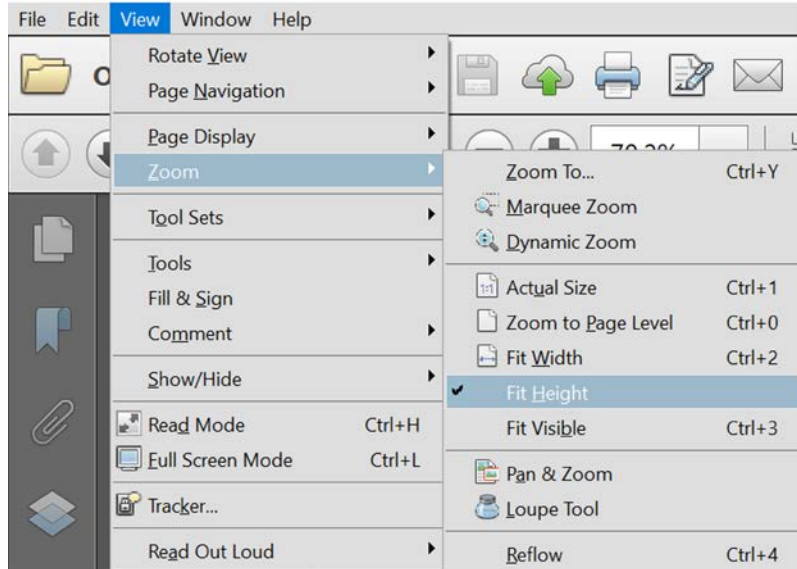


# Prism 8 curve fitting to rise-and-fall to baseline exponential equation with baseline drift



“Fit height” enables page flipping in PDF viewer

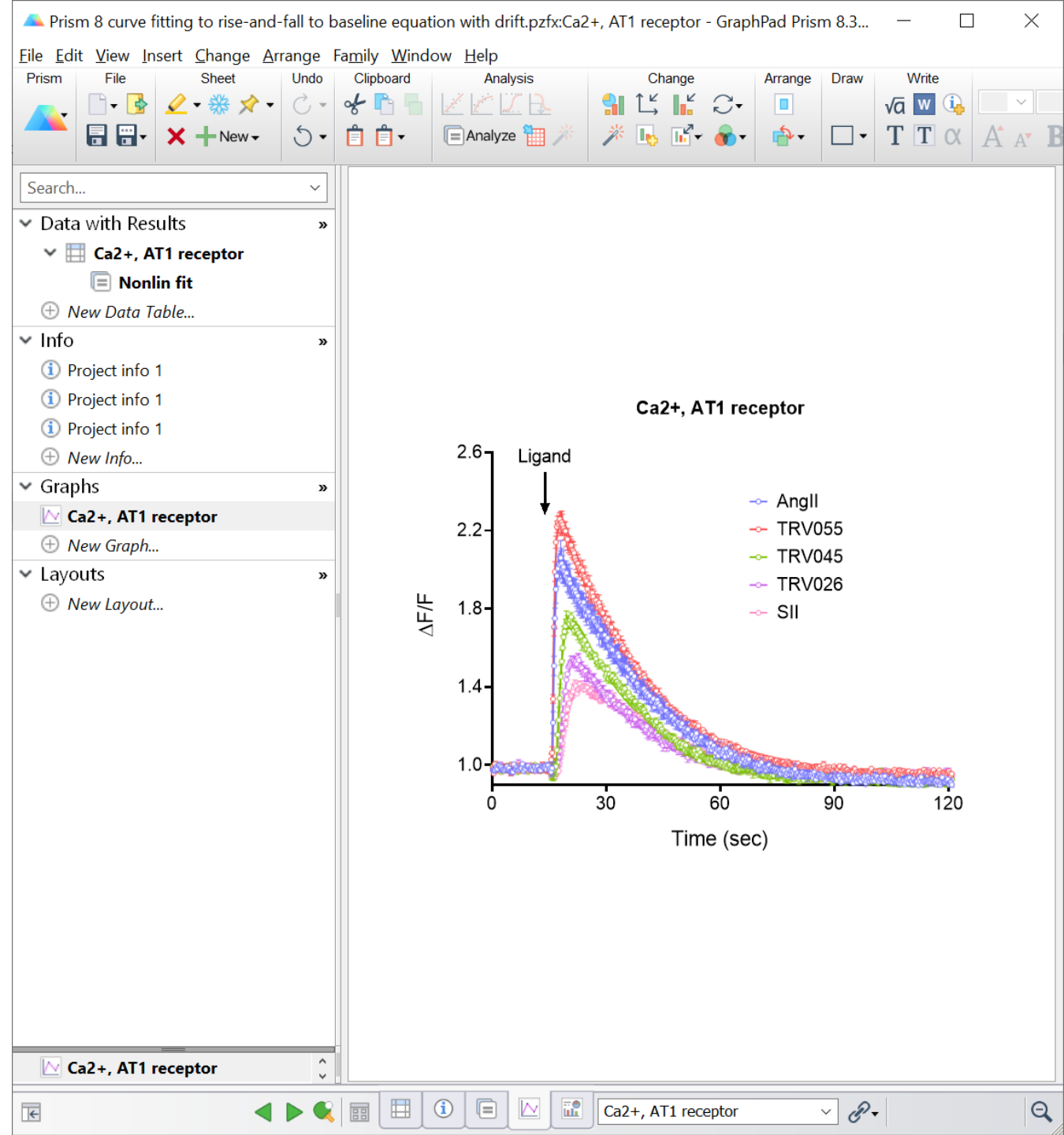
Here we are going to fit biosensor time course data to the rise-and-fall to baseline equation.

In this example there is baseline drift, i.e. the baseline falls slightly over time. This is handled using a modified equation.

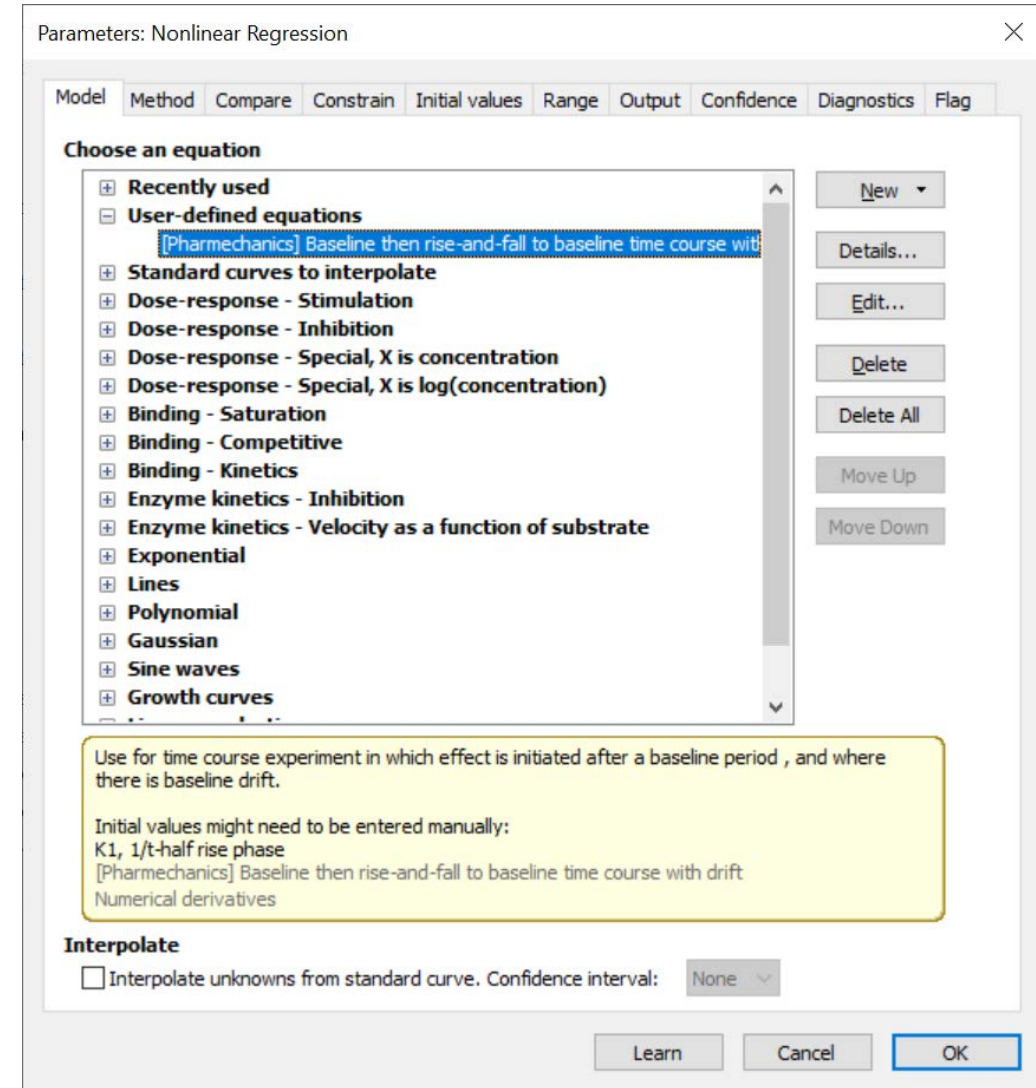
The curve-fitting program is Prism 8, from GraphPad Software, Inc.

<https://www.graphpad.com/scientific-software/prism/>

The example will use is Ca<sup>2+</sup> mobilization via the AT1 receptor, by five ligands – AngII and four synthetic ligands. A maximally-stimulating concentration was used (32  $\mu$ M).



- First we need to load the equation.
- The rise-and-fall equation with drift is not a built-in equation in Prism.
- Instead it is loaded as a User-defined equation.
- This can be done easily from a template.
- This is shown starting on [page 21](#).
- The equation is called: “[Pharmechanics] Baseline then rise-and-fall to baseline with drift”



Enter data into Prism data table

## Notes

If you have technical replicates, enter each replicate, rather than just the mean.

Prism 8 curve fitting to rise-and-fall to baseline equation with drift.pzf:Ca2+, AT1 receptor - GraphPad Prism 8.3...

File Edit View Insert Change Arrange Family Window Help

Prism File Sheet Undo Clipboard Analysis Change Import Draw Write

Search...

▼ Data with Results

- Ca2+, AT1 receptor
- + New Data Table...

▼ Info

- Project info 1
- Project info 1
- Project info 1
- + New Info...

▼ Graphs

- Ca2+, AT1 receptor
- + New Graph...

▼ Layouts

- + New Layout...

X	Group A			Group B			Group C			
	Time (sec)	Angll			TRV055			TRV045		
X	A:Y1	A:Y2	A:Y3	B:Y1	B:Y2	B:Y3	C:Y1	C:Y2	C:Y3	
1	0.00	1.0092	1.0069	0.9589	1.0310	0.9871	0.9799	1.0261	1.0128	0.9865
2	0.25	0.9839	0.9909	1.0094	0.9800	0.9776	0.9633	1.0060	0.9735	0.9857
3	0.50	0.9962	1.0047	0.9689	1.0188	1.0200	1.0233	1.0006	0.9923	1.0032
4	0.75	1.0086	0.9785	1.0031	0.9993	0.9819	1.0213	1.0135	1.0048	1.0441
5	1.00	0.9880	1.0149	1.0208	0.9996	0.9765	1.0163	0.9996	1.0242	0.9795
6	1.25	0.9745	1.0258	0.9924	0.9771	1.0083	0.9998	1.0079	1.0071	0.9928
7	1.50	1.0387	1.0128	0.9928	1.0048	1.0080	0.9912	0.9929	1.0155	0.9982
8	1.75	1.0008	1.0338	1.0048	1.0304	1.0069	0.9801	0.9910	0.9984	0.9892
9	2.00	1.0011	1.0300	0.9770	0.9984	1.0166	0.9871	0.9773	0.9846	0.9847
10	2.25	0.9997	1.0185	1.0001	1.0062	1.0272	0.9855	1.0044	1.0017	1.0065
11	2.50	0.9789	0.9807	1.0221	1.0104	0.9758	1.0007	0.9679	0.9937	1.0002
12	2.75	1.0141	0.9956	0.9754	1.0114	0.9984	0.9898	1.0184	1.0067	0.9793
13	3.00	1.0000	0.9779	0.9892	1.0189	0.9883	1.0025	0.9895	1.0292	1.0035
14	3.25	1.0059	0.9731	1.0069	1.0211	0.9897	0.9761	1.0033	1.0080	1.0074
15	3.50	0.9995	1.0000	1.0124	1.0269	0.9746	1.0118	1.0105	0.9883	1.0327
16	3.75	0.9939	1.0192	1.0139	0.9904	0.9993	0.9964	0.9744	1.0225	0.9869
17	4.00	1.0086	0.9954	0.9772	0.9951	0.9747	1.0130	0.9915	0.9814	0.9970
18	4.25	1.0142	0.9742	1.0089	0.9895	1.0113	1.0169	0.9951	1.0023	0.9850
19	4.50	0.9794	0.9770	0.9953	0.9758	1.0042	1.0160	0.9934	0.9943	1.0101
20	4.75	0.9749	0.9752	0.9954	0.9472	1.0008	0.9827	1.0115	1.0289	1.0094
21	5.00	0.9653	0.9684	1.0166	1.0188	1.0171	1.0117	1.0284	1.0048	1.0030
22	5.25	0.9811	0.9783	0.9857	1.0102	1.0002	0.9962	0.9902	1.0190	0.9972
23	5.50	1.0362	1.0106	1.0134	0.9953	0.9962	1.0270	1.0116	1.0259	0.9779
24	5.75	0.9987	0.9953	0.9943	1.0119	1.0281	0.9917	1.0008	1.0274	1.0114
25	6.00	0.9923	1.0113	0.9848	0.9915	1.0172	0.9847	0.9955	1.0102	1.0076
26	6.25	1.0075	1.0160	0.9941	0.9864	0.9889	1.0144	0.9976	1.0039	1.0139
27	6.50	0.9970	0.9864	0.9949	0.9917	1.0195	0.9722	0.9975	0.9607	0.9836
28	6.75	1.0201	0.9959	0.9843	0.9650	1.0087	0.9854	0.9913	0.9954	0.9805
29	7.00	0.9964	0.9813	1.0057	1.0073	0.9920	1.0395	0.9989	0.9762	1.0038
30	7.25	0.9824	1.0008	1.0200	1.0061	1.0241	0.9874	1.0018	1.0124	1.0143
31	7.50	1.0004	1.0124	0.9838	1.0082	1.0023	1.0056	0.9777	0.9978	0.9881
32	7.75	1.0272	1.0254	1.0111	0.9966	0.9840	1.0108	1.0017	0.9890	0.9822
33	8.00	0.9869	0.9931	0.9802	1.0129	1.0084	1.0148	1.0025	0.9897	0.9990
34	8.25	0.9962	0.9917	1.0098	1.0017	0.9764	1.0101	0.9872	0.9991	0.9941
35	8.50	0.9922	0.9896	1.0067	0.9869	0.9975	1.0088	1.0160	1.0068	1.0068
36	8.75	1.0159	0.9959	1.0181	1.0269	0.9876	1.0177	1.0066	1.0075	1.0059
37	9.00	0.9998	1.0367	0.9967	1.0119	0.9906	1.0257	0.9820	1.0093	1.0019
38	9.25	1.0258	0.9871	1.0217	0.9955	0.9926	0.9765	0.9804	0.9845	0.9805
39	9.50	0.9856	0.9997	1.0038	0.9992	1.0095	0.9888	1.0067	0.9839	1.0002
40	9.75	0.9989	0.9854	0.9945	0.9965	1.0291	1.0103	1.0125	0.9805	1.0147
41	10.00	1.0015	0.9863	0.9958	1.0120	0.9998	0.9771	0.9850	1.0035	0.9800
42	10.25	1.0152	1.0032	1.0014	0.9813	1.0287	1.0132	1.0269	1.0041	0.9888
43	10.50	0.9861	1.0014	0.9873	1.0120	0.9966	1.0193	0.9879	0.9686	1.0284
44	10.75	0.9859	1.0179	1.0244	1.0004	0.9881	0.9981	0.9830	1.0195	0.9838

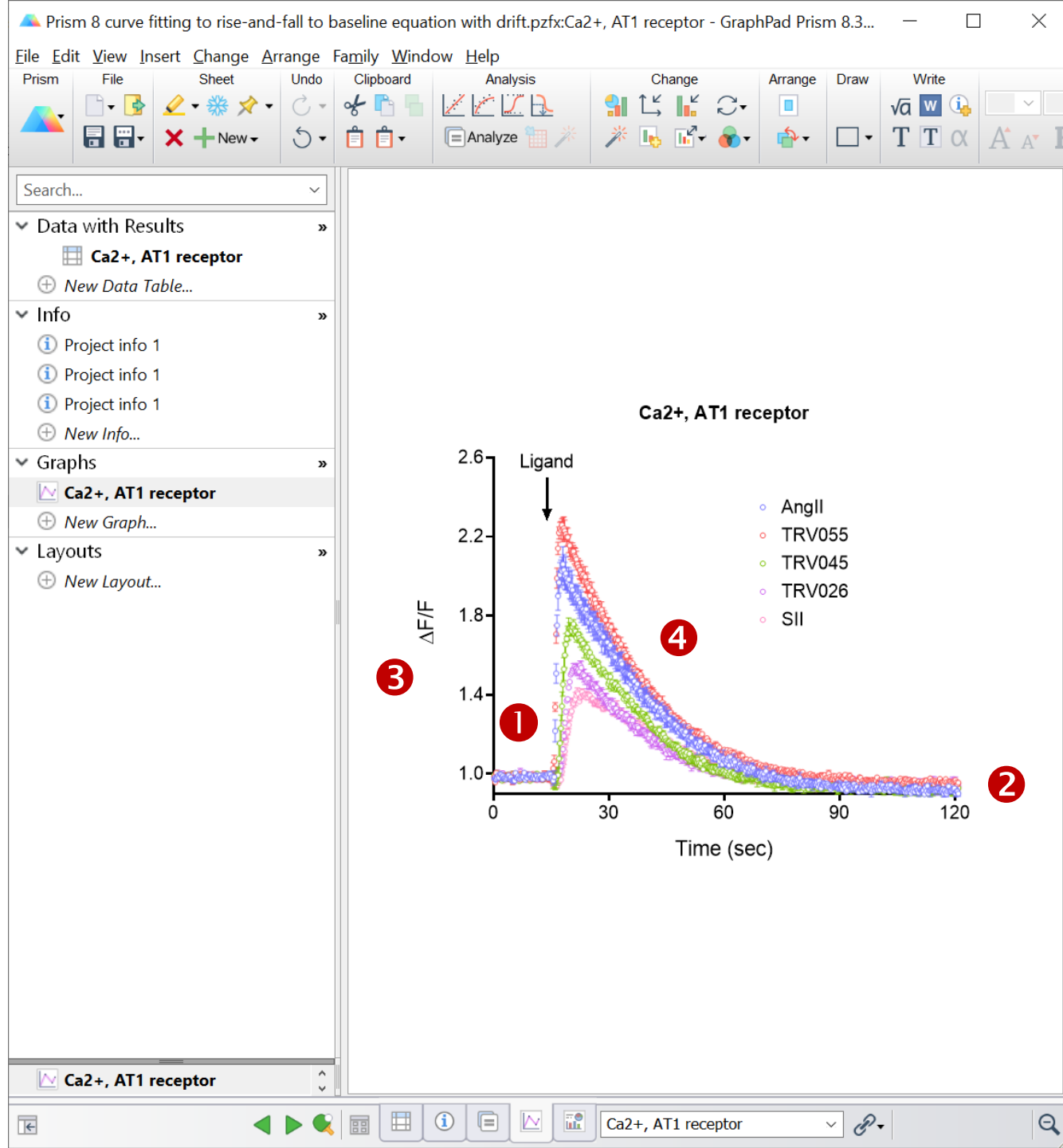
Ca2+, AT1 receptor

Row 8

Here is the graph of the data.

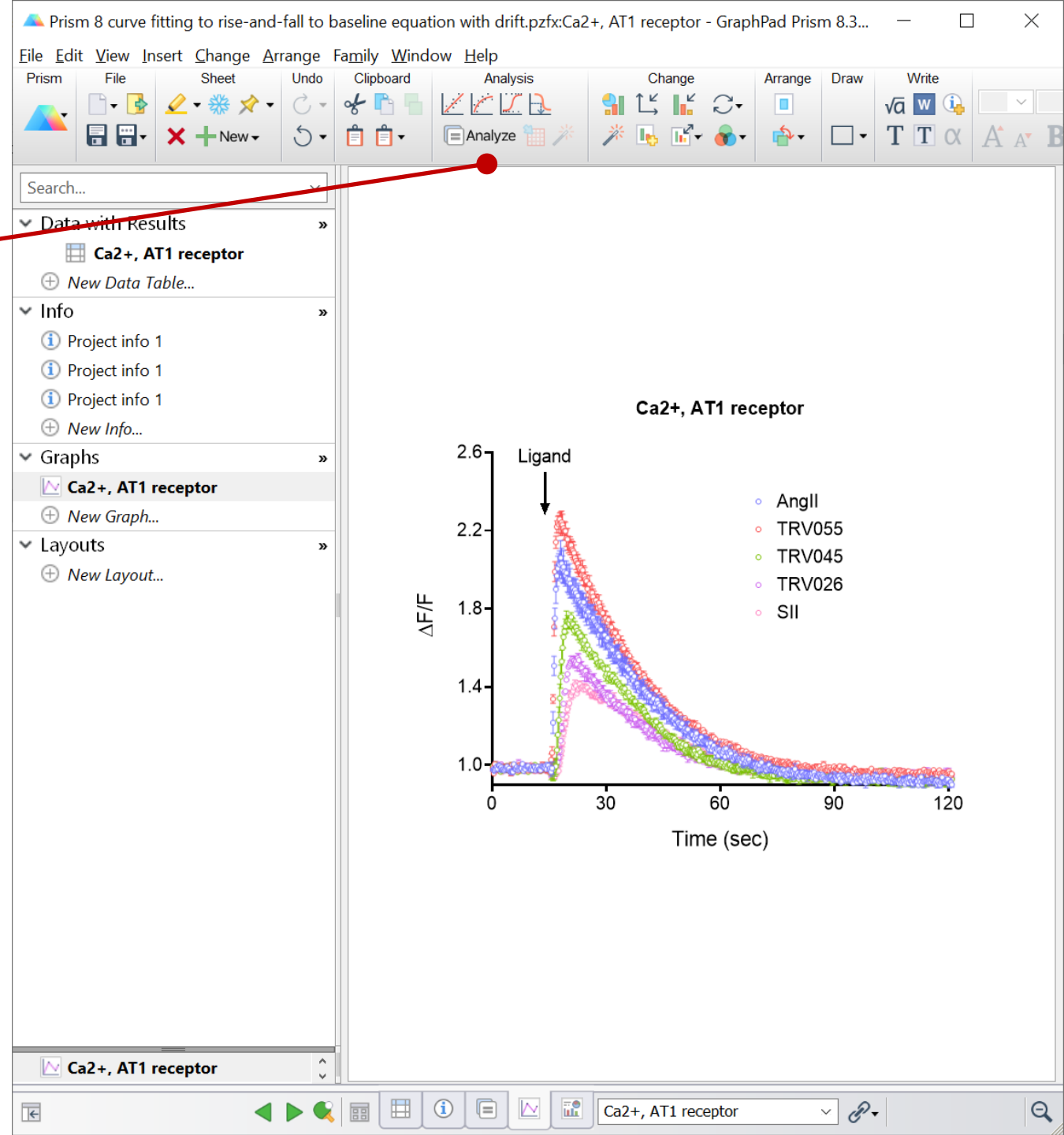
## Notes

1. Lead-in phase before addition of ligand, where we are measuring the baseline signal.
2. Response at the end is slightly lower than response at the beginning. This indicates the baseline has drifted downwards.
3. Data are expressed as  $\Delta F / F$ . This is the fluorescence intensity after ligand addition divided by the average baseline fluorescence intensity before addition, calculated using a spreadsheet.
4. Error bars are SEM.



Now we will analyze the data.

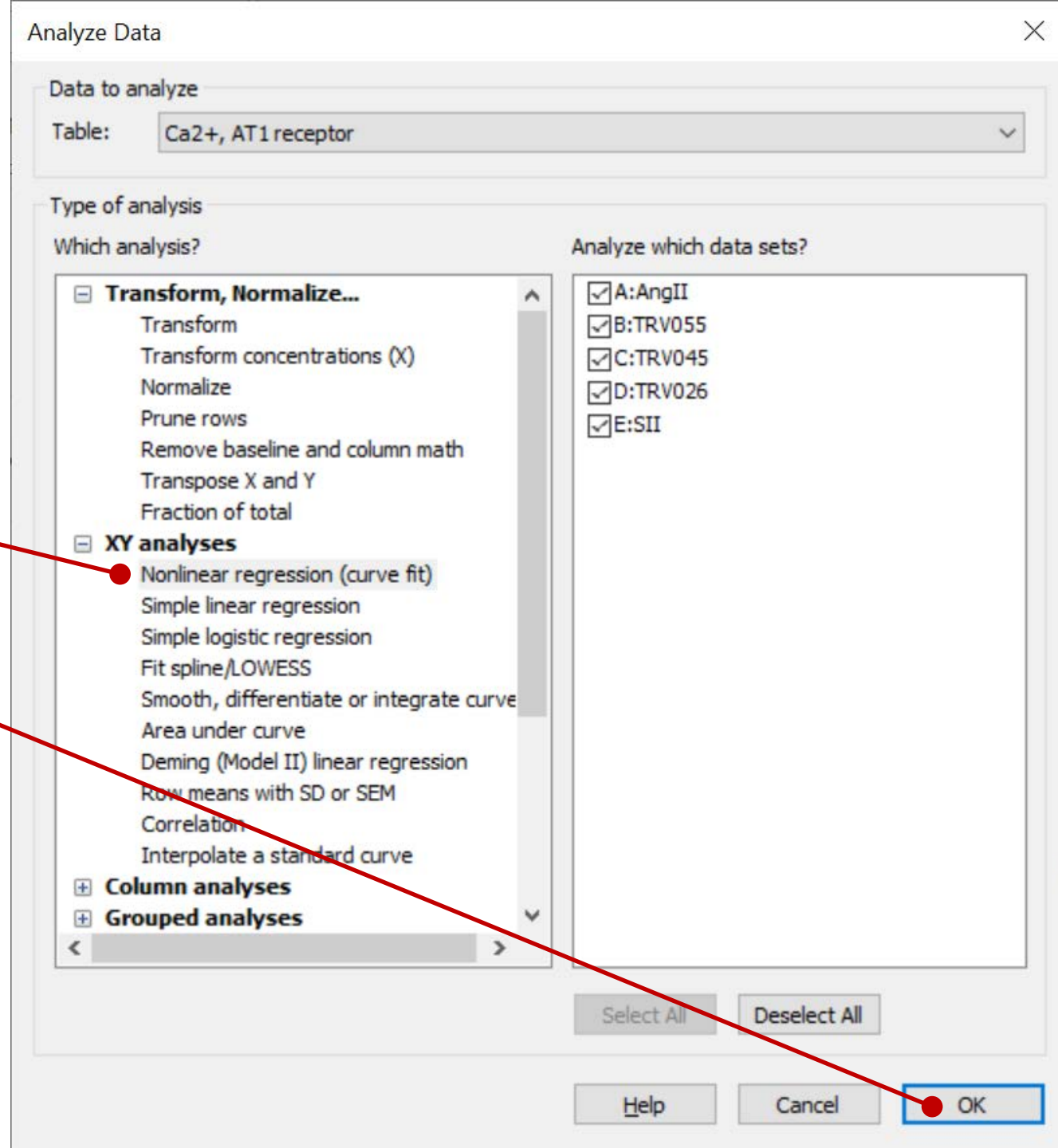
Click "Analyze"



This brings up the “Analyze Data”  
dialogue

Select “Nonlinear regression”

Click “OK”



This brings up the “Parameters: Nonlinear Regression” dialogue.

Now we select the equation.

Click “User-defined equations” checkbox.

Note this will only appear if user-defined equations have been loaded. See [page 21](#).

Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

Choose an equation

- Recently used
- User-defined equations
- Standard curves to interpolate
- Dose-response - Stimulation
- Dose-response - Inhibition
- Dose-response - Special, X is concentration
- Dose-response - Special, X is log(concentration)
- Binding - Saturation
- Binding - Competitive
- Binding - Kinetics
- Enzyme kinetics - Inhibition
- Enzyme kinetics - Velocity as a function of substrate
- Exponential
- Lines
- Polynomial
- Gaussian
- Sine waves
- Growth curves
- Linear quadratic curves

New ▾

User-defined equations

**Interpolate**

Interpolate unknowns from standard curve. Confidence interval: None ▾

Learn Cancel OK



Select “[Pharmechanics] Baseline then rise-and-fall to baseline with drift”

Note this will only appear if the equation has been loaded. See [page 21](#).

Click on the “Initial values” tab

Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

Choose an equation

- Recently used
- User-defined equations
  - [Pharmechanics] Baseline then rise-and-fall to baseline time course with drift
- Standard curves to interpolate
- Dose-response - Stimulation
- Dose-response - Inhibition
- Dose-response - Special, X is concentration
- Dose-response - Special, X is log(concentration)
- Binding - Saturation
- Binding - Competitive
- Binding - Kinetics
- Enzyme kinetics - Inhibition
- Enzyme kinetics - Velocity as a function of substrate
- Exponential
- Lines
- Polynomial
- Gaussian
- Sine waves
- Growth curves

Use for time course experiment in which effect is initiated after a baseline period , and where there is baseline drift.

Initial values might need to be entered manually:  
K1, 1/t-half rise phase  
[Pharmechanics] Baseline then rise-and-fall to baseline time course with drift  
Numerical derivatives

Interpolate

Interpolate unknowns from standard curve. Confidence interval: None

Learn Cancel OK

Here we recommend manually entering the X0 initial value. X0 is the time the signal starts to rise.

Click "Select All"

Uncheck "Choose Automatically" for X0

Enter the estimated X0 value (from visual inspection of the graph)

Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

Select Data Set Select All

- Ca2+, AT1 receptor:A:AngII
- Ca2+, AT1 receptor:B:TRV055
- Ca2+, AT1 receptor:C:TRV045
- Ca2+, AT1 receptor:D:TRV026
- Ca2+, AT1 receptor:E:SII

To select several data sets, press Control or Shift while selecting.

Parameter Name	Choose Automatically	Initial Value	Hook
X0	<input checked="" type="checkbox"/>	13.525	
Baseline	<input checked="" type="checkbox"/>	0.903564352666	
Drift	<input checked="" type="checkbox"/>	0.008632390671	
C	<input checked="" type="checkbox"/>	1579.085458845	
K1	<input checked="" type="checkbox"/>	0.147874306839	
K2	<input checked="" type="checkbox"/>	0.004436229205	

Learn Cancel OK

Now we are going to change a setting to make the analysis run efficiently.

Prism uses a rigorous method to compute the error associated with the fitted parameter values. For complicated equations this can greatly increase the fitting time.

The rigorous method can be turned off to make the analysis run faster.

Click on the "Confidence" tab

Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

Select Data Set

Select All

Ca2+, AT1 receptor:A:AngII  
Ca2+, AT1 receptor:B:TRV055  
Ca2+, AT1 receptor:C:TRV045  
Ca2+, AT1 receptor:D:TRV026  
Ca2+, AT1 receptor:E:SII

To select several data sets, press Control or Shift while selecting.

Parameter Name	Choose Automatically	Initial Value	Hook
X0	<input type="checkbox"/>	15	
Baseline	<input checked="" type="checkbox"/>	###	
Drift	<input checked="" type="checkbox"/>	###	
C	<input checked="" type="checkbox"/>	###	
K1	<input checked="" type="checkbox"/>	0.147874306839	
K2	<input checked="" type="checkbox"/>	0.004436229205	

Learn

Cancel

OK

“Asymmetrical” is the rigorous error calculation method

To turn it off, click the “Symmetrical” radio button

Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

**Confidence intervals (CI) of parameters**

Calculate CI of parameters

Confidence level: 95%

Output Format: Range ("1.23 to 4.56")

Asymmetrical (profile-likelihood) CI

Recommended because they are more accurate. Can be slow.

Compute even when the fit is ambiguous and the CIs would be difficult to interpret.

Symmetrical (asymptotic) approximate CI

Less accurate so not recommended. Matches Prism 1-6 and most programs. Faster to calculate.

Show SE of parameters

**Confidence or prediction bands**

Plot confidence/prediction bands

Confidence level: 95%

Confidence bands

Confidence bands show you the likely location of the TRUE curve.

Prediction bands

Prediction bands show you the likely location of additional data points.

**Ambiguous fits and unstable parameters**

Identify “ambiguous” fits. Matches Prism 8.1 and earlier.

Identify “unstable” parameters. A new (8.2) feature from Prism Labs.

Neither. Just show the best-fit values even when the fit is problematic.

Make these choices the default for future fits.

Learn

Cancel

OK

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

**Confidence intervals (CI) of parameters**

Calculate CI of parameters

Confidence level: 95% ▾

Output Format: Range ("1.23 to 4.56") ▾

Asymmetrical (profile-likelihood) CI

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Neither. Just show the best-fit values even when the fit is problematic.

Make these choices the default for future fits.

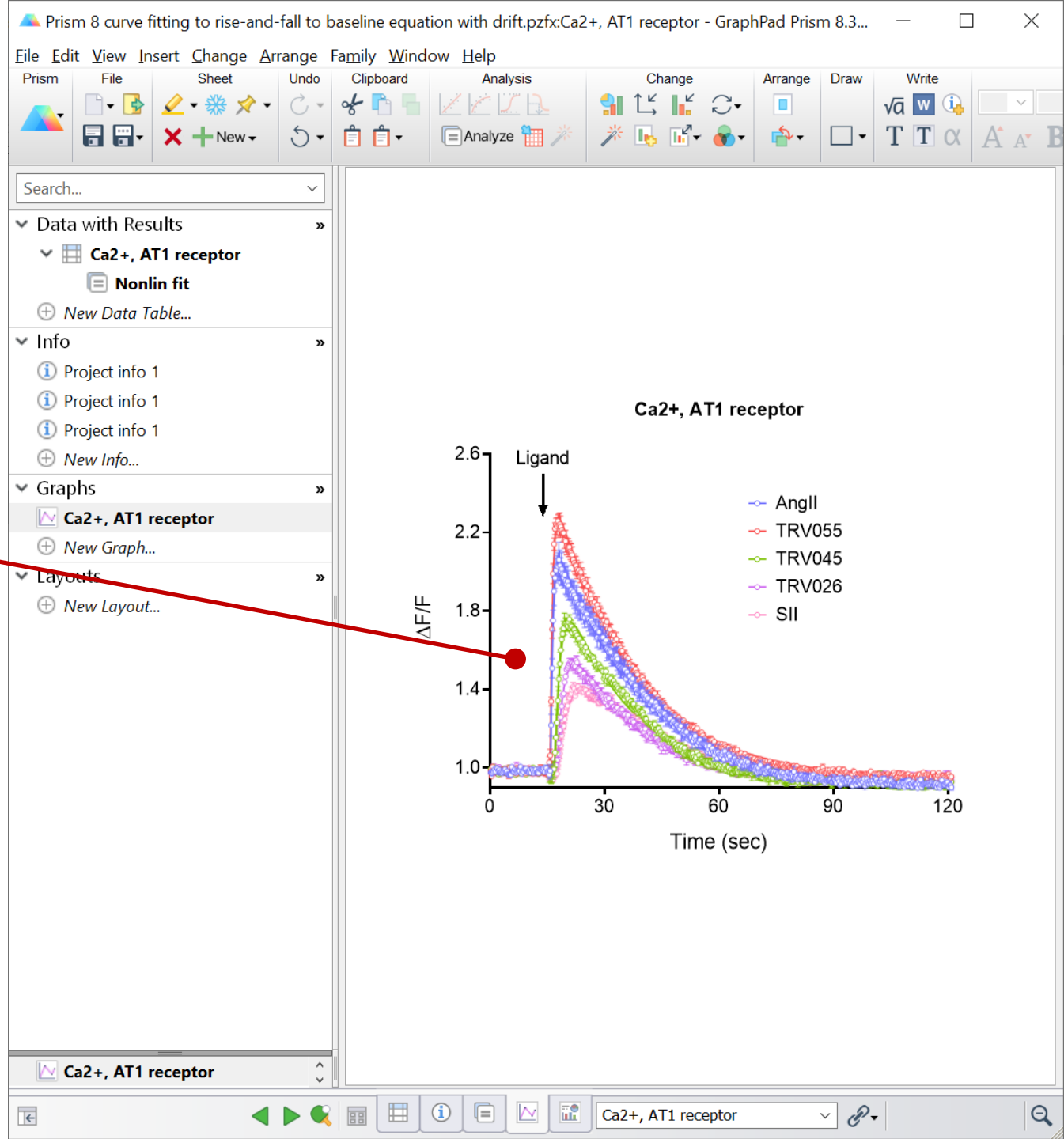
Learn

Cancel

OK

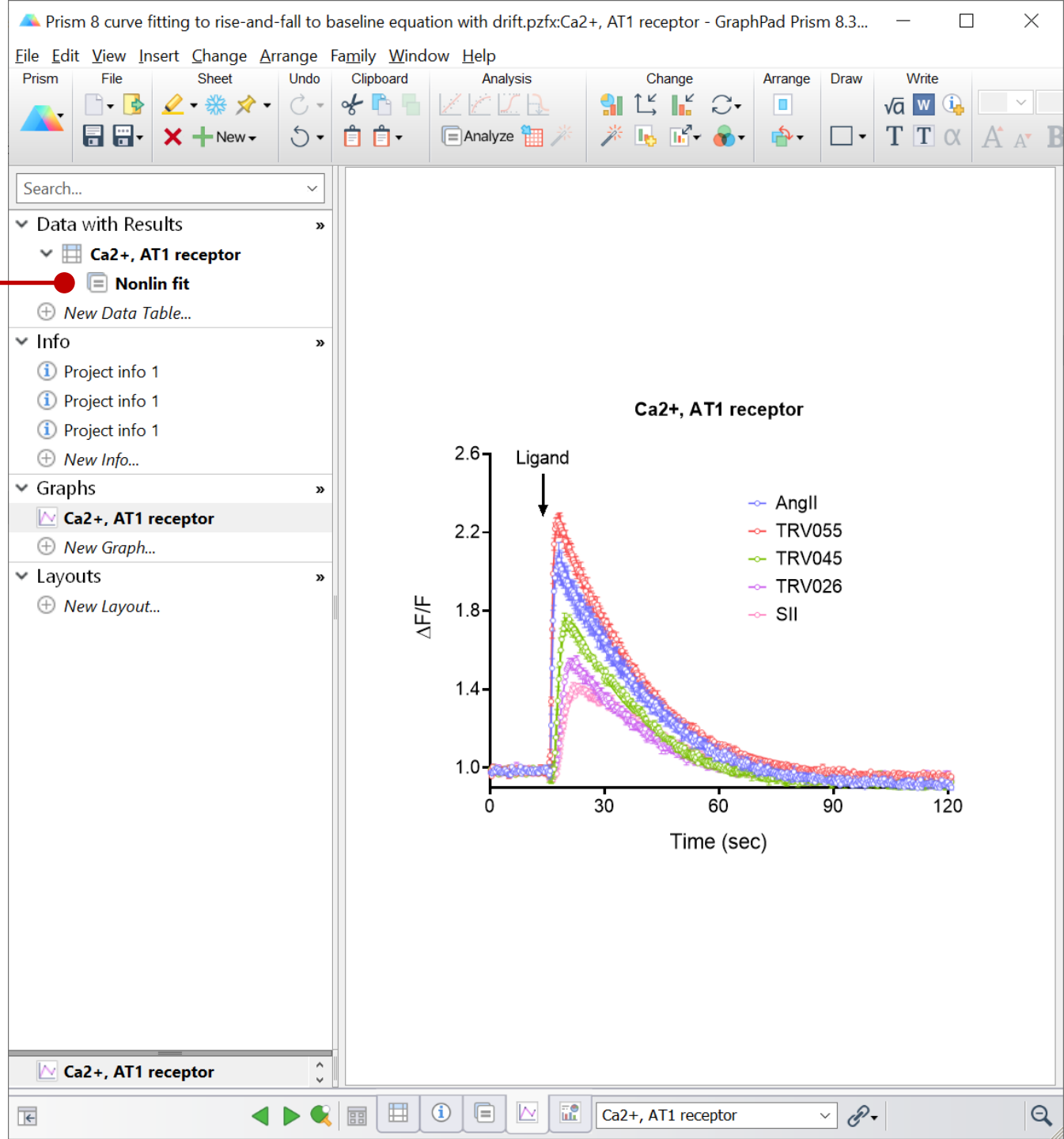
Click "OK" to run the analysis

These are the fitted curves



# Reviewing the results

Click “Nonlin fit” to bring up the results table





Prism File Sheet Undo Clipboard Analysis Interpret Change Draw Write Text Export Print Send LA Help

GraphPad Prism 8

Search...

Table of results

▼ Data with Results

- Ca2+, AT1 receptor
  - Nonlin fit
  - New Data Table...
- Info
  - Project info 1
  - Project info 1
  - Project info 1
  - New Info...
- Graphs
  - Ca2+, AT1 receptor
  - New Graph...
- Layouts
  - New Layout...

Nonlin fit

Look at the R squared values to determine the goodness of fit

Nonlin fit Table of results		A Angll	B TRV055	C TRV045	D TRV026	E SII	F
1	[Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift						
2	<b>Best-fit values</b>						
3	X0	15.6	15.5	16.6	17.2	17.1	
4	Baseline	0.994	0.996	0.995	1.00	0.997	
		-0.000724	-0.000379	-0.000569	-0.000339	-0.000463	
		1.88	2.19	0.625	0.373	0.176	
		1.54	1.52	0.638	0.503	0.269	
		0.0475	0.0492	0.0589	0.0638	0.0548	
		0.449	0.457	1.09	1.38	2.57	
		14.6	14.1	11.8	10.9	12.6	
11	<b>Std. Error</b>						
12	X0	0.0201	0.00774	0.0281	0.0287	0.0447	
13	Baseline	0.00342	0.00241	0.00265	0.00190	0.00174	
14	Drift	3.40e-005	2.40e-005	2.71e-005	1.96e-005	1.77e-005	
15	C	0.0813	0.0449	0.0179	0.00932	0.00386	
16	K1	0.0694	0.0325	0.0207	0.0149	0.00801	
17	K2	0.000452	0.000280	0.000703	0.000824	0.000890	
18	<b>95% CI (asymptotic)</b>						
19	X0	15.6 to 15.6	15.5 to 15.5	16.6 to 16.7	17.1 to 17.2	17.1 to 17.2	
20	Baseline	0.988 to 1.00	0.991 to 1.00	0.990 to 1.00	0.996 to 1.00	0.994 to 1.00	
21	Drift	-0.000791 to -0.000658	-0.000426 to -0.000332	-0.000623 to -0.000516	-0.000377 to -0.000300	-0.000498 to -0.000428	
22	C	1.72 to 2.04	2.10 to 2.28	0.590 to 0.661	0.355 to 0.392	0.168 to 0.183	
23	K1	1.41 to 1.68	1.45 to 1.58	0.598 to 0.679	0.474 to 0.532	0.254 to 0.285	
24	K2	0.0466 to 0.0484	0.0487 to 0.0498	0.0575 to 0.0603	0.0621 to 0.0654	0.0531 to 0.0566	
25	Half-time K1	0.413 to 0.493	0.438 to 0.477	1.02 to 1.16	1.30 to 1.46	2.43 to 2.73	
26	Half-time K2	14.3 to 14.9	13.9 to 14.2	11.5 to 12.0	10.6 to 11.2	12.3 to 13.1	
27	<b>Goodness of Fit</b>						
28	Degrees of Freedom	1620	1620	1620	1620	1620	
29	R squared	0.977	0.991	0.972	0.971	0.971	
30	Sum of Squares	3.25	1.60	2.09	1.11	0.905	
31	Sy.x	0.0448	0.0315	0.0359	0.0262	0.0236	
32	<b>Constraints</b>						
33	C	C > 0	C > 0	C > 0	C > 0	C > 0	
34	K2	K2 > 0	K2 > 0	K2 > 0	K2 > 0	K2 > 0	
35							
36	<b>Number of points</b>						

Prism File Sheet Undo Clipboard Analysis Interpret Change Draw Write Text Export Print Send LA Help

GraphPad Prism 8

Search...

Table of results

Data with Results

- Ca2+, AT1 receptor
  - Nonlin fit

Info

- Project info 1
- Project info 1
- Project info 1

Graphs

- Ca2+, AT1 receptor

Layouts

- New Layout...

Data are fit well by the equation:  
R squared > 0.9

Nonlin fit Table of results		A Angll	B TRV055	C TRV045	D TRV026	E SII	F
1	[Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift						
2	<b>Best-fit values</b>						
3	X0	15.6	15.5	16.6	17.2	17.1	
4	Baseline	0.994	0.996	0.995	1.00	0.997	
5	Drift	-0.000724	-0.000379	-0.000569	-0.000339	-0.000463	
6	C	1.88	2.19	0.625	0.373	0.176	
7	K1	1.54	1.52	0.638	0.503	0.269	
8	K2	0.0475	0.0492	0.0589	0.0638	0.0548	
9	Half-time K1	0.449	0.457	1.09	1.38	2.57	
10	Half-time K2	14.6	14.1	11.8	10.9	12.6	
11	95% CI (asymptotic)						
12	X0	0.0201	0.00774	0.0281	0.0287	0.0447	
13	Baseline	0.00342	0.00241	0.00265	0.00190	0.00174	
14	Drift	3.40e-005	2.40e-005	2.71e-005	1.96e-005	1.77e-005	
15	C	0.0813	0.0449	0.0179	0.00932	0.00386	
16	K1	0.0694	0.0325	0.0207	0.0149	0.00801	
17	K2	0.000452	0.000280	0.000703	0.000824	0.000890	
18	<b>95% CI (asymptotic)</b>						
19	X0	15.6 to 15.6	15.5 to 15.5	16.6 to 16.7	17.1 to 17.2	17.1 to 17.2	
20	Baseline	0.988 to 1.00	0.991 to 1.00	0.990 to 1.00	0.996 to 1.00	0.994 to 1.00	
21	Drift	-0.000791 to -0.000658	-0.000426 to -0.000332	-0.000623 to -0.000516	-0.000377 to -0.000300	-0.000498 to -0.000428	
22	C	1.72 to 2.04	2.10 to 2.28	0.590 to 0.661	0.355 to 0.392	0.168 to 0.183	
23	K1	1.41 to 1.68	1.45 to 1.58	0.598 to 0.679	0.474 to 0.532	0.254 to 0.285	
24	K2	0.0466 to 0.0484	0.0487 to 0.0498	0.0575 to 0.0603	0.0621 to 0.0654	0.0531 to 0.0566	
25	Half-time K1	0.413 to 0.493	0.438 to 0.477	1.02 to 1.16	1.30 to 1.46	2.43 to 2.73	
26	Half-time K2	14.3 to 14.9	13.9 to 14.2	11.5 to 12.0	10.6 to 11.2	12.3 to 13.1	
27	<b>Goodness of Fit</b>						
28	Degrees of Freedom	1620	1620	1620	1620	1620	
29	R squared	0.977	0.991	0.972	0.971	0.971	
30	Sum of Squares	3.25	1.60	2.09	1.11	0.905	
31	Sy.x	0.0448	0.0315	0.0359	0.0262	0.0236	
32	<b>Constraints</b>						
33	C	C > 0	C > 0	C > 0	C > 0	C > 0	
34	K2	K2 > 0	K2 > 0	K2 > 0	K2 > 0	K2 > 0	
35							
36	<b>Number of points</b>						

**Calculating the initial rate and  $k_{\tau}$**

The initial rate and  $k_{\tau}$  are easy to determine.

The initial rate is equal to the value of the parameter "C"

Since we are using a maximally-stimulating concentration of ligand,  $k_{\tau}$  is equal to the initial rate, and so is equal to C.

$$\text{AngII} = 1.88 \text{ NFU}\cdot\text{sec}^{-1}$$

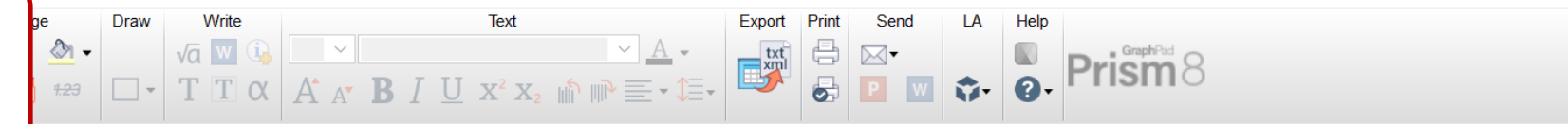
$$\text{TRV055} = 2.19 \text{ NFU}\cdot\text{sec}^{-1}$$

$$\text{TRV045} = 0.63 \text{ NFU}\cdot\text{sec}^{-1}$$

$$\text{TRV026} = 0.37 \text{ NFU}\cdot\text{sec}^{-1}$$

$$\text{SII} = 0.18 \text{ NFU}\cdot\text{sec}^{-1}$$

NFU, normalized fluorescence units



	A	B	C	D	E	F
	AngII	TRV055	TRV045	TRV026	SII	
15.6	15.5	16.6	17.2	17.1		
0.994	0.996	0.995	1.00	0.997		
-0.000724	-0.000379	-0.000569	-0.000339	-0.000463		
1.88	2.19	0.625	0.373	0.176		
1.54	1.52	0.638	0.503	0.269		
0.0475	0.0492	0.0589	0.0638	0.0548		
0.449	0.457	1.09	1.38	2.57		
14.6	14.1	11.8	10.9	12.6		
0.0201	0.00774	0.0281	0.0287	0.0447		
0.00342	0.00241	0.00265	0.00190	0.00174		
3.40e-005	2.40e-005	2.71e-005	1.96e-005	1.77e-005		
0.0813	0.0449	0.0179	0.00932	0.00386		
0.0694	0.0325	0.0207	0.0149	0.00801		
0.000452	0.000280	0.000703	0.000824	0.000890		
15.6 to 15.6	15.5 to 15.5	16.6 to 16.7	17.1 to 17.2	17.1 to 17.2		
0.988 to 1.00	0.991 to 1.00	0.990 to 1.00	0.996 to 1.00	0.994 to 1.00		
-0.000791 to -0.000658	-0.000426 to -0.000332	-0.000623 to -0.000516	-0.000377 to -0.000300	-0.000498 to -0.000428		
1.72 to 2.04	2.10 to 2.28	0.590 to 0.661	0.355 to 0.392	0.168 to 0.183		
1.41 to 1.68	1.45 to 1.58	0.598 to 0.679	0.474 to 0.532	0.254 to 0.285		
0.0466 to 0.0484	0.0487 to 0.0498	0.0575 to 0.0603	0.0621 to 0.0654	0.0531 to 0.0566		
0.413 to 0.493	0.438 to 0.477	1.02 to 1.16	1.30 to 1.46	2.43 to 2.73		
14.3 to 14.9	13.9 to 14.2	11.5 to 12.0	10.6 to 11.2	12.3 to 13.1		
1620	1620	1620	1620	1620		
0.977	0.991	0.972	0.971	0.971		
3.25	1.60	2.09	1.11	0.905		
0.0448	0.0315	0.0359	0.0262	0.0236		
C > 0	C > 0	C > 0	C > 0	C > 0		
K2 > 0	K2 > 0	K2 > 0	K2 > 0	K2 > 0		

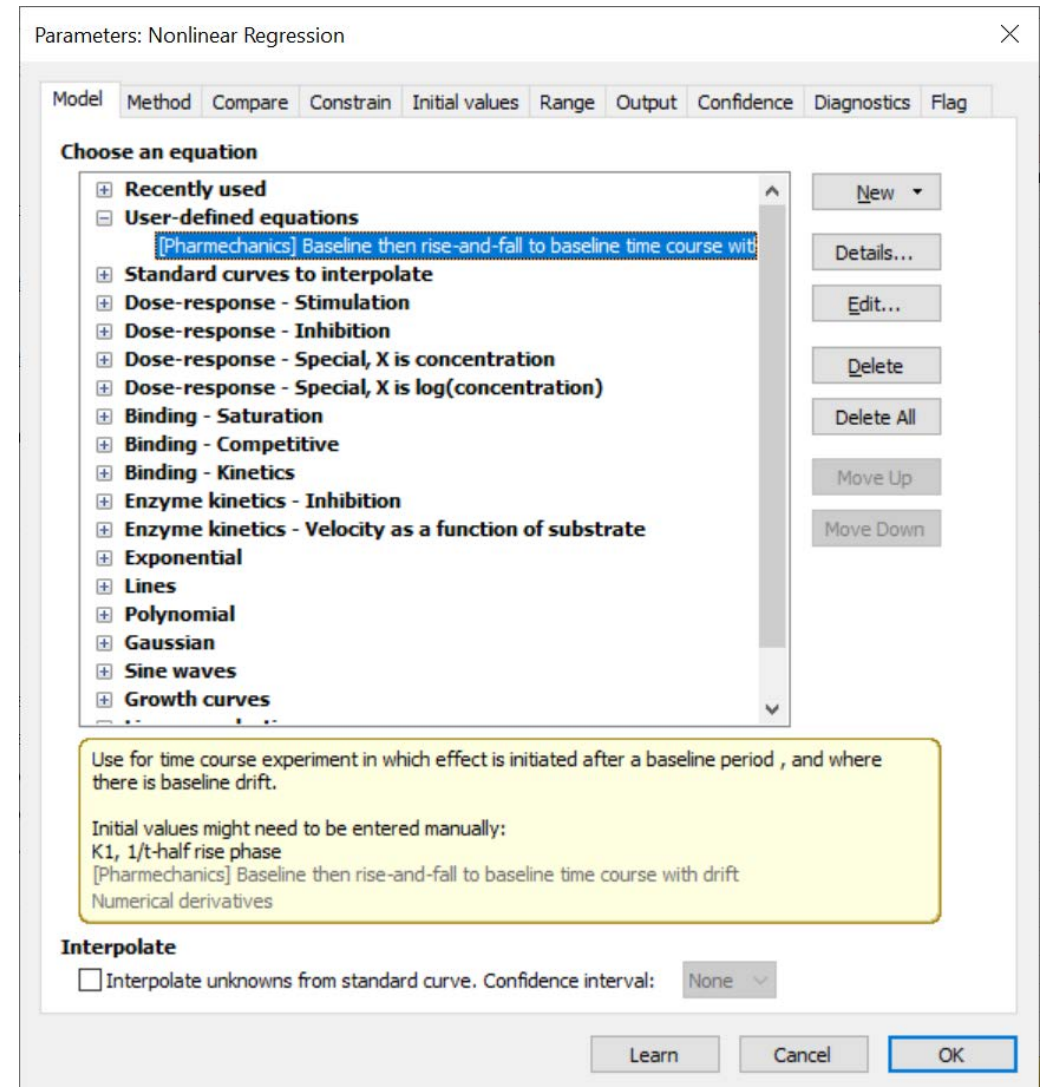
# Loading equations into Prism from a file

GraphPad Prism contains an equation editor for the input of user-defined equations.

There is a sharing method that simplifies the loading of equations written by other users.

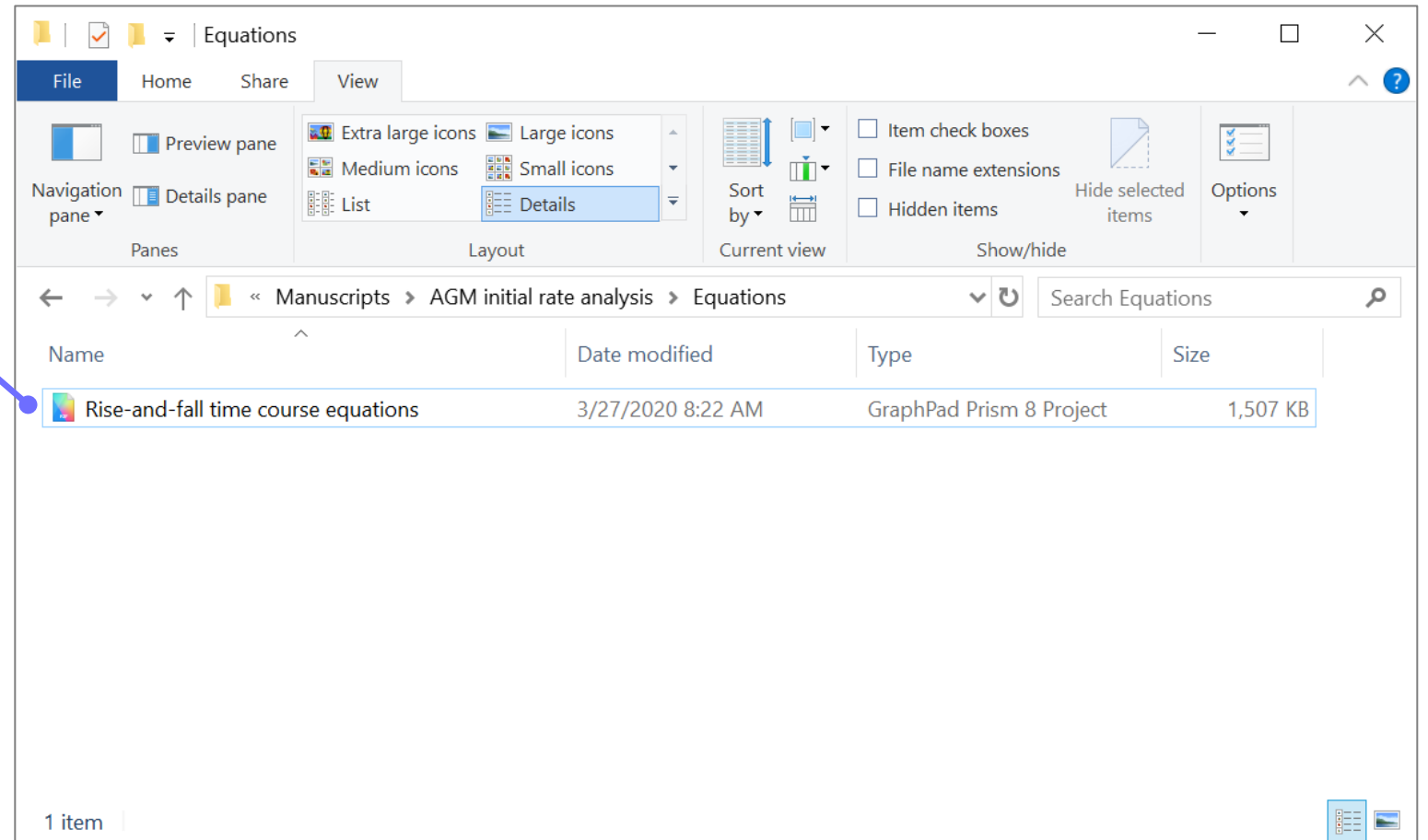
This avoids the need to write in the equation and all the fit settings.

This process is described in this presentation.



First, download the file containing the equations to your computer.

Then open it.



Rise-and-fall time course equations for AGM.pzf:Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift - GraphPad Prism 8.3.0 (538)

File Edit View Insert Change Arrange Family Window Help

Prism File Sheet Undo Clipboard Analysis Change Arrange Draw Write Text

Search...

- ▼ Data with Results
  - ▼ Rise-and-fall to baseline
    - Nonlin fit
  - ▼ Rise-and-fall to steady state
    - Nonlin fit
  - ▼ Baseline then rise-and-fall to baseline
    - Nonlin fit
  - ▼ Baseline then rise-and-fall to steady state
    - Nonlin fit
  - ▼ **Baseline then rise-and-fall to baseline with drift**
    - Nonlin fit**
  - + New Data Table...
- ▼ Info
  - Project info 1
  - + New Info...
- ▼ Graphs
  - Curve: Nonlin fit of Rise-and-fall to baseline
  - Curve: Nonlin fit of Rise-and-fall to steady state
  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline
  - Curve: Nonlin fit of Baseline then rise-and-fall to steady state
  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift**
  - + New Graph...
- ▼ Layouts
  - + New Layout...

Y value

Time (sec)

Baseline with Drift

Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift

We are going to load the equation from the Results sheet.

The equation we need is called "Baseline then rise-and-fall to baseline with drift"



Rise-and-fall time course equations for AGM.pzf:Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift - GraphPad Prism 8.3.0 (538)

File Edit View Insert Change Arrange Family Window Help

Prism File Sheet Undo Clipboard Analysis Change Arrange Draw Write Text

Search...

- ▼ Data with Results
  - ▼ Rise-and-fall to baseline
    - Nonlin fit
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    - Nonlin fit
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  - ▼ **Baseline then rise-and-fall to baseline with drift**
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  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline
  - Curve: Nonlin fit of Baseline then rise-and-fall to steady state
  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift**
  - + New Graph...
- ▼ Layouts
  - + New Layout...

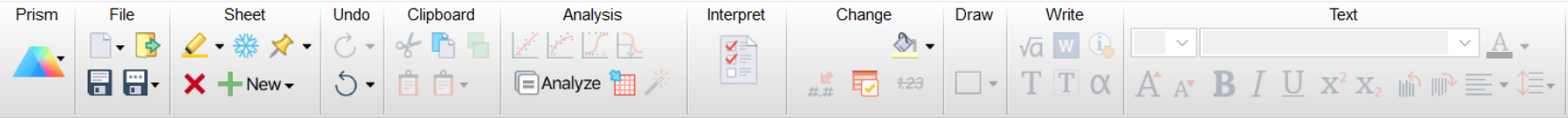
Y value

Time (sec)

Baseline with Drift

Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift

Select the equation you want by clicking on the "Nonlin fit" Results tab.



Search...

- Data with Results
  - Rise-and-fall to baseline
    - Nonlin fit
  - Rise-and-fall to steady state
    - Nonlin fit
  - Baseline then rise-and-fall to baseline
    - Nonlin fit
  - Baseline then rise-and-fall to steady state
    - Nonlin fit
  - Baseline then rise-and-fall to baseline with drift**
    - Nonlin fit**
- Info
  - Project info 1
  - New Info...
- Graphs
  - Curve: Nonlin fit of Rise-and-fall to baseline
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  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline
  - Curve: Nonlin fit of Baseline then rise-and-fall to steady state
  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift**
  - New Graph...
- Layouts
  - New Layout...

Nonlin fit

Table of results

Nonlin fit		A
Table of results		
1	[Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift	
2	<b>Best-fit values</b>	
3	X0	15.00
4	Baseline	1.000
5	Drift	-0.001500
6	C	2.000
7	K1	1.500
8	K2	0.05000
9	Half-time K1	0.4621
10	Half-time K2	13.86
11	<b>Std. Error</b>	
12	X0	6.099e-016
13	Baseline	1.170e-016
14	Drift	1.165e-018
15	C	2.496e-015
16	K1	1.954e-015
17	K2	1.493e-017
18	<b>95% CI (asymptotic)</b>	
19	X0	15.00 to 15.00
20	Baseline	1.000 to 1.000
21	Drift	-0.001500 to -0.001500
22	C	2.000 to 2.000
23	K1	1.500 to 1.500
24	K2	0.05000 to 0.05000
25	Half-time K1	0.4621 to 0.4621
26	Half-time K2	13.86 to 13.86
27	<b>Goodness of Fit</b>	
28	Degrees of Freedom	536
29	R squared	1.000
30	Sum of Squares	4.090e-028
31	Sy.x	8.735e-016
32	<b>Constraints</b>	
33	C	C > 0
34	K2	K2 > 0
35		
36	<b>Number of points</b>	

Click this icon

Rise-and-fall time course equations for AGM.pzf:Nonlin fit of Baseline then rise-and-fall to baseline with drift - GraphPad Prism 8.3.0 (538)

File Edit View Insert Change Arrange Family Window Help

Prism File Sheets

Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

**Choose an equation**

- Recently used
- User-defined equations
  - [Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift
- Standard curves to interpolate
- Dose-response - Stimulation
- Dose-response - Inhibition
- Dose-response - Special, X is concentration
- Dose-response - Special, X is log(concentration)
- Binding - Saturation
- Binding - Competitive
- Binding - Kinetics
- Enzyme kinetics - Inhibition
- Enzyme kinetics - Velocity as a function of substrate
- Exponential
- Lines
- Polynomial
- Gaussian
- Sine waves
- Growth curves

Use for time course experiment in which effect is initiated after a baseline period, and where there is baseline drift.

Initial values might need to be entered manually:  
K1, 1/t-half rise phase  
[Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift  
Numerical derivatives

**Interpolate**

Interpolate unknowns from standard curve. Confidence interval: None

Learn Cancel OK

	A
drift	
	15.00
	1.000
	-0.001500
	2.000
	1.500
	0.05000
	0.4621
	13.86
	6.099e-016
	1.170e-016
	1.165e-018
	2.496e-015
	1.954e-015
	1.493e-017
	15.00 to 15.00
	1.000 to 1.000
	-0.001500 to -0.001500
	2.000 to 2.000
	1.500 to 1.500
	0.05000 to 0.05000
	0.4621 to 0.4621
	13.86 to 13.86
	536
	1.000
	4.090e-028
	8.735e-016
	C > 0
	K2 > 0

Nonlin fit

33 C  
34 K2  
35  
36 Number of points

Nonlin fit of Baseline then rise- Table of results

This process loads the equation into the “User-defined equations” list. It only needs to be done once. After that, the new equation will be available every time you open Prism.

Prism File Sheet

Parameters: Nonlinear Regression

- Model
- Method
- Compare
- Constrain
- Initial values
- Range
- Output
- Confidence
- Diagnostics
- Flag

Choose an equation

- + Recently used
- User-defined equations
  - [Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift
- + Standard curves to interpolate
- + Dose-response - Stimulation
- + Dose-response - Inhibition
- + Dose-response - Special, X is concentration
- Dose-response - Special, X is log(concentration)
- + Binding - Saturation
- + Binding - Competitive
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- + Enzyme kinetics - Inhibition
- + Enzyme kinetics - Velocity as a function of substrate
- + Exponential
- + Lines
- + Polynomial
- + Gaussian
- + Sine waves
- + Growth curves

Use for time course experiment in which effect is initiated after a baseline period, and where there is baseline drift.

Initial values might need to be entered manually:  
 K1, 1/t-half rise phase  
 [Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift  
 Numerical derivatives

Interpolate

Interpolate unknowns from standard curve. Confidence interval: None

Click "Details" for guidance on how to use the equation.

Search...

Data with Results

- Rise-and-fall to baseline
    - Nonlin fit
  - Rise-and-fall to steady state
    - Nonlin fit
  - Baseline then rise-and-fall to baseline
    - Nonlin fit
  - Baseline then rise-and-fall to baseline with drift
    - Nonlin fit
  - Baseline then rise-and-fall to baseline with drift**
    - Nonlin fit**
- + New Data Table...

Info

- + Project info 1
- + New Info...

Graphs

- + Curve: Nonlin fit of Rise-and-fall to baseline
- + Curve: Nonlin fit of Rise-and-fall to steady state
- + Curve: Nonlin fit of Baseline then rise-and-fall to baseline
- + Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift
- + **Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift**
- + New Graph...

Layouts

- + New Layout...

Nonlin fit

33	C
34	K2
35	
36	Number of points

Text

A
drift
15.00
1.000
-0.001500
2.000
1.500
0.05000
0.4621
13.86
6.099e-016
1.170e-016
1.165e-018
2.496e-015
1.954e-015
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15.00 to 15.00
1.000 to 1.000
-0.001500 to -0.001500
2.000 to 2.000
1.500 to 1.500
0.05000 to 0.05000
0.4621 to 0.4621
13.86 to 13.86
536
1.000
4.090e-028
8.735e-016
C > 0
K2 > 0

Equation Rules for Initial Values Default Constraints Transforms to Report

Experiment setup

Contact info

Data type

Analysis details

Equation

[Pharmechanics] Baseline then rise-and-fall to baseline time course with drift

Tip: Use for time course experiment in which effect is initiated after a baseline period , and where there is baseline drift.

Initial values might need to be entered manually:

K1, 1/t-half rise phase

K2, 1/t-half fall phase

C, Gradient of rise phase

Contact [sam.hoare@pharmechanics.com](mailto:sam.hoare@pharmechanics.com) for technical support

X: Time

X0: Effect start time

Y: Y starts at Baseline, then starting at X0 goes up to a peak, then declines to Baseline

Baseline: Y value baseline, i.e, before effect start

K1: Rate constant 1, units of inverse time

K2: Rate constant 2, units of inverse time

K1 > K2, i.e. K1 is the faster rate

C: Initial rate of rise phase, Y units per unit time.

Drift: Slope of change of baseline over time

$$Y = \text{IF}(X < X0, \text{Baseline} + \text{Drift} * X, \text{Baseline} + \text{Drift} * X0 + \text{Drift} * (X - X0) + (C / (K1 - K2)) * (\exp(-K2 * (X - X0)) - \exp(-K1 * (X - X0))))$$

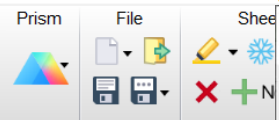
Click Close

Clone this equation

Edit equation

Help

Close



Parameters: Nonlinear Regression

Model Method Compare Constrain Initial values Range Output Confidence Diagnostics Flag

Choose an equation

- Recently used
- User-defined equations
  - [Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift
- Standard curves to interpolate
- Dose-response - Stimulation
- Dose-response - Inhibition
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- Binding - Competitive
- Binding - Kinetics
- Enzyme kinetics - Inhibition
- Enzyme kinetics - Velocity as a function of substrate
- Exponential
- Lines
- Polynomial
- Gaussian
- Sine waves
- Other curves

- New
- Details...
- Edit...
- Delete
- Delete All
- Move Up
- Move Down

Use for time course experiment in which effect is initiated after a baseline period, and where there is baseline drift.

Initial values might need to be entered manually:  
 K1, 1/t-half rise phase  
 [Pharmacokinetics] Baseline then rise-and-fall to baseline time course with drift  
 Numerical derivatives

Interpolate

Interpolate unknowns from standard curve. Confidence interval: None

Learn Cancel **OK**

- Search...
- Data with Results
  - Rise-and-fall to baseline
  - Nonlin fit
  - Rise-and-fall to steady state
  - Nonlin fit
  - Baseline then rise-and-fall to baseline
  - Nonlin fit
  - Baseline then rise-and-fall to baseline with drift
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  - Curve: Nonlin fit of Baseline then rise-and-fall to baseline with drift
  - New Graph...
- Layouts
  - New Layout...

33	C
34	K2
35	
36	Number of points

Text

	A
drift	
	15.00
	1.000
	-0.001500
	2.000
	1.500
	0.05000
	0.4621
	13.86
	6.099e-016
	1.170e-016
	1.165e-018
	2.496e-015
	1.954e-015
	1.493e-017
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	2.000 to 2.000
	1.500 to 1.500
	0.05000 to 0.05000
	0.4621 to 0.4621
	13.86 to 13.86
	536
	1.000
	4.090e-028
	8.735e-016
	C > 0
	K2 > 0

Click OK then close file. Now the equation is available every time you open Prism, in the "User-defined equations" list.