Initial concentration** 50 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R24, R25 and as a product in R18, R27).

$$\frac{d}{dt}x17 = v_{17} + v_{26} - v_{23} - v_{24} \quad (166)$$

## 7.23 Species x14

**Name** STAT3C-STAT3Cast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a product in R19, R27).

$$\frac{d}{dt}x14 = v_{18} + v_{26} \quad (167)$$

## 7.24 Species x22

**Name** STAT3N

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R20 and as a product in R34, R35).

$$\frac{d}{dt}x22 = v_{33} + v_{34} - v_{19} \quad (168)$$



### 7.25 Species x32

**Name** (IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3-SHP2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R22, R42 and as a product in R28).

$$\frac{d}{dt}x_{32} = v_{27} - v_{21} - v_{41} \quad (169)$$

### 7.26 Species x13

**Name** STAT3Cast-STAT3Cast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R25, R26 and as a product in R23).

$$\frac{d}{dt}x_{13} = 0.5 v_{22} - v_{24} - v_{25} \quad (170)$$

### 7.27 Species x20

**Name** STAT3Nast-STAT3Nast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R31, R32 and as a product in R26 and as a modifier in R37).

$$\frac{d}{dt}x_{20} = v_{25} - v_{30} - v_{31} \quad (171)$$

### 7.28 Species x21

**Name** STAT3Nast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R33 and as a product in R31, R34).

$$\frac{d}{dt}x_{21} = 2 v_{30} + v_{33} - v_{32} \quad (172)$$

### 7.29 Species x23

**Name** PP2

**Initial concentration** 60 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R32, R33 and as a product in R35, R36).

$$\frac{d}{dt}x_{23} = v_{34} + v_{35} - v_{31} - v_{32} \quad (173)$$

### 7.30 Species x27

**Name** PP2-STAT3Nast-STAT3Nast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R36 and as a product in R32).

$$\frac{d}{dt}x_{27} = v_{31} - v_{35} \quad (174)$$

### 7.31 Species x24

**Name** STAT3N-STAT3Nast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R34 and as a product in R36).

$$\frac{d}{dt}x_{24} = v_{35} - v_{33} \quad (175)$$

### 7.32 Species x25

**Name** Mrna-SOCS3N

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R38 and as a product in R37).

$$\frac{d}{dt}x_{25} = v_{36} - v_{37} \quad (176)$$

### 7.33 Species x34

**Name** Grb2

**Initial concentration** 85 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R43, R45 and as a product in R44).

$$\frac{d}{dt}x_{34} = v_{43} - v_{42} - v_{44} \quad (177)$$

### 7.34 Species x36

**Name** Ras-GDP

**Initial concentration** 19000 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R48 and as a product in R49).

$$\frac{d}{dt}x_{36} = v_{48} - v_{47} \quad (178)$$

### 7.35 Species x42

**Name** (IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GDP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R50 and as a product in R48).

$$\frac{d}{dt}x_{42} = v_{47} - v_{49} \quad (179)$$

### 7.36 Species x37

**Name** Ras-GTP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R51 and as a product in R50).

$$\frac{d}{dt}x_{37} = v_{49} - v_{50} \quad (180)$$

### 7.37 Species x47

**Name** Raf

**Initial concentration** 67 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R51 and as a product in R55).

$$\frac{d}{dt}x_{47} = v_{54} - v_{50} \quad (181)$$

### 7.38 Species x48

**Name** Raf-Ras-GTP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R56 and as a product in R51).

$$\frac{d}{dt}x_{48} = v_{50} - v_{55} \quad (182)$$

### 7.39 Species x52

**Name** Rafast-Phosp1

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R55 and as a product in R57).

$$\frac{d}{dt}x_{52} = v_{56} - v_{54} \quad (183)$$

#### 7.40 Species x51

**Name** Rafast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in six reactions (as a reactant in R57, R58, R60 and as a product in R56, R59, R64).

$$\frac{d}{dt}x51 = v55 + v58 + v63 - v56 - v57 - v59 \quad (184)$$

#### 7.41 Species x50

**Name** Phosp1

**Initial concentration** 67 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R57 and as a product in R55).

$$\frac{d}{dt}x50 = v54 - v56 \quad (185)$$

#### 7.42 Species x53

**Name** MEK

**Initial concentration** 41667 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R58 and as a product in R61).

$$\frac{d}{dt}x53 = v60 - v57 \quad (186)$$

#### 7.43 Species x54

**Name** MEK-Rafast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R59 and as a product in R58).

$$\frac{d}{dt}x54 = v57 - v58 \quad (187)$$

#### 7.44 Species x55

**Name** MEK-P

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R60, R63 and as a product in R59, R62).

$$\frac{d}{dt}x55 = v58 + v61 - v59 - v62 \quad (188)$$

#### 7.45 Species x60

**Name** MEK-P-Phosp2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R61 and as a product in R63).

$$\frac{d}{dt}x_{60} = v_{62} - v_{60} \quad (189)$$

#### 7.46 Species x59

**Name** Phosp2

**Initial concentration** 67 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R63, R65 and as a product in R61, R62).

$$\frac{d}{dt}x_{59} = v_{60} + v_{61} - v_{62} - v_{64} \quad (190)$$

#### 7.47 Species x57

**Name** MEK-PP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in six reactions (as a reactant in R65, R66 and as a product in R64, R67, R68, R69).

$$\frac{d}{dt}x_{57} = v_{63} + v_{66} + v_{67} + v_{68} - v_{64} - v_{65} \quad (191)$$

#### 7.48 Species x61

**Name** ERK

**Initial concentration** 35000 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R66 and as a product in R70).

$$\frac{d}{dt}x_{61} = v_{69} - v_{65} \quad (192)$$

#### 7.49 Species x62

**Name** ERK-MEK-PP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R67 and as a product in R66).

$$\frac{d}{dt}x_{62} = v_{65} - v_{66} \quad (193)$$

### 7.50 Species x63

**Name** ERK-P

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R72 and as a product in R67, R68, R71).

$$\frac{d}{dt}x_{63} = v_{66} + v_{67} + v_{70} - v_{71} \quad (194)$$

### 7.51 Species x65

**Name** ERK-PP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R73 and as a product in R69).

$$\frac{d}{dt}x_{65} = v_{68} - v_{72} \quad (195)$$

### 7.52 Species x68

**Name** ERK-P-Phosp3

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R70 and as a product in R72).

$$\frac{d}{dt}x_{68} = v_{71} - v_{69} \quad (196)$$

### 7.53 Species x35

**Name** SOS

**Initial concentration** 34 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R46, R47 and as a product in R44).

$$\frac{d}{dt}x_{35} = v_{43} - v_{45} - v_{46} \quad (197)$$

### 7.54 Species x28

**Name** PP2-STAT3Nast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R35 and as a product in R33).

$$\frac{d}{dt}x_{28} = v_{32} - v_{34} \quad (198)$$

### 7.55 Species x31

**Name** (IL6-gp80-gp130-JAK)ast2-STAT3C-SOCS3

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R28 and as a product in R21).

$$\frac{d}{dt}x_{31} = v_{20} - v_{27} \quad (199)$$

### 7.56 Species x56

**Name** MEK-P-Rafast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R64 and as a product in R60).

$$\frac{d}{dt}x_{56} = v_{59} - v_{63} \quad (200)$$

### 7.57 Species x43

**Name** (IL6-gp80-gp130-JAK)ast2-SHP2ast-Grb2-SOS-Ras-GTP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R49 and as a product in R54).

$$\frac{d}{dt}x_{43} = v_{53} - v_{48} \quad (201)$$

### 7.58 Species x3

**Name** gp130

**Initial concentration** 0.8 nmol · l<sup>-1</sup>

This species takes part in one reaction (as a modifier in R5), which does not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{d}{dt}x_3 = 0 \quad (202)$$

### 7.59 Species x58

**Name** MEK-PP-Phosp2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R62 and as a product in R65).

$$\frac{d}{dt}x_{58} = v_{64} - v_{61} \quad (203)$$

### 7.60 Species x4

**Name** JAK

**Initial concentration** 12 nmol · l<sup>-1</sup>

This species takes part in one reaction (as a reactant in R5).

$$\frac{d}{dt}x_4 = -v_4 \quad (204)$$

### 7.61 Species x26

**Name** Mrna-SOCS3C

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R39 and as a product in R38 and as a modifier in R40).

$$\frac{d}{dt}x_{26} = v_{37} - v_{38} \quad (205)$$

### 7.62 Species x49

**Name** Ras-GTPast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R54 and as a product in R56).

$$\frac{d}{dt}x_{49} = v_{55} - v_{53} \quad (206)$$

### 7.63 Species x33

**Name** (IL6-gp80-gp130-JAK)ast2-STAT3C-SHP2

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in one reaction (as a product in R42).

$$\frac{d}{dt}x_{33} = v_{41} \quad (207)$$

### 7.64 Species x64

**Name** ERK-P-MEK-PP

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R68, R69).

$$\frac{d}{dt}x_{64} = -v_{67} - v_{68} \quad (208)$$



### 7.65 Species x19

**Name** PP1-STAT3Cast-STAT3Cast

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R27 and as a product in R25).

$$\frac{d}{dt}x_{19} = v_{24} - v_{26} \quad (209)$$

### 7.66 Species x38

**Name** Grb2-SOS

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R44, R52 and as a product in R53).

$$\frac{d}{dt}x_{38} = v_{52} - v_{43} - v_{51} \quad (210)$$

### 7.67 Species x66

**Name** Phosp3

**Initial concentration** 16667 nmol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R72, R73 and as a product in R70, R71).

$$\frac{d}{dt}x_{66} = v_{69} + v_{70} - v_{71} - v_{72} \quad (211)$$

### 7.68 Species x67

**Name** ERK-PP-Phosp3

**Initial concentration** 0 nmol · l<sup>-1</sup>

This species takes part in two reactions (as a reactant in R71 and as a product in R73).

$$\frac{d}{dt}x_{67} = v_{72} - v_{70} \quad (212)$$

SBML<sup>2</sup>TeX was developed by Andreas Dräger<sup>a</sup>, Hannes Planatscher<sup>a</sup>, Dieudonné M Wouamba<sup>a</sup>, Adrian Schröder<sup>a</sup>, Michael Hucka<sup>b</sup>, Lukas Endler<sup>c</sup>, Martin Golebiewski<sup>d</sup> and Andreas Zell<sup>a</sup>. Please see <http://www.ra.cs.uni-tuebingen.de/software/SBML2LaTeX> for more information.

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