

Supplementary Material 2: Additional Figures

Correcting for Model Changes in Statistical Post-Processing

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Abstract

In this supplementary note, the results for all the variables of the quasi-geostrophic system are depicted. We consider the streamfunction variables ψ_1, \dots, ψ_{10} and the temperature variables $\theta_1, \dots, \theta_{10}$, corresponding to the modes:

$$\begin{aligned} F_1(x, y) &= \sqrt{2} \cos(y), \\ F_2(x, y) &= 2 \cos(nx) \sin(y), \\ F_3(x, y) &= 2 \sin(nx) \sin(y), \\ F_4(x, y) &= \sqrt{2} \cos(2y), \\ F_5(x, y) &= 2 \cos(nx) \sin(2y), \\ F_6(x, y) &= 2 \sin(nx) \sin(2y), \\ F_7(x, y) &= 2 \cos(2nx) \sin(y), \\ F_8(x, y) &= 2 \sin(2nx) \sin(y), \\ F_9(x, y) &= 2 \cos(2nx) \sin(2y), \\ F_{10}(x, y) &= 2 \sin(2nx) \sin(2y), \end{aligned}$$

Each variable has been corrected by using itself as the unique predictor, according to the different models and methods described in the main article. Four figures per variable are shown in the following order:

1. The corrections of the moments of the variable (similar to Figs. 5 and 6 of the main article).
2. The corrections of the parameters α and β of the EVMOS postprocessing scheme (similar to Fig. 8 of the main article).
3. The performance of the correction (similar to Figs. 9 and 10 of the main article).
4. The comparison of the efficiency of the response theory correction for different numbers m of trajectories (similar to Fig. 11 of the main article).

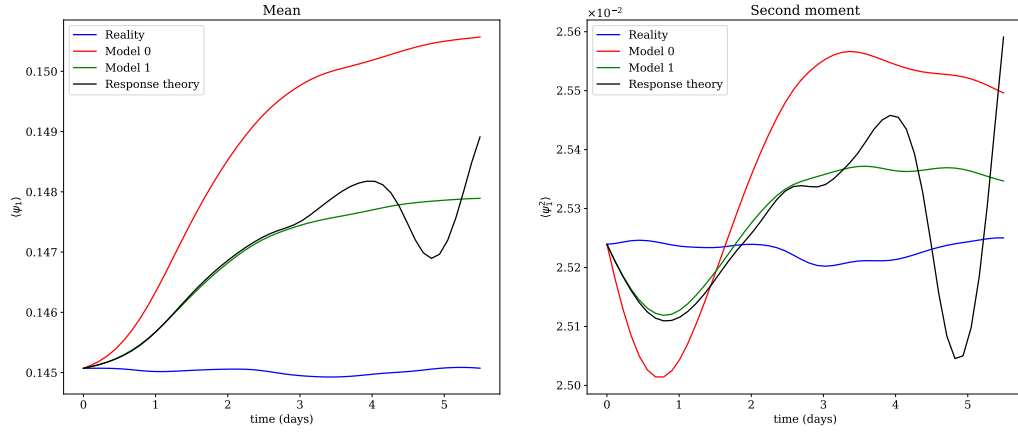
Contents

1	Experiment varying the friction coefficient	3
1.1	Variable ψ_1	3
1.2	Variable ψ_2	6
1.3	Variable ψ_3	9
1.4	Variable ψ_4	12
1.5	Variable ψ_5	15
1.6	Variable ψ_6	18
1.7	Variable ψ_7	21
1.8	Variable ψ_8	24
1.9	Variable ψ_9	27
1.10	Variable ψ_{10}	30
1.11	Variable θ_1	33
1.12	Variable θ_2	36
1.13	Variable θ_3	39
1.14	Variable θ_4	42
1.15	Variable θ_5	45
1.16	Variable θ_6	48
1.17	Variable θ_7	51
1.18	Variable θ_8	54
1.19	Variable θ_9	57
1.20	Variable θ_{10}	60
2	Experiment varying the Newtonian cooling coefficient	63
2.1	Variable ψ_1	63
2.2	Variable ψ_2	66
2.3	Variable ψ_3	69
2.4	Variable ψ_4	72
2.5	Variable ψ_5	75
2.6	Variable ψ_6	78
2.7	Variable ψ_7	81
2.8	Variable ψ_8	84
2.9	Variable ψ_9	87
2.10	Variable ψ_{10}	90
2.11	Variable θ_1	93
2.12	Variable θ_2	96
2.13	Variable θ_3	99
2.14	Variable θ_4	102
2.15	Variable θ_5	105
2.16	Variable θ_6	108
2.17	Variable θ_7	111
2.18	Variable θ_8	114
2.19	Variable θ_9	117
2.20	Variable θ_{10}	120

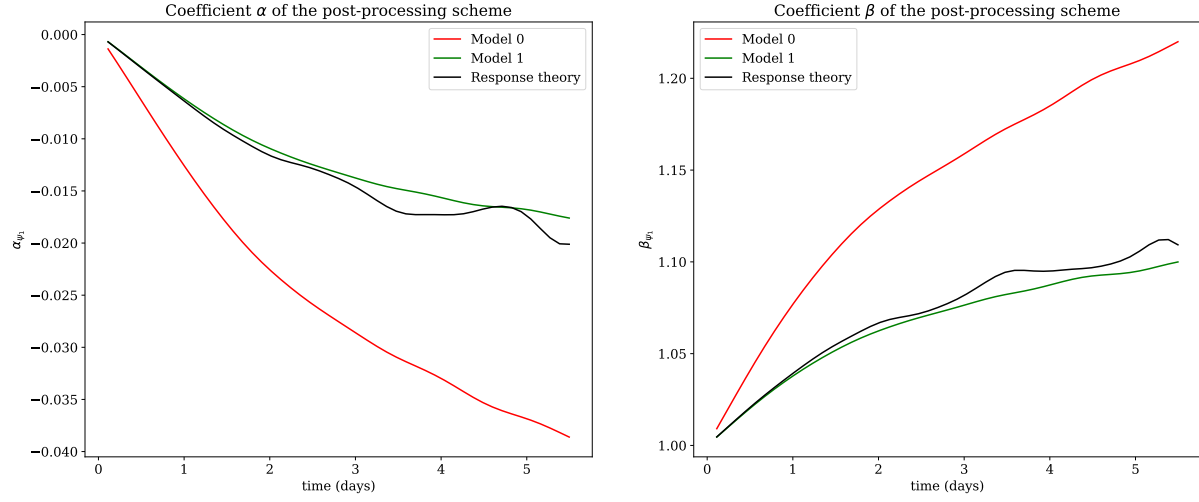
1 Experiment varying the friction coefficient

1.1 Variable ψ_1

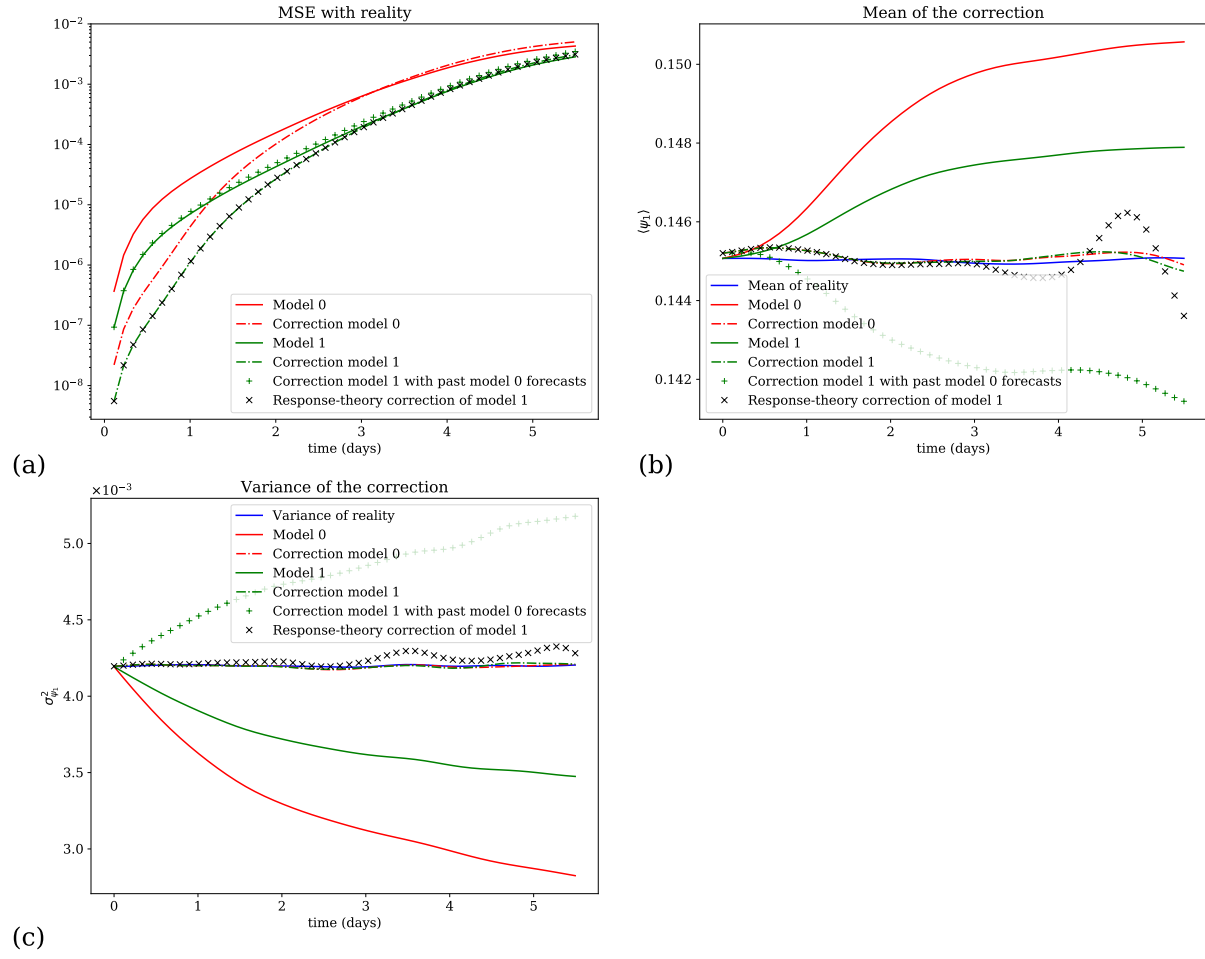
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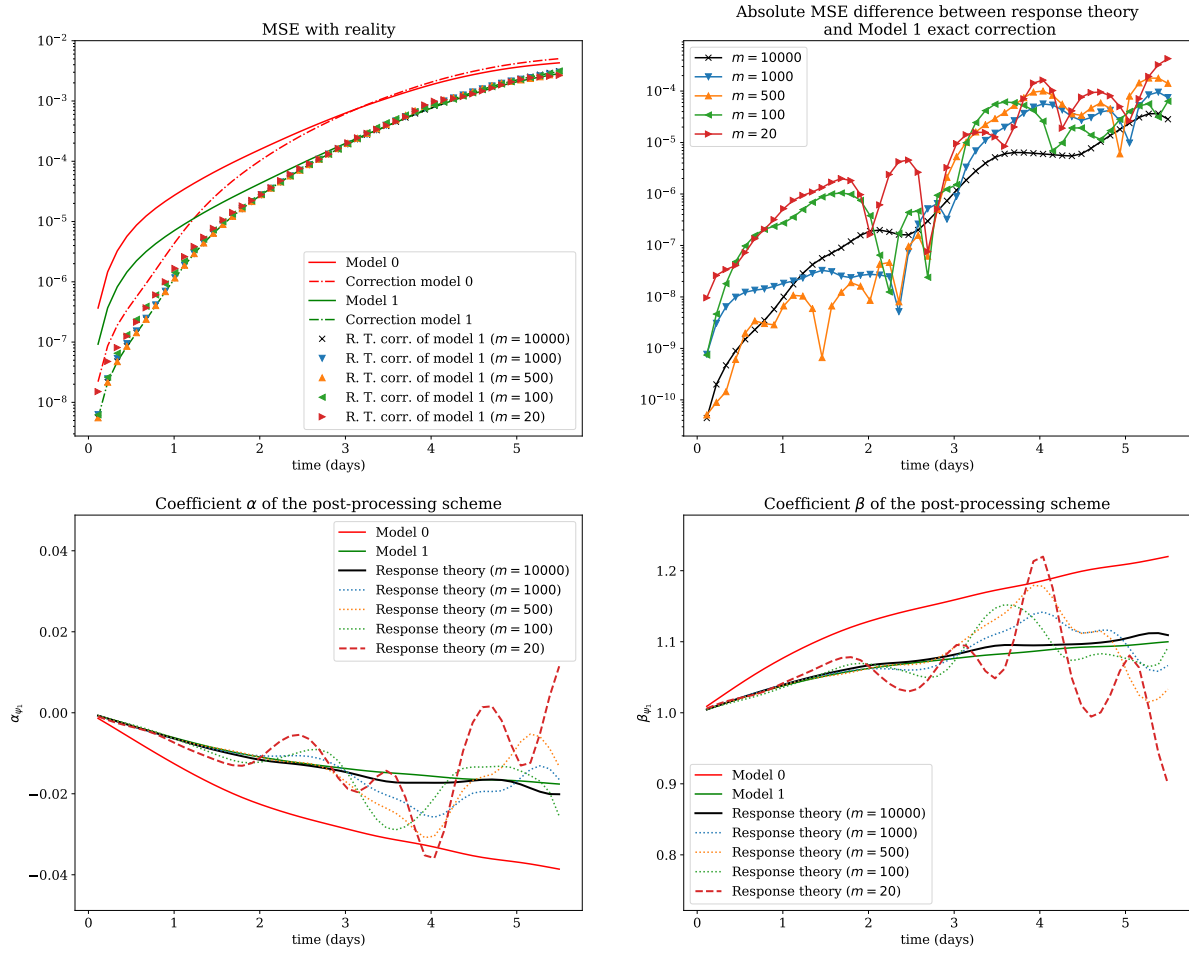
1.1.2 Corrections of the parameters α and β



1.1.3 Performance of the correction

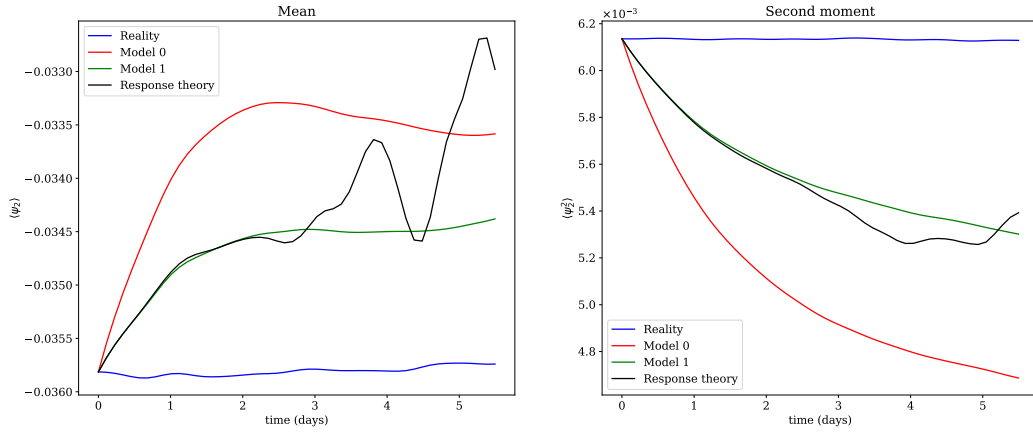


1.1.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

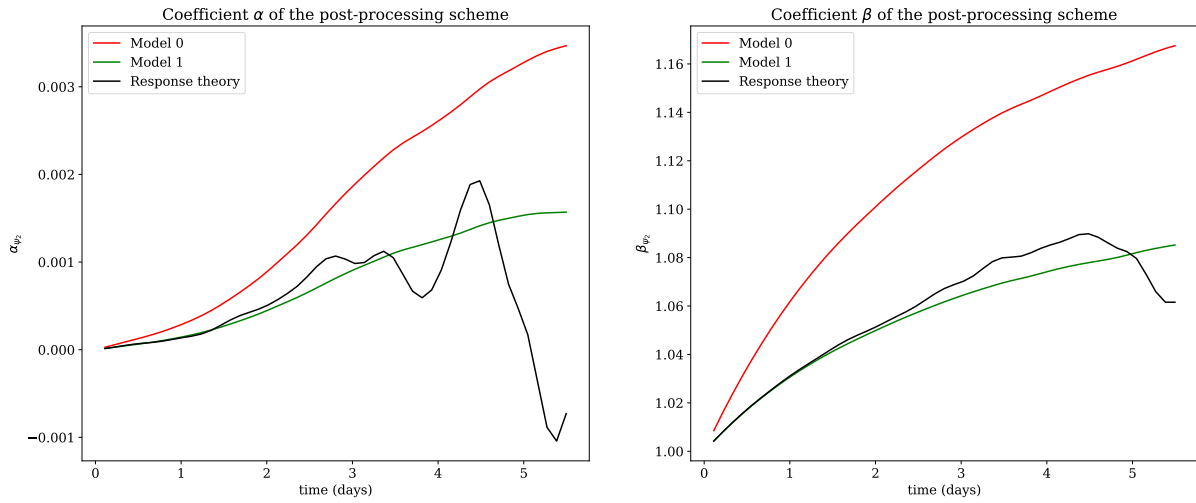


1.2 Variable ψ_2

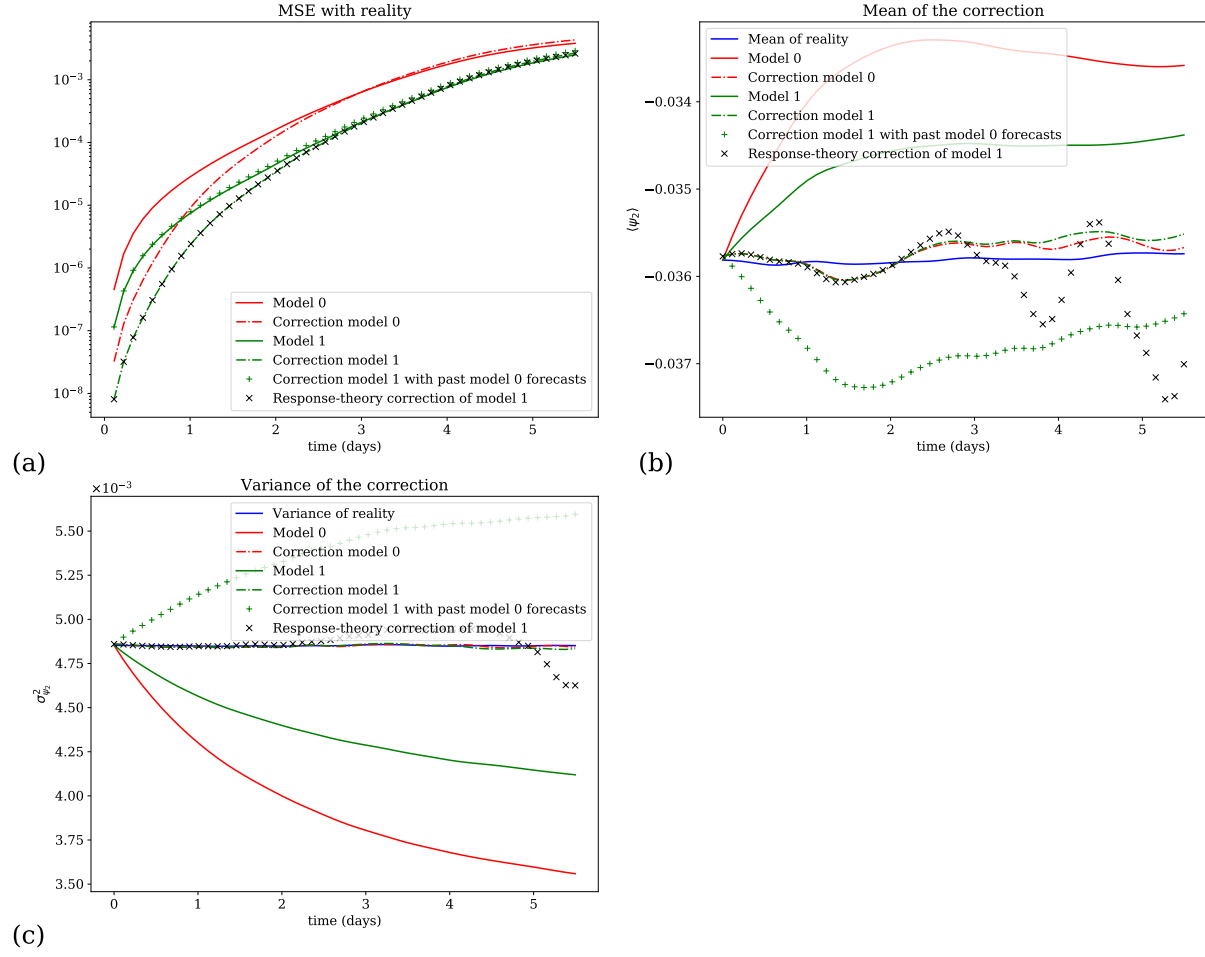
1.2.1 Corrections of the moments of the variable



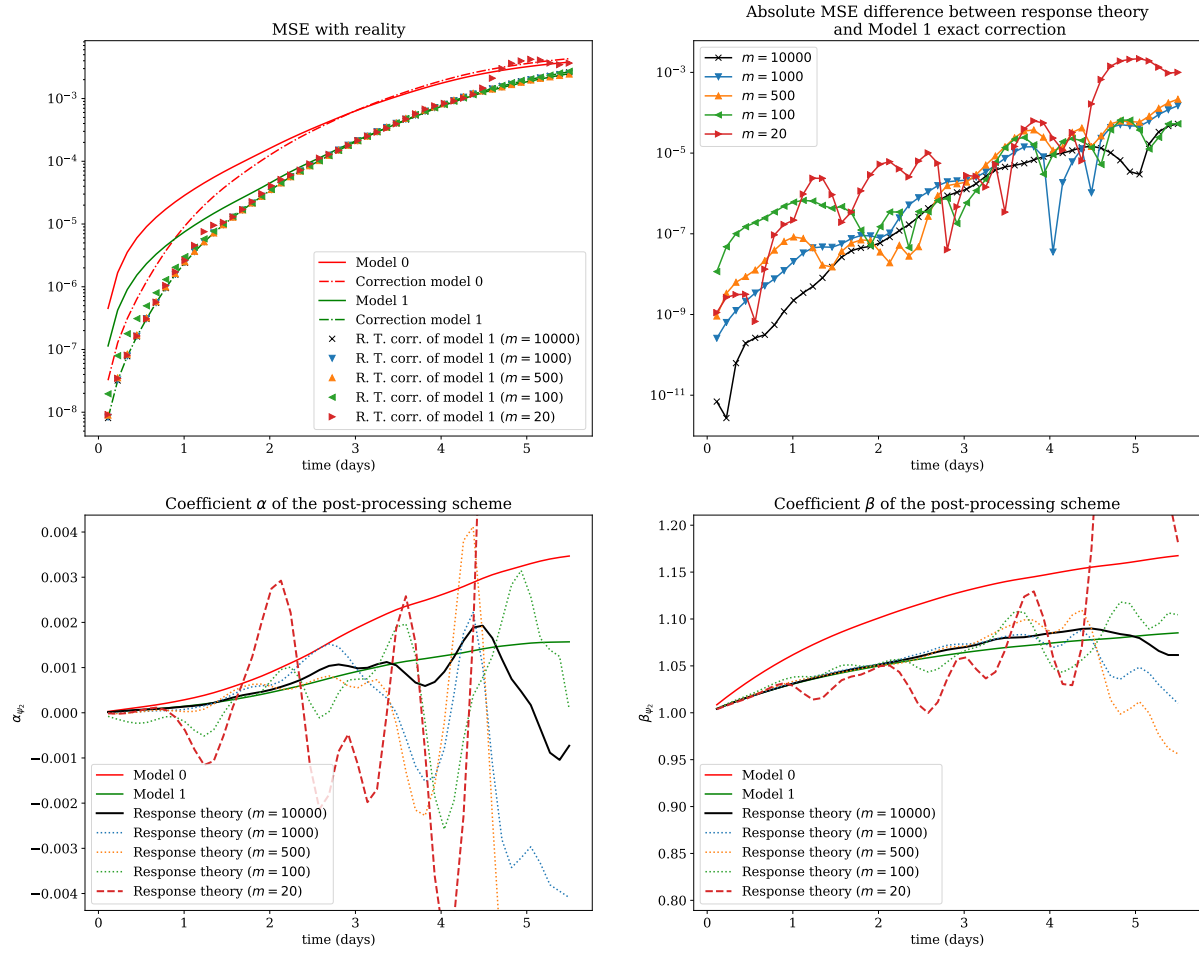
1.2.2 Corrections of the parameters α and β



1.2.3 Performance of the correction

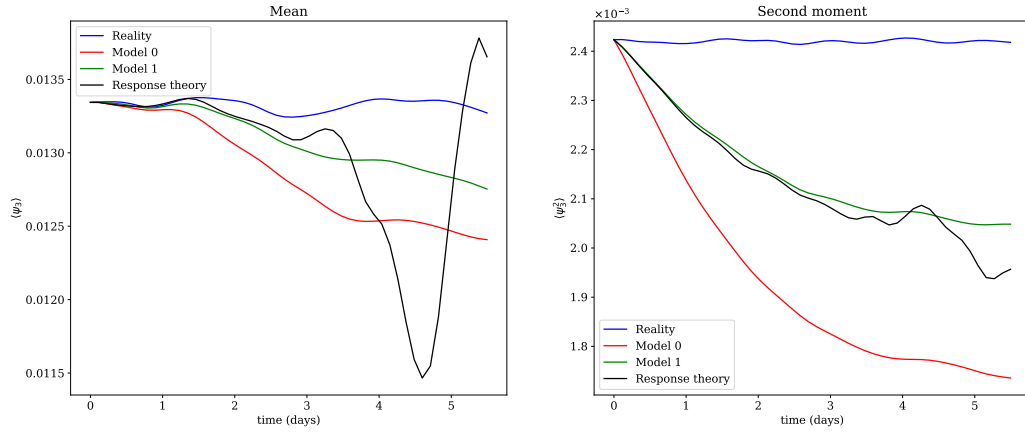


1.2.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

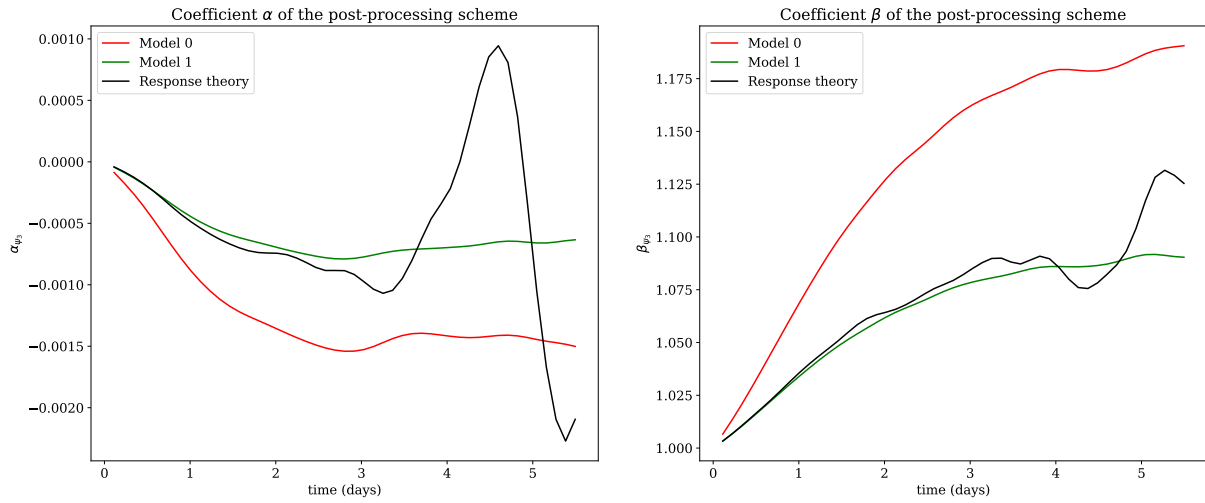


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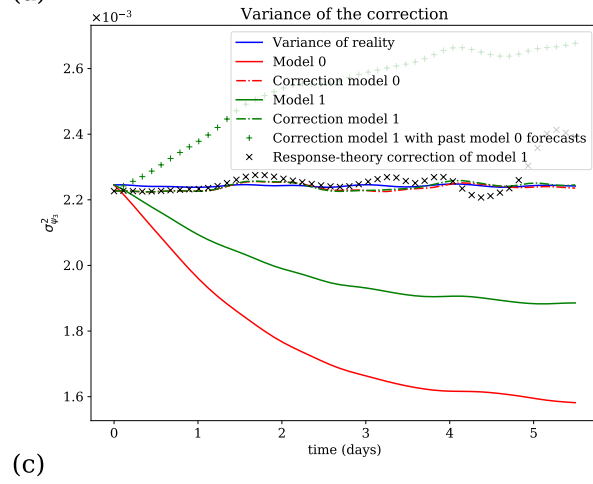
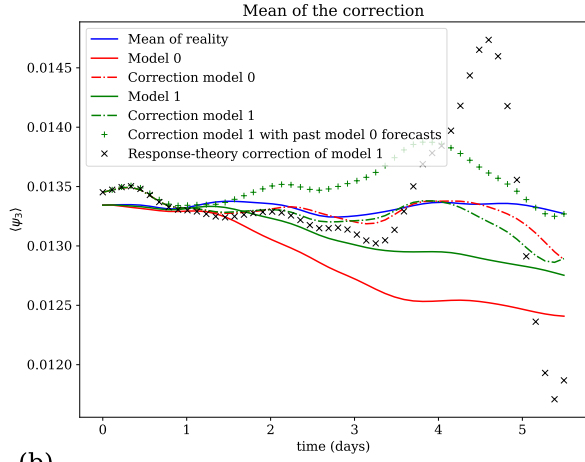
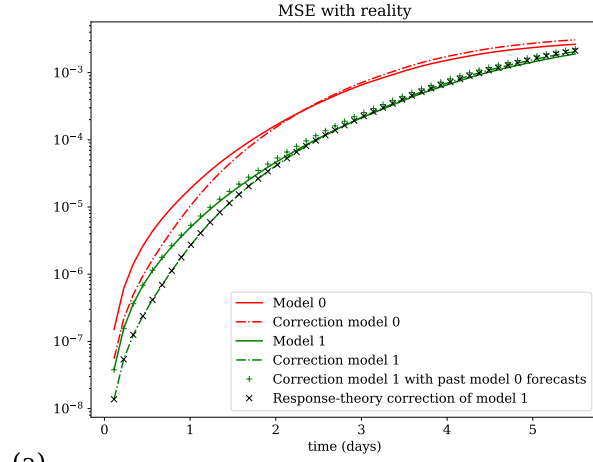
1.3.1 Corrections of the moments of the variable



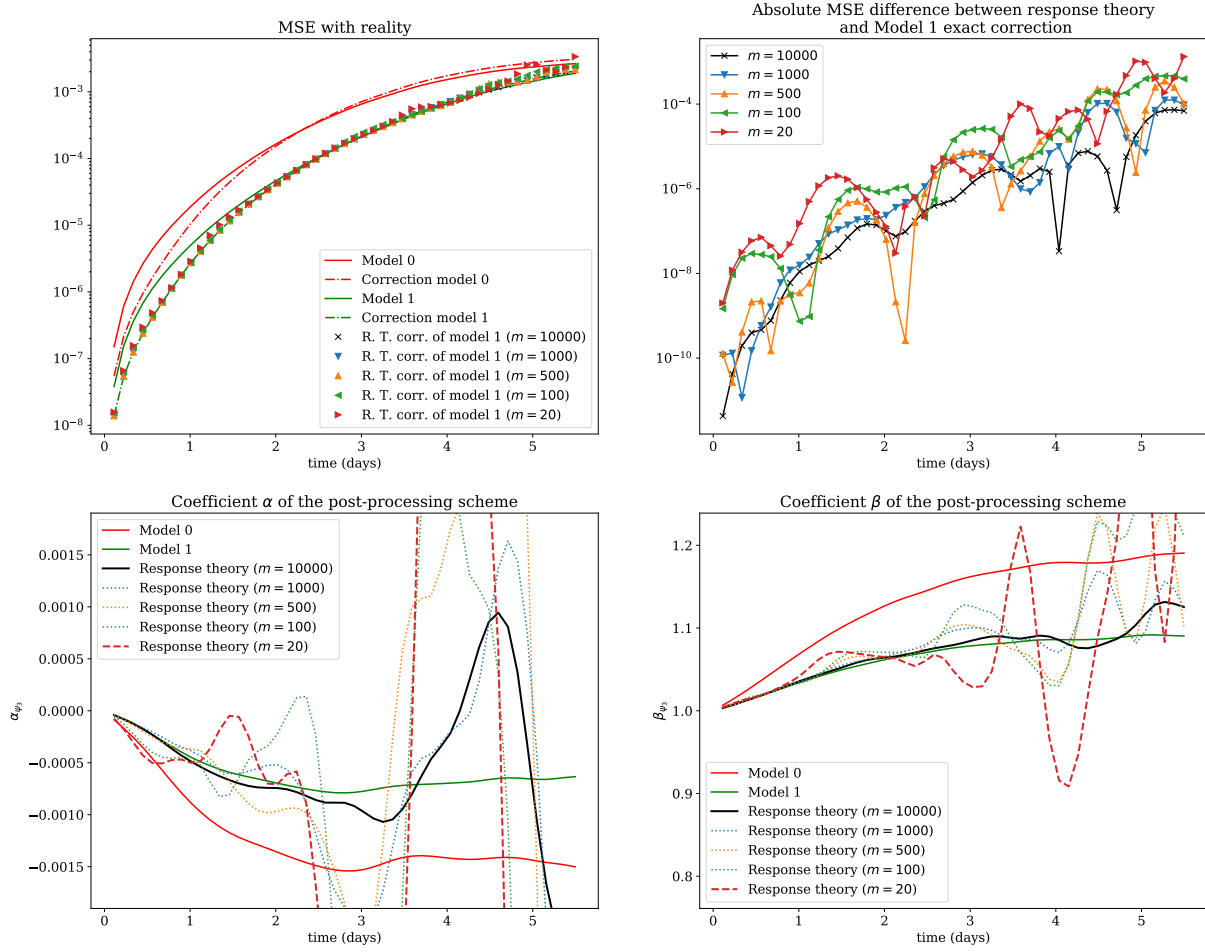
1.3.2 Corrections of the parameters α and β



1.3.3 Performance of the correction

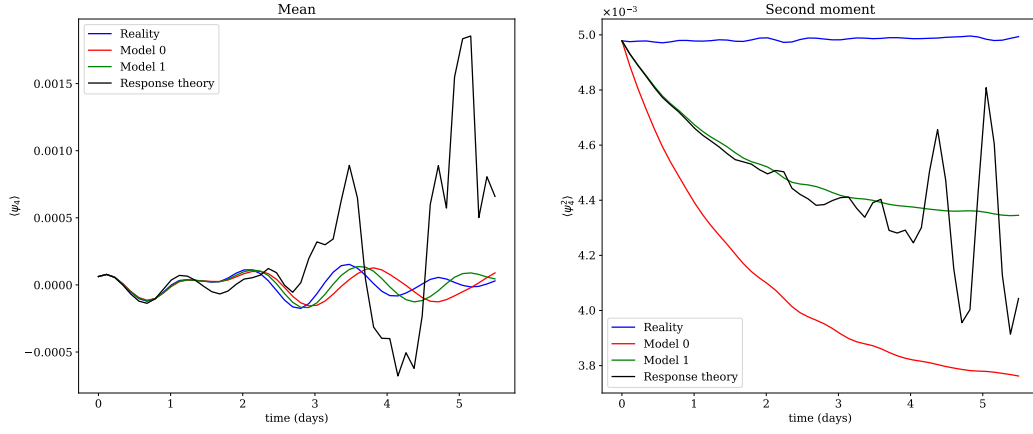


1.3.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

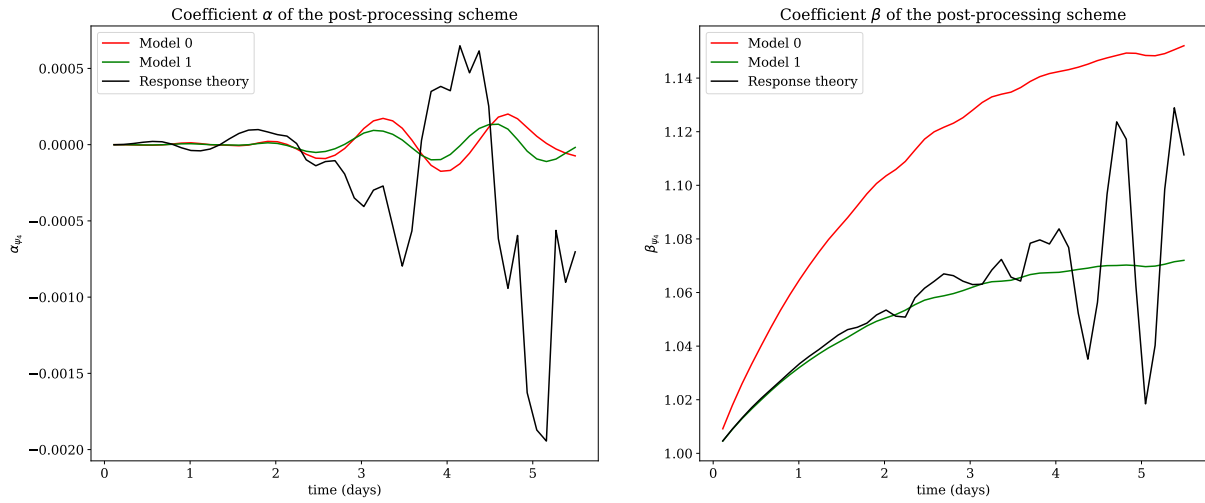


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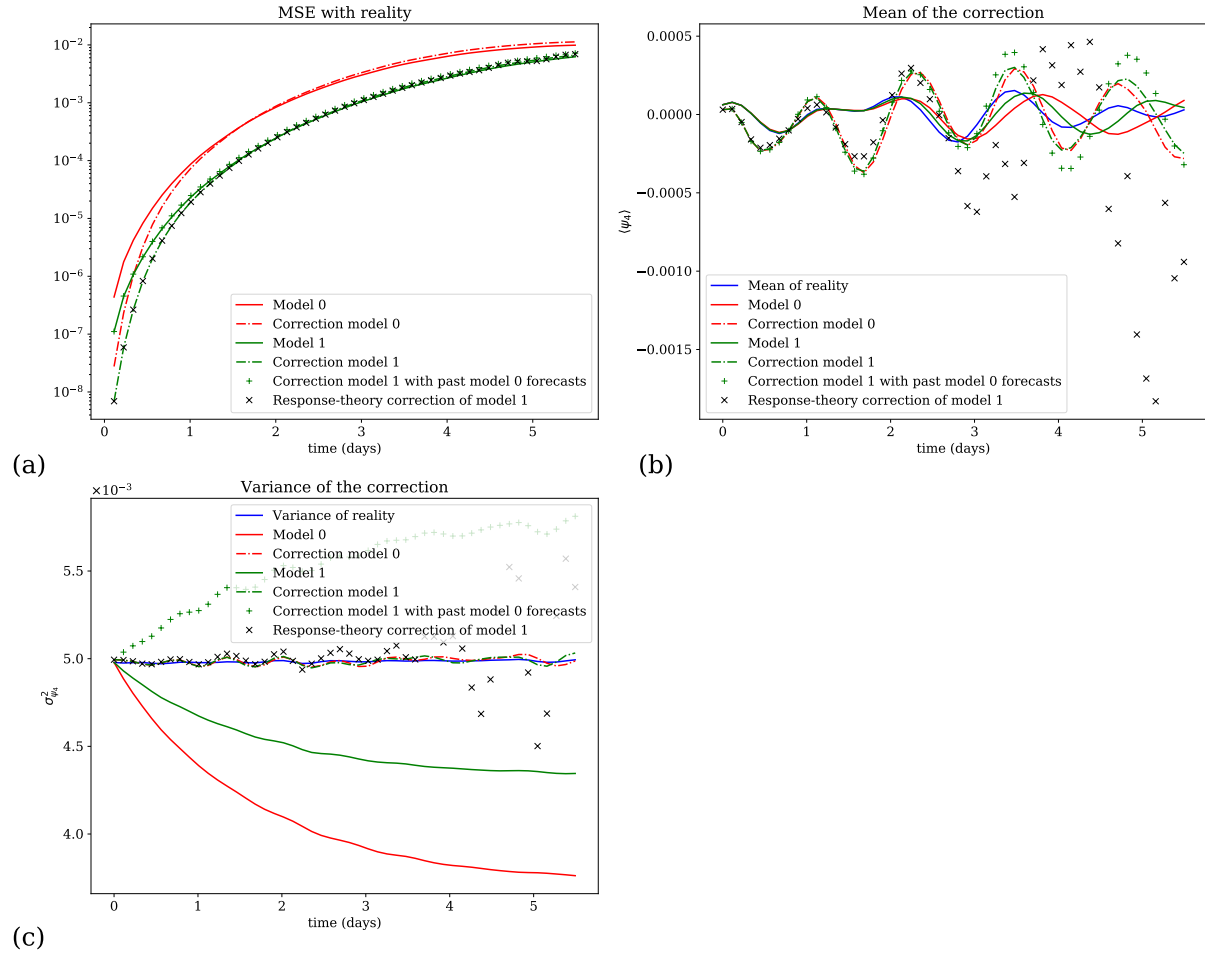
1.4.1 Corrections of the moments of the variable



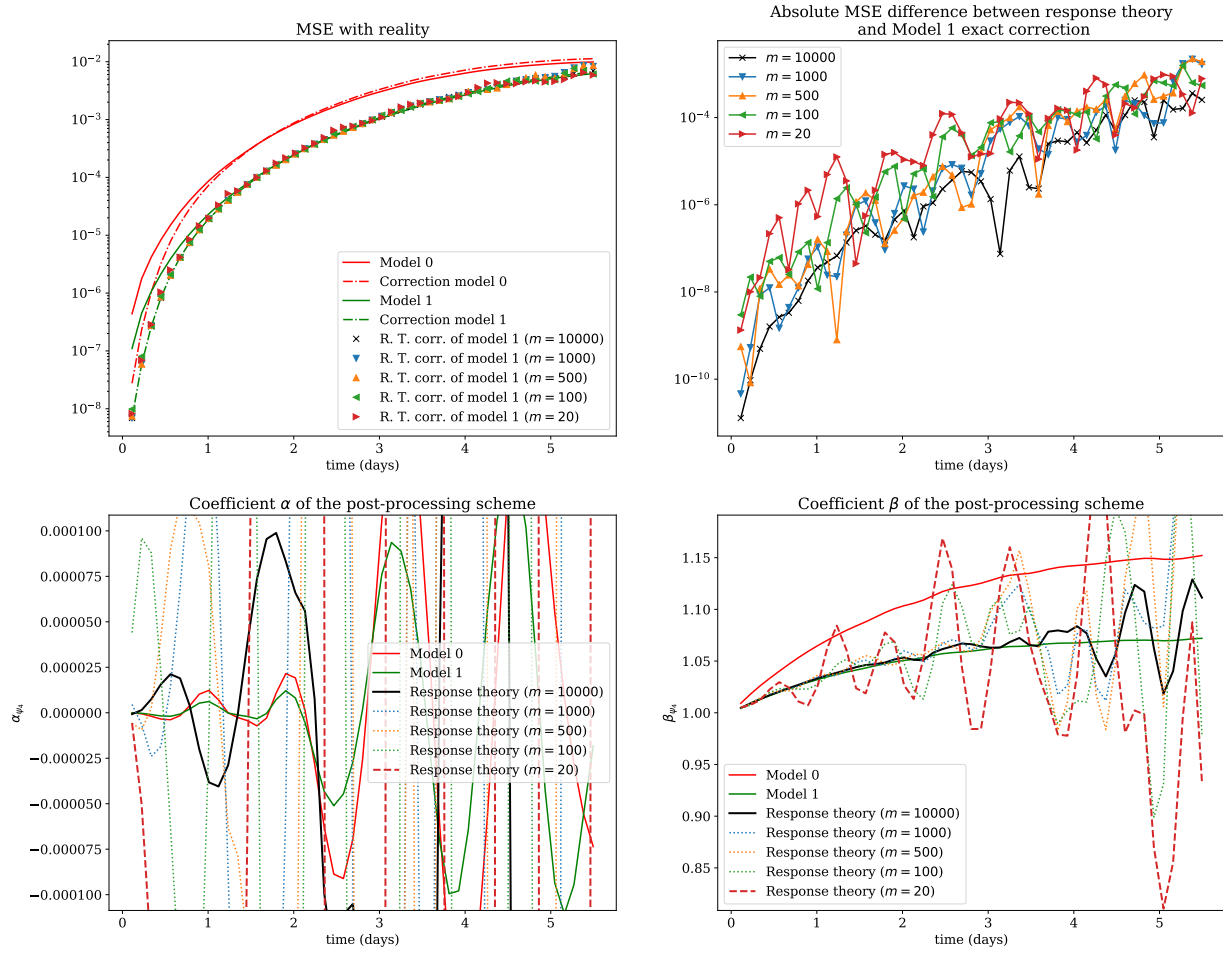
1.4.2 Corrections of the parameters α and β



1.4.3 Performance of the correction

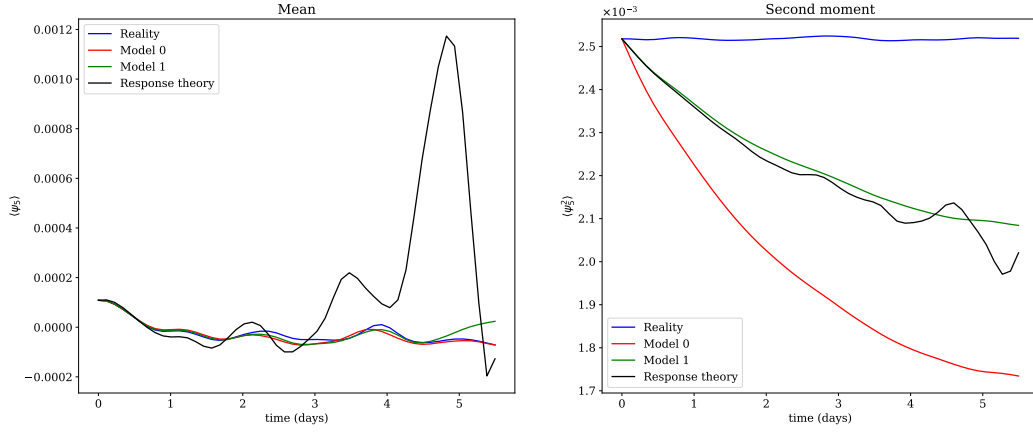


1.4.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

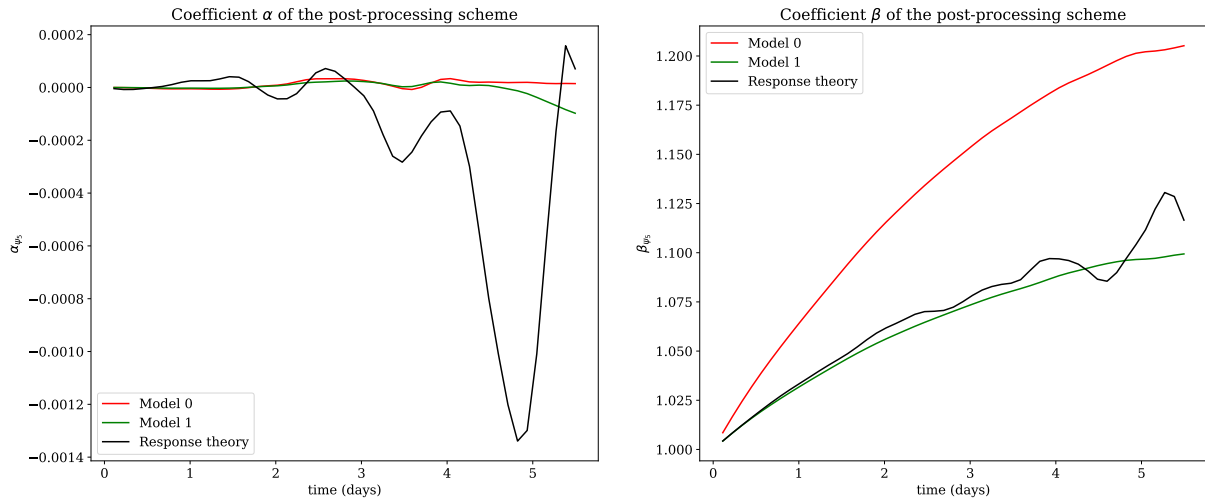


1.5 Variable ψ_5

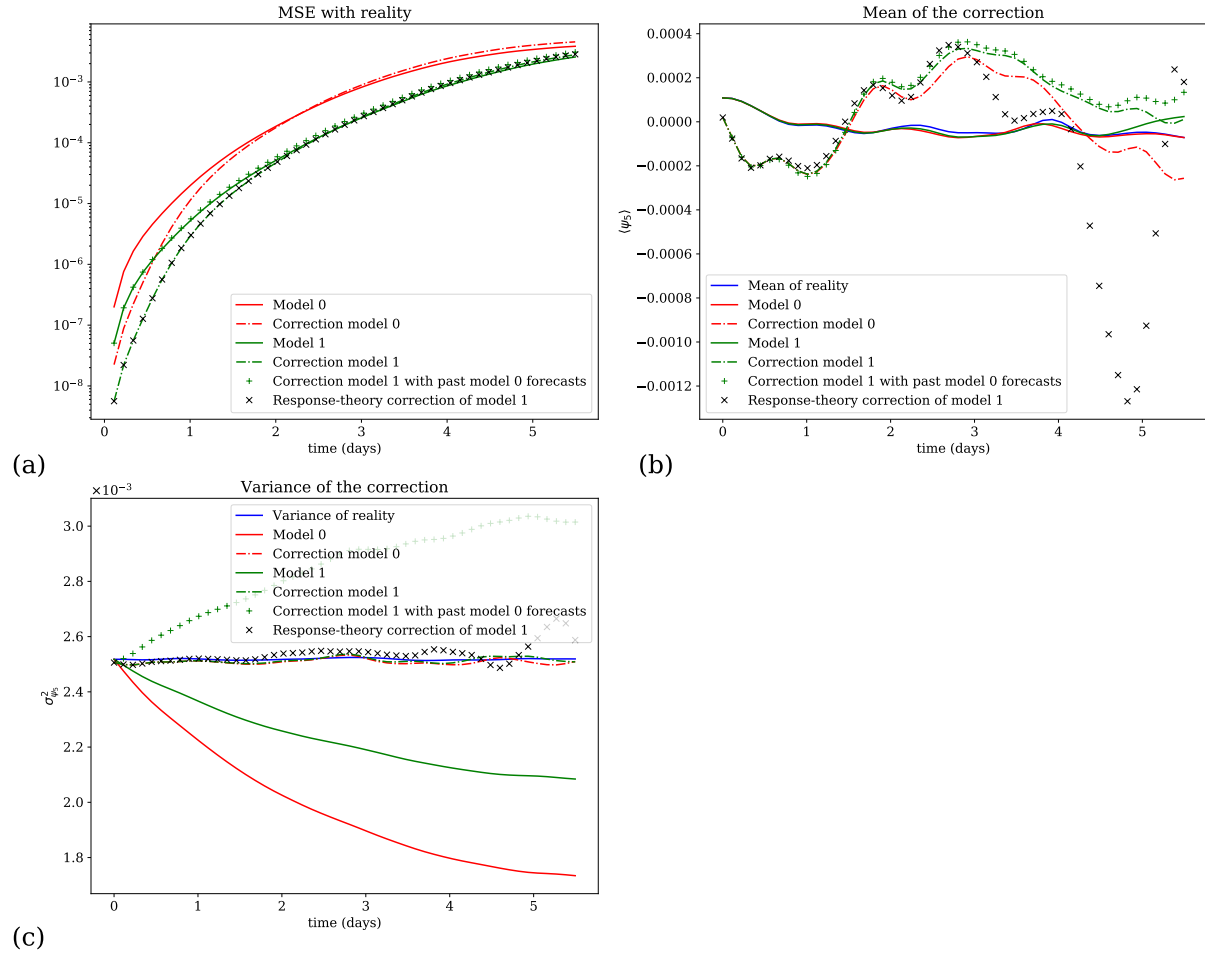
1.5.1 Corrections of the moments of the variable



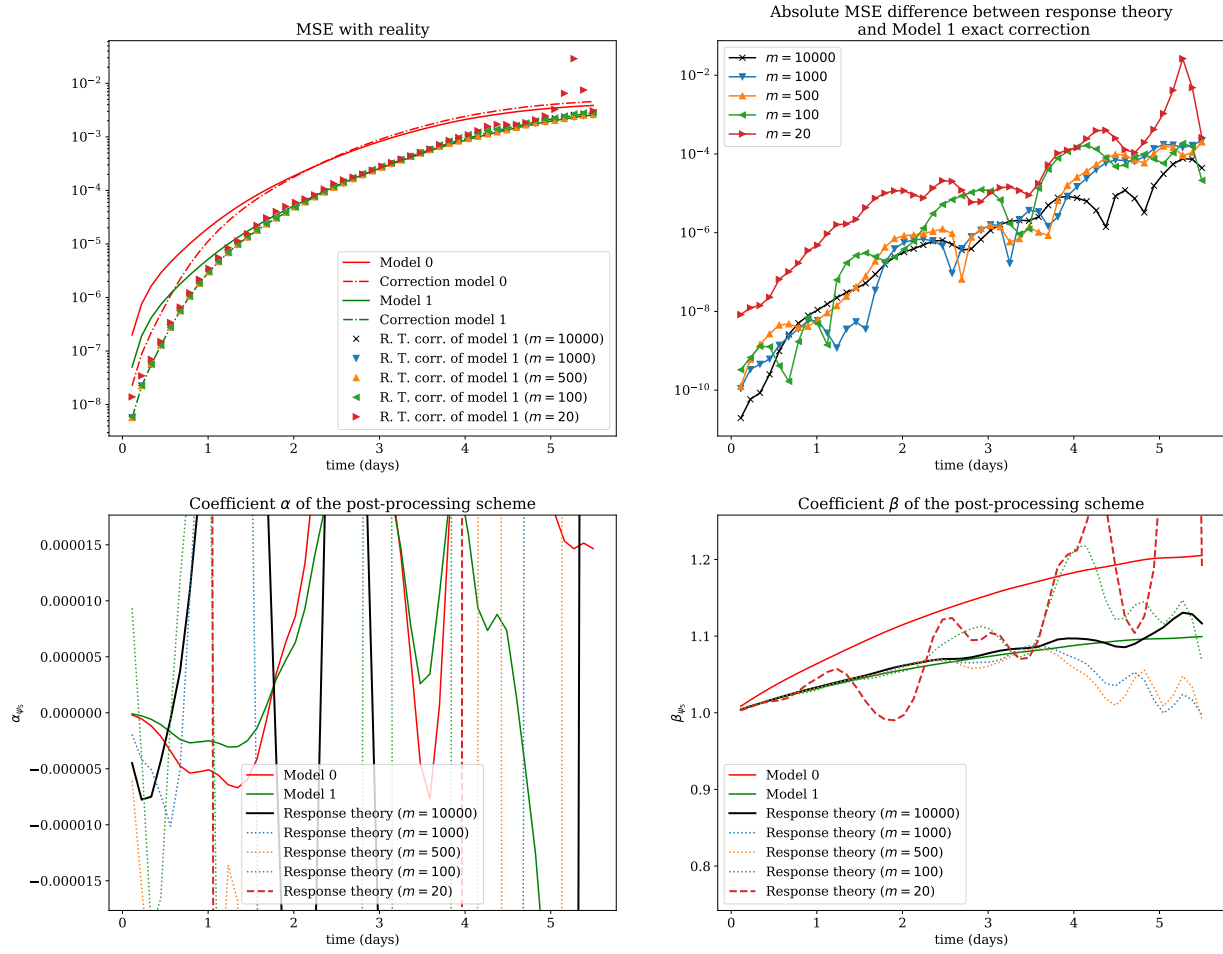
1.5.2 Corrections of the parameters α and β



1.5.3 Performance of the correction

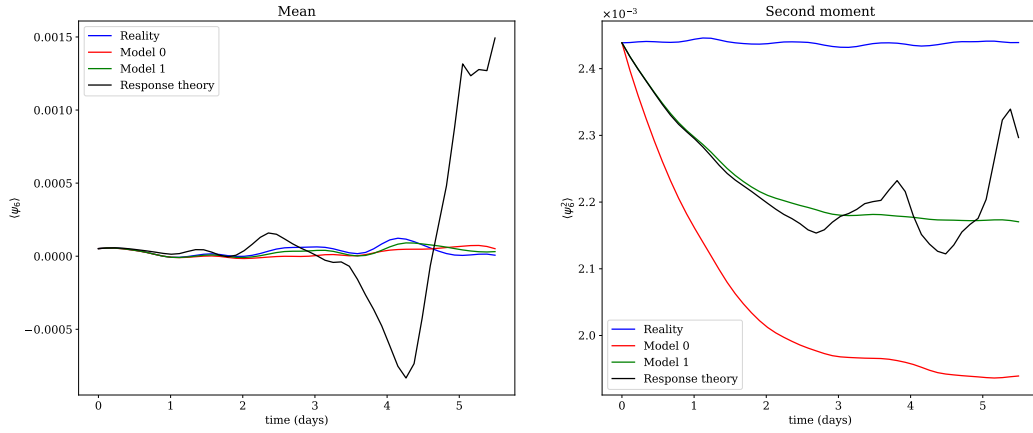


1.5.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

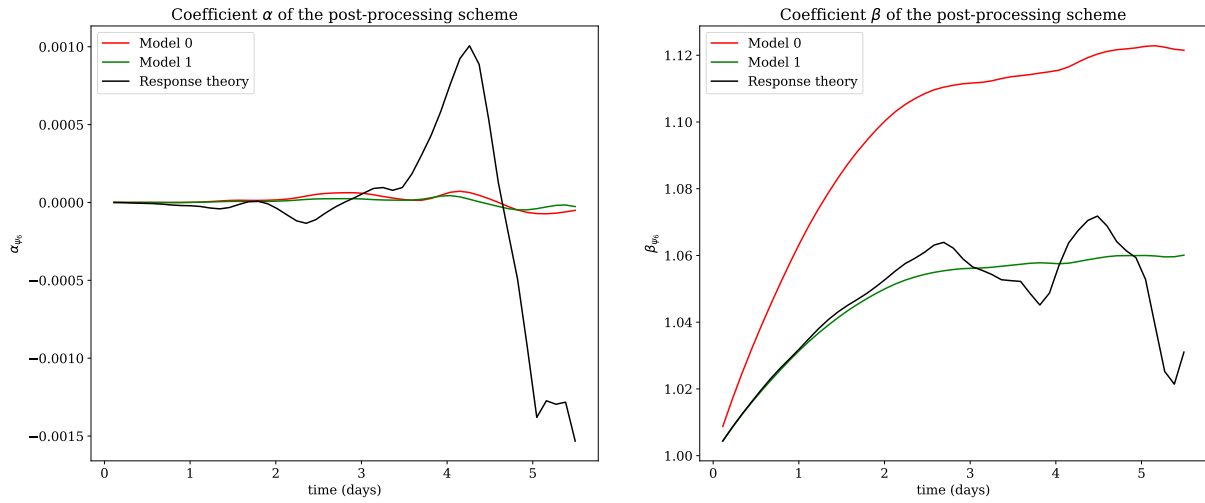


1.6 Variable ψ_6

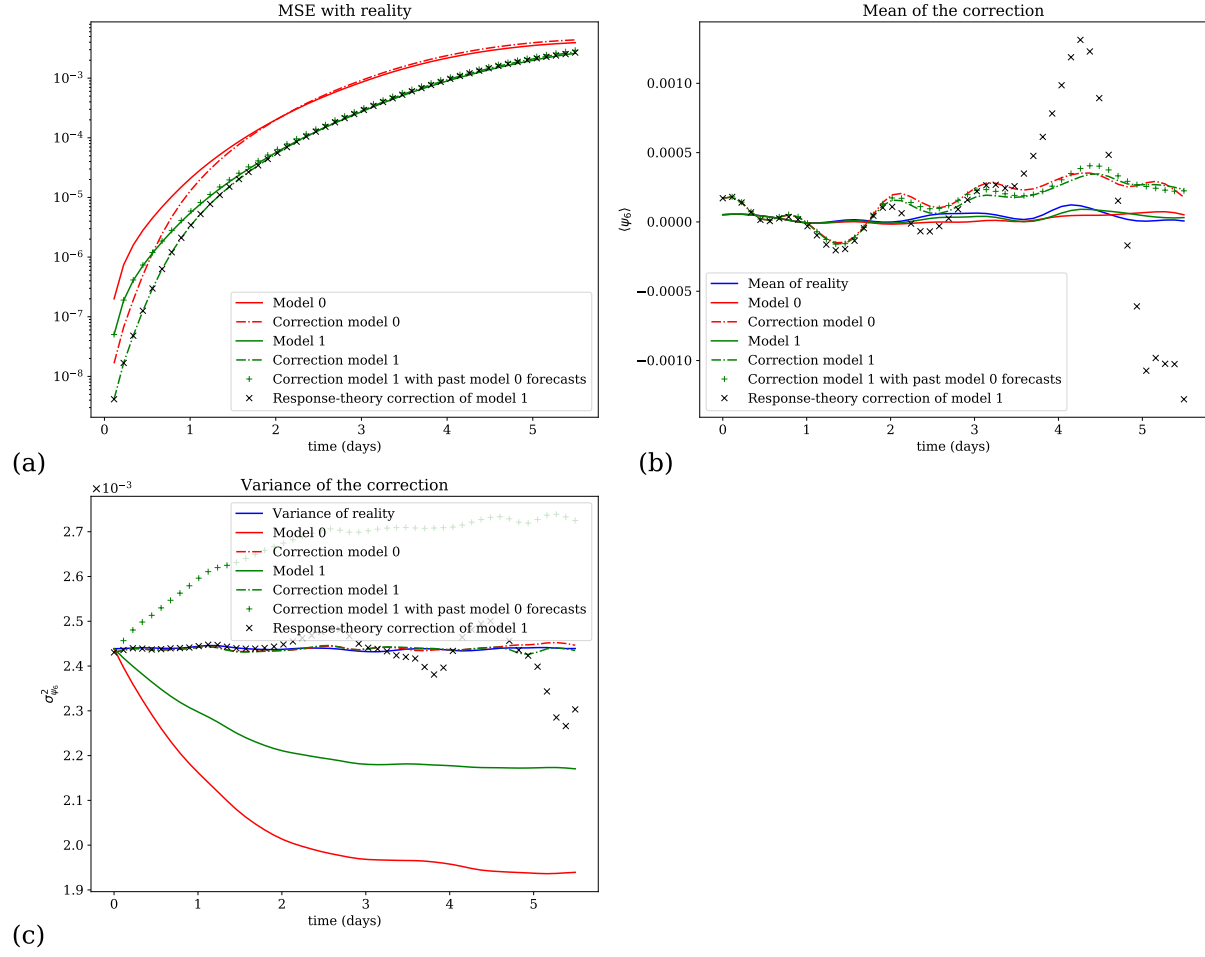
1.6.1 Corrections of the moments of the variable



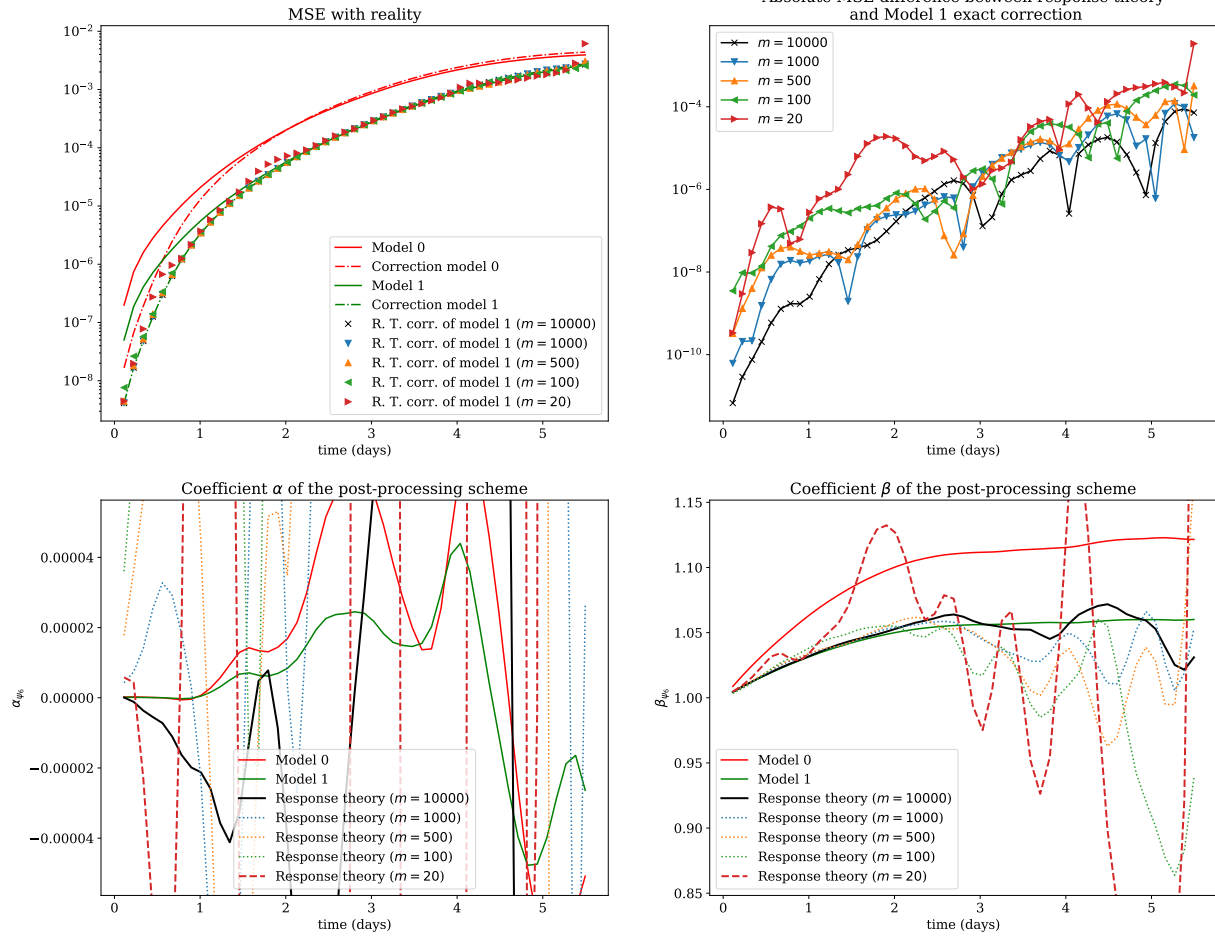
1.6.2 Corrections of the parameters α and β



1.6.3 Performance of the correction

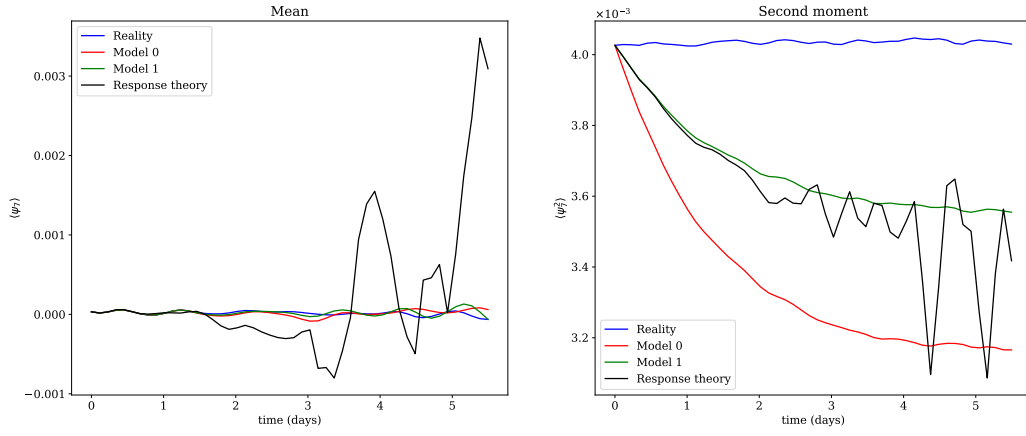


1.6.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

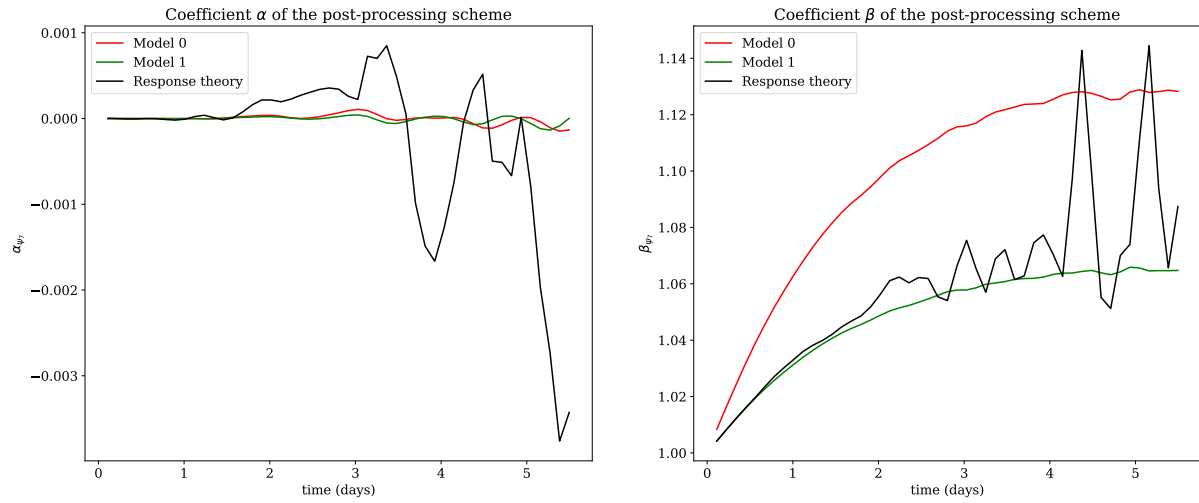


1.7 Variable ψ_7

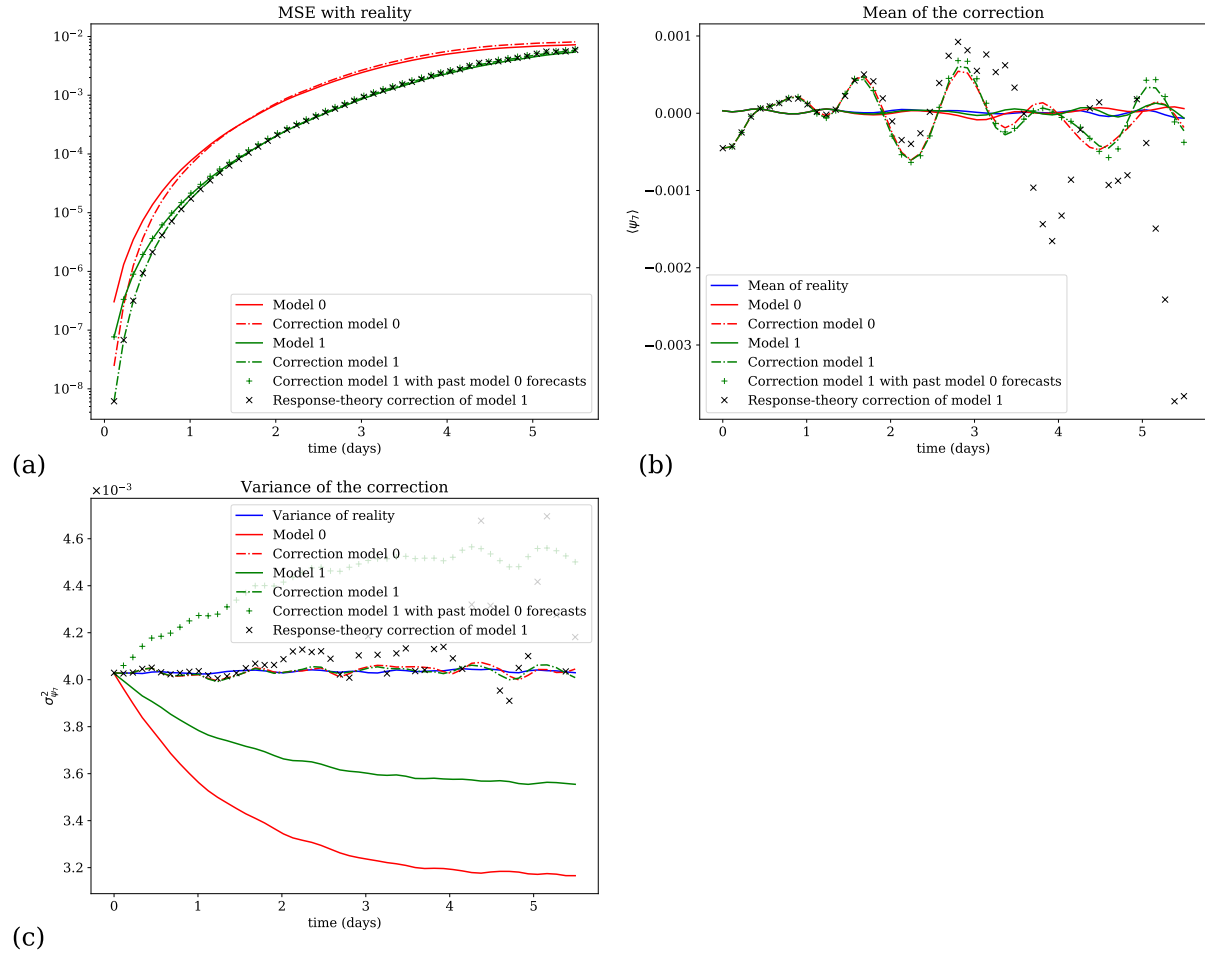
1.7.1 Corrections of the moments of the variable



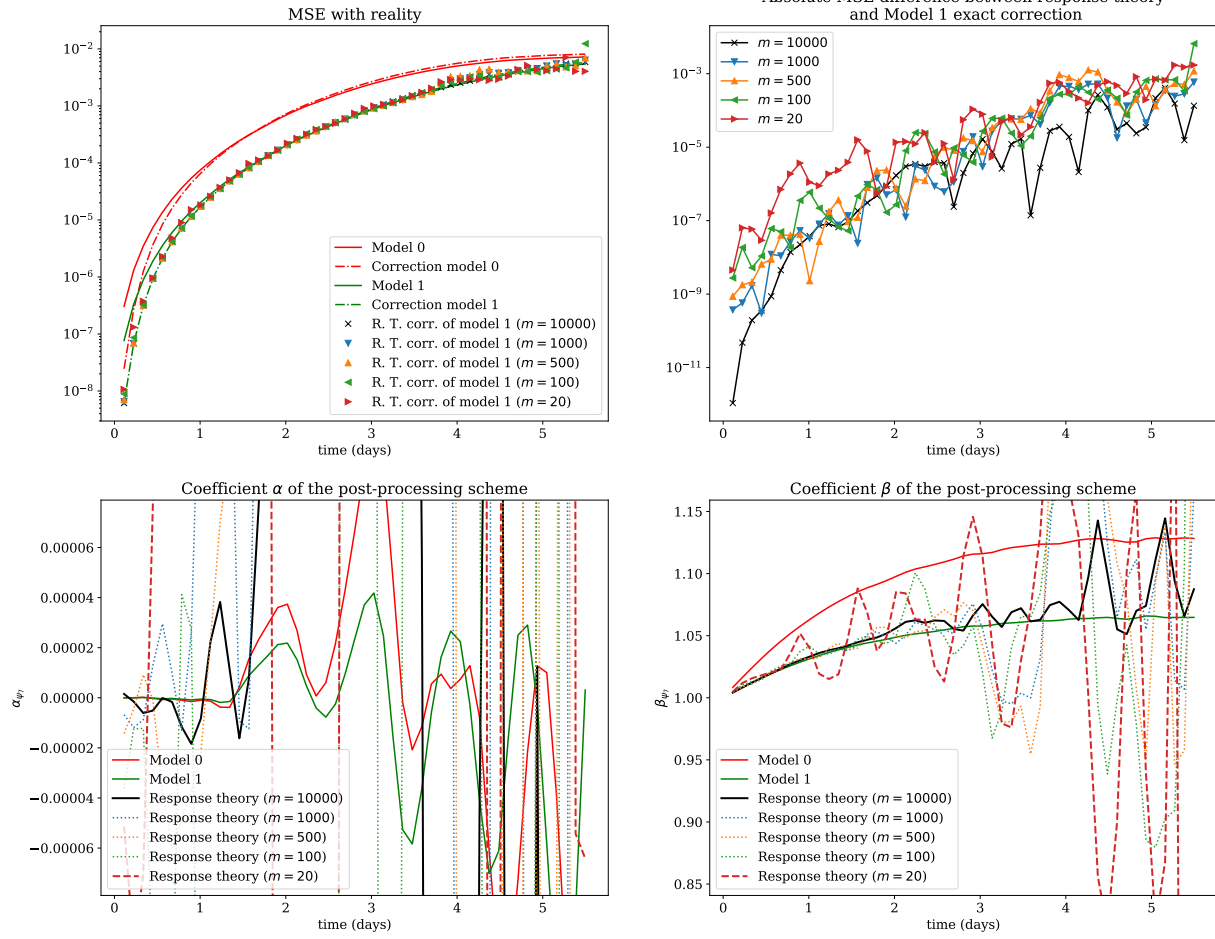
1.7.2 Corrections of the parameters α and β



1.7.3 Performance of the correction

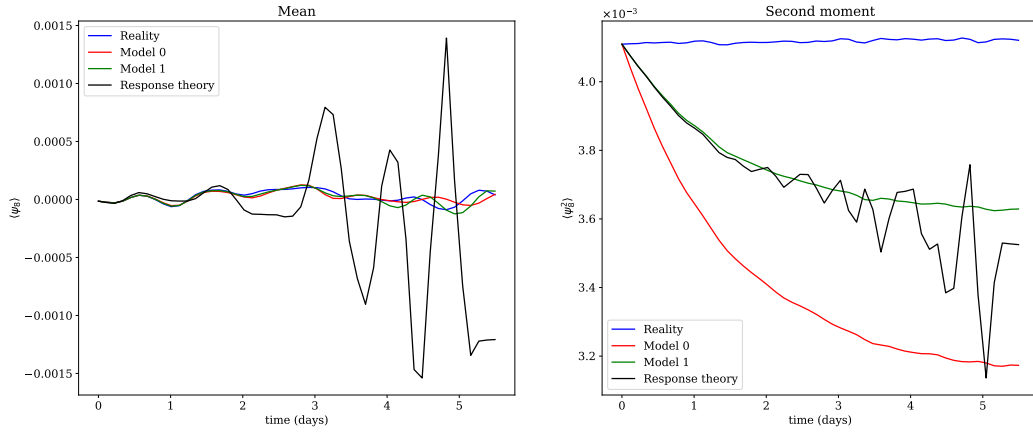


1.7.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

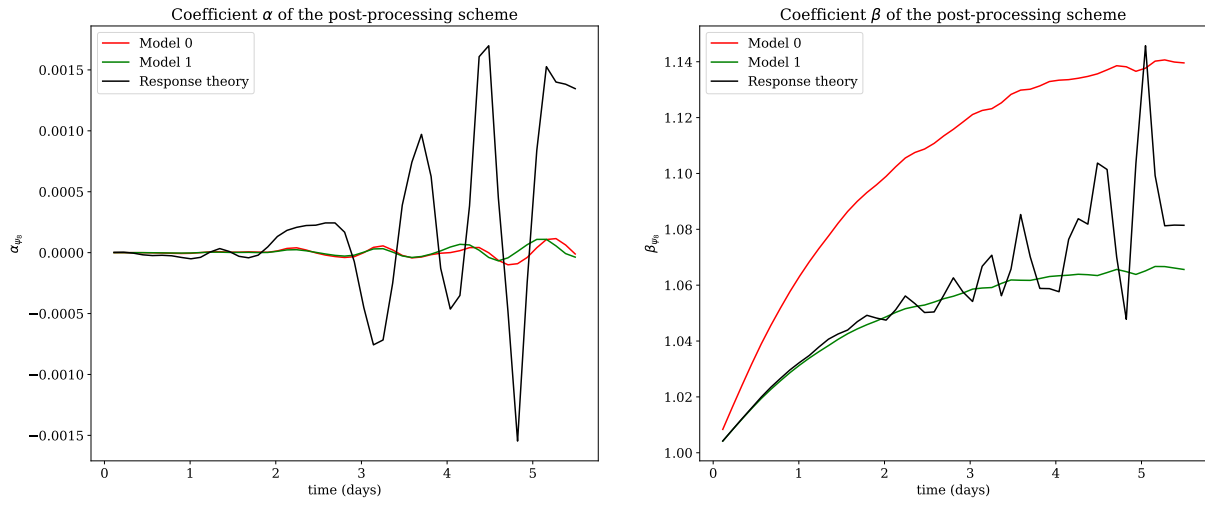


1.8 Variable ψ_8

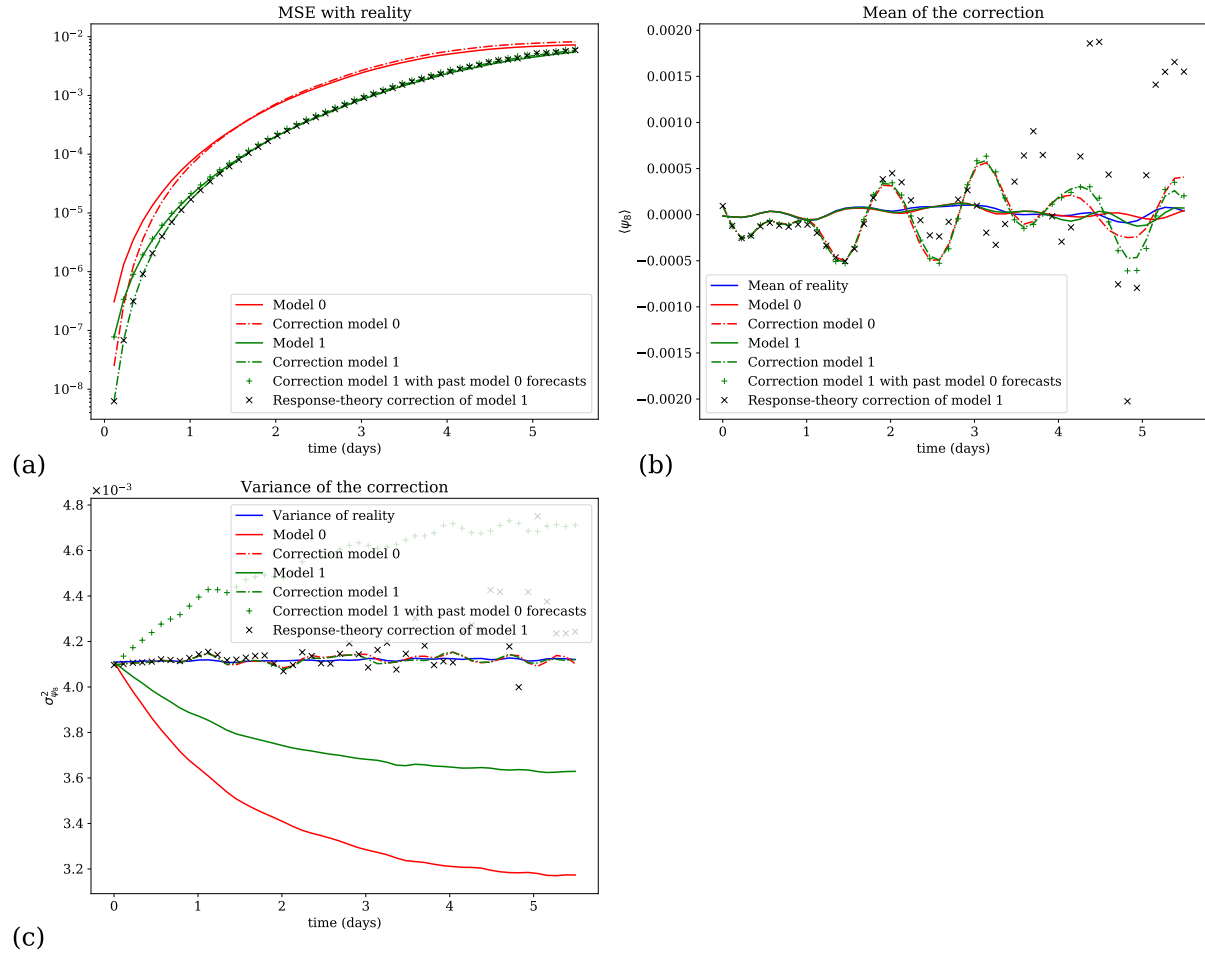
1.8.1 Corrections of the moments of the variable



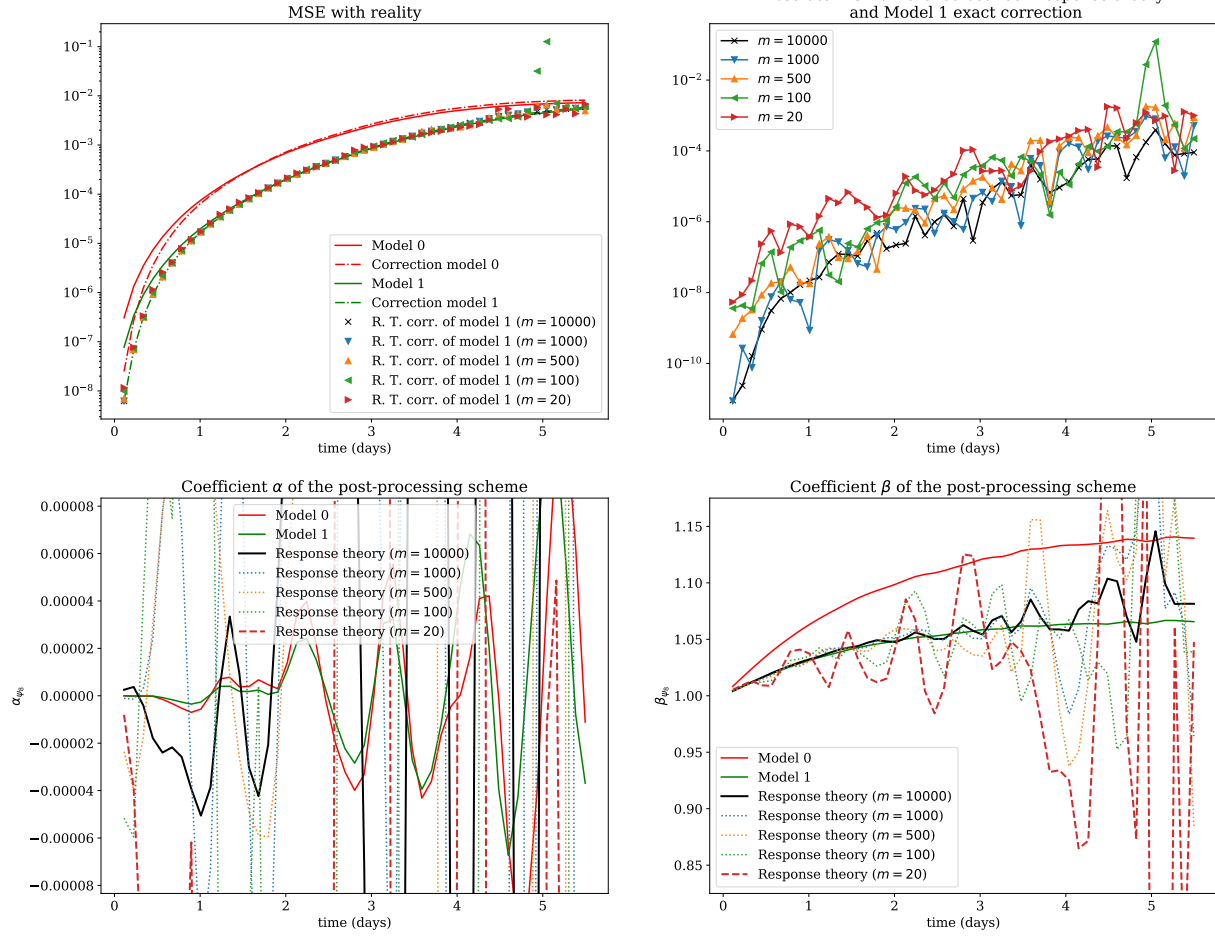
1.8.2 Corrections of the parameters α and β



1.8.3 Performance of the correction

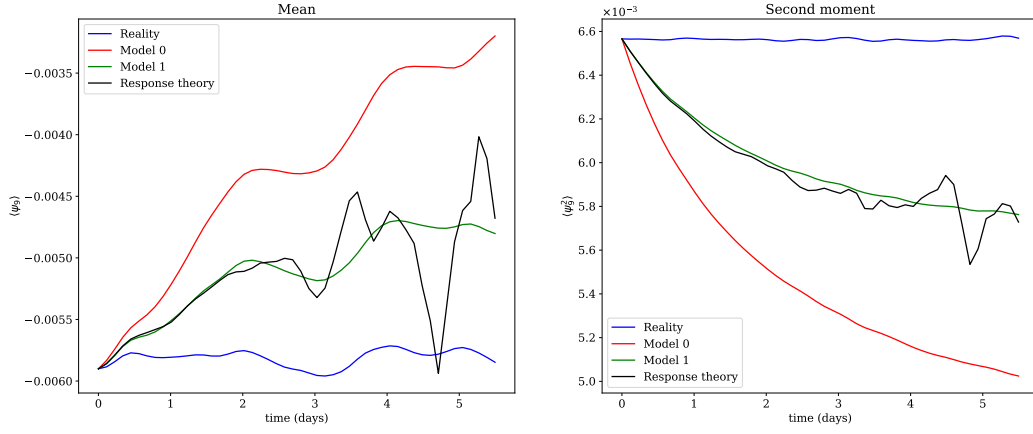


1.8.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

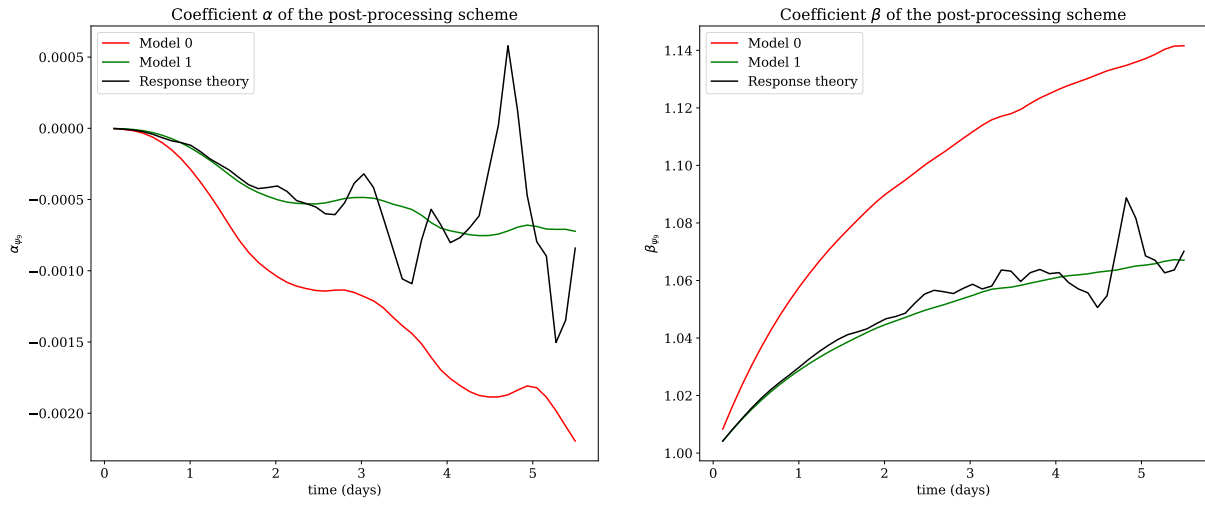


1.9 Variable ψ_9

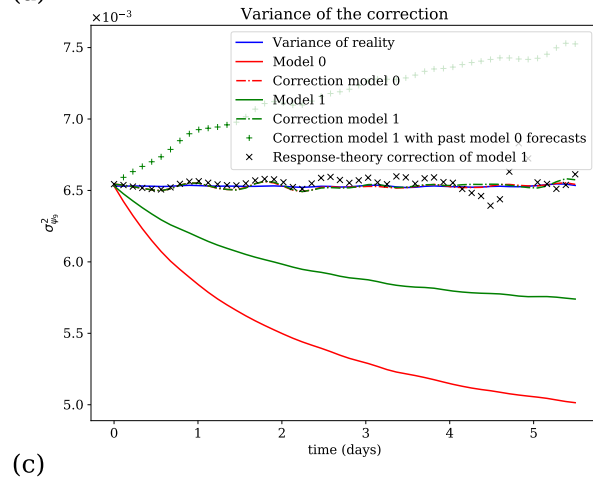
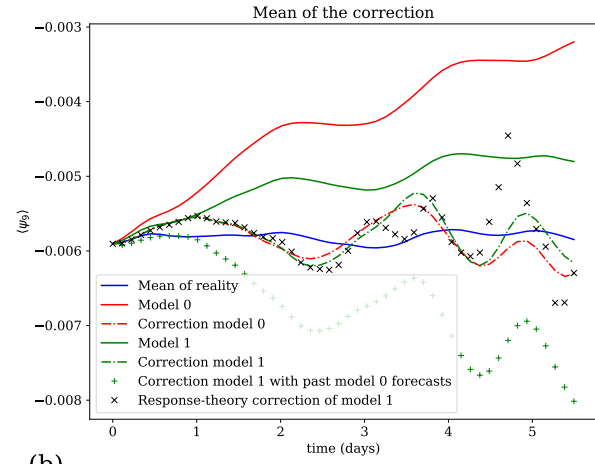
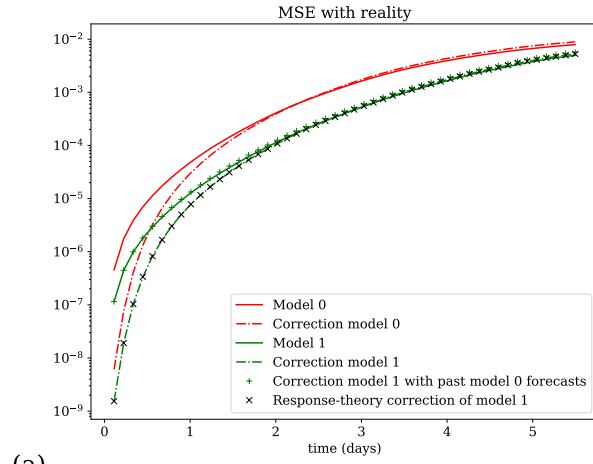
1.9.1 Corrections of the moments of the variable



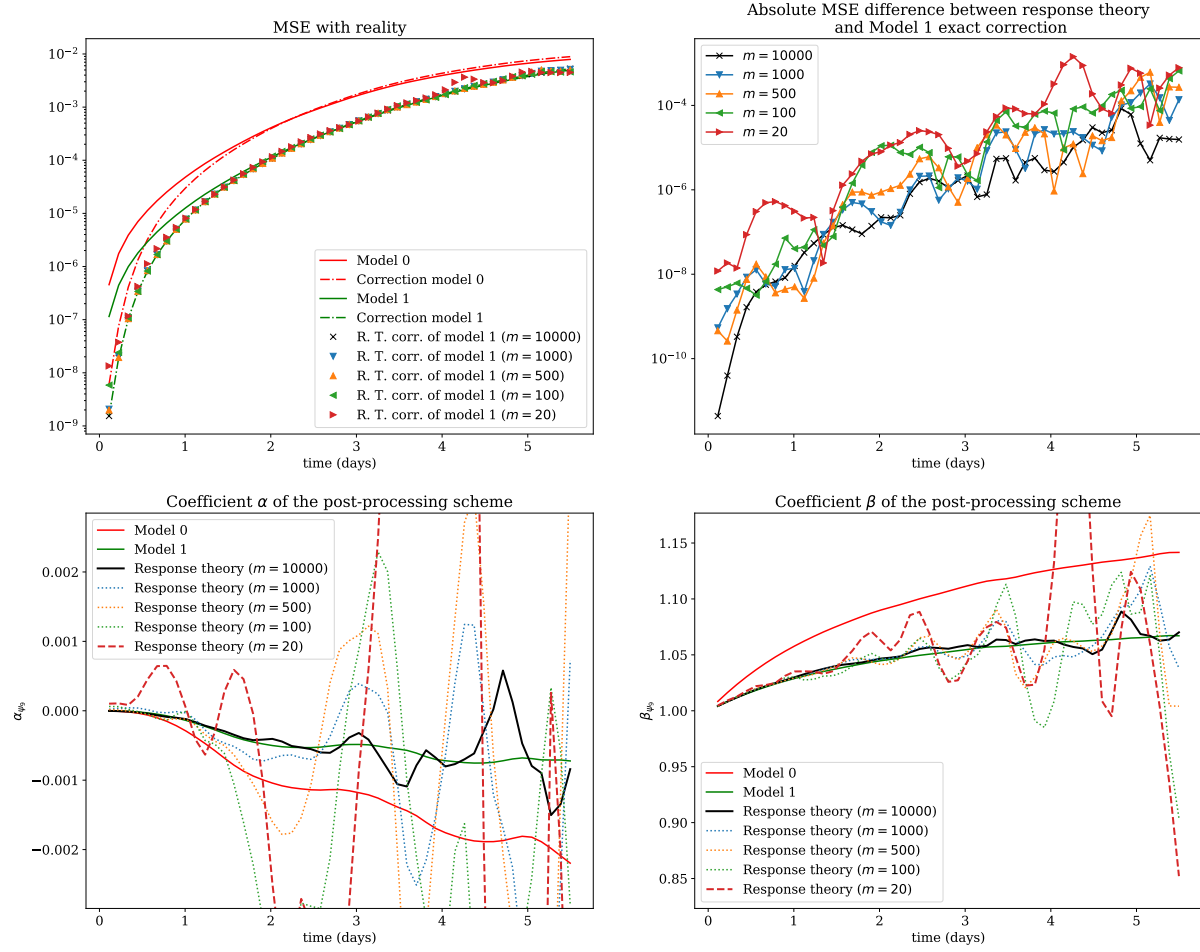
1.9.2 Corrections of the parameters α and β



1.9.3 Performance of the correction

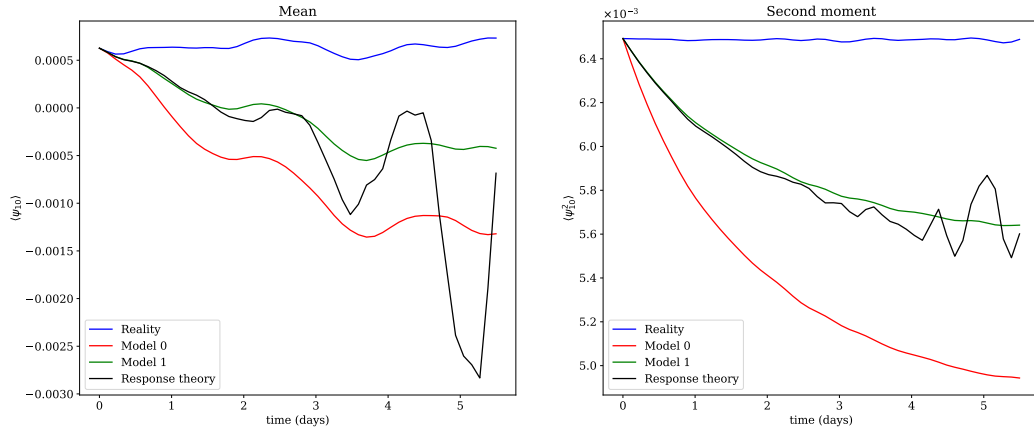


1.9.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

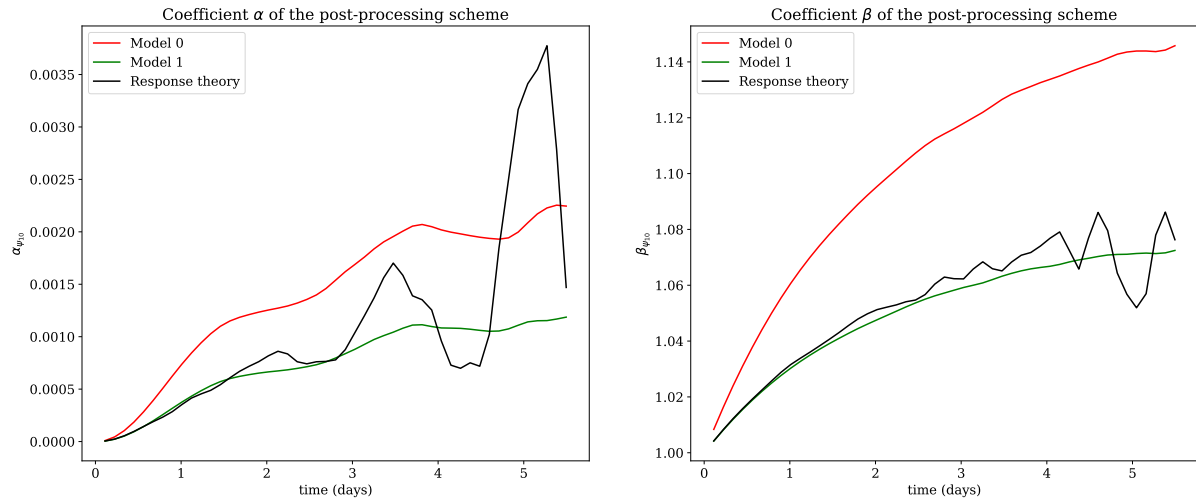


1.10 Variable ψ_{10}

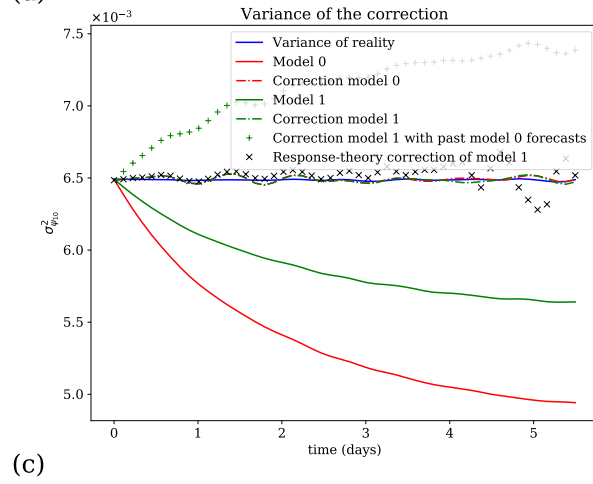
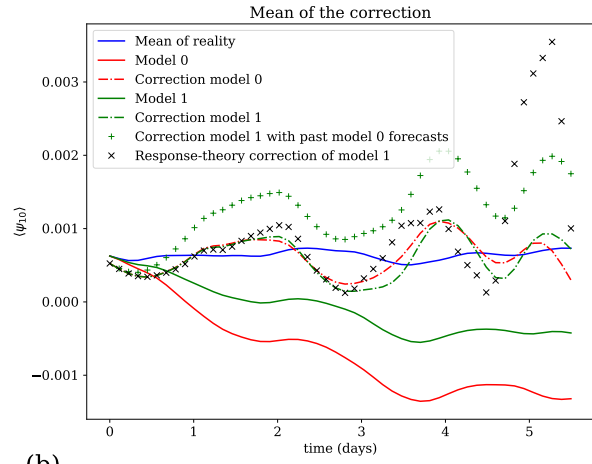
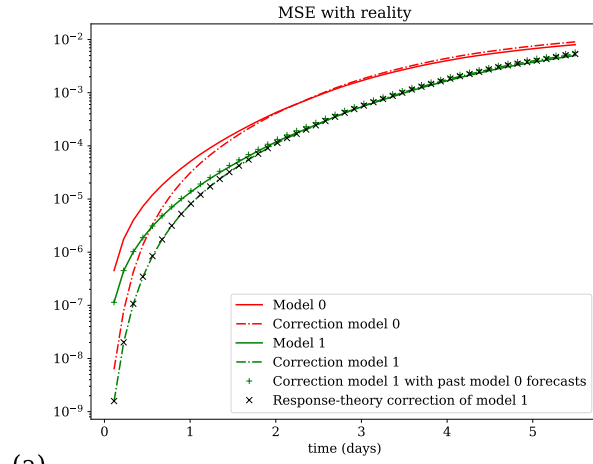
1.10.1 Corrections of the moments of the variable



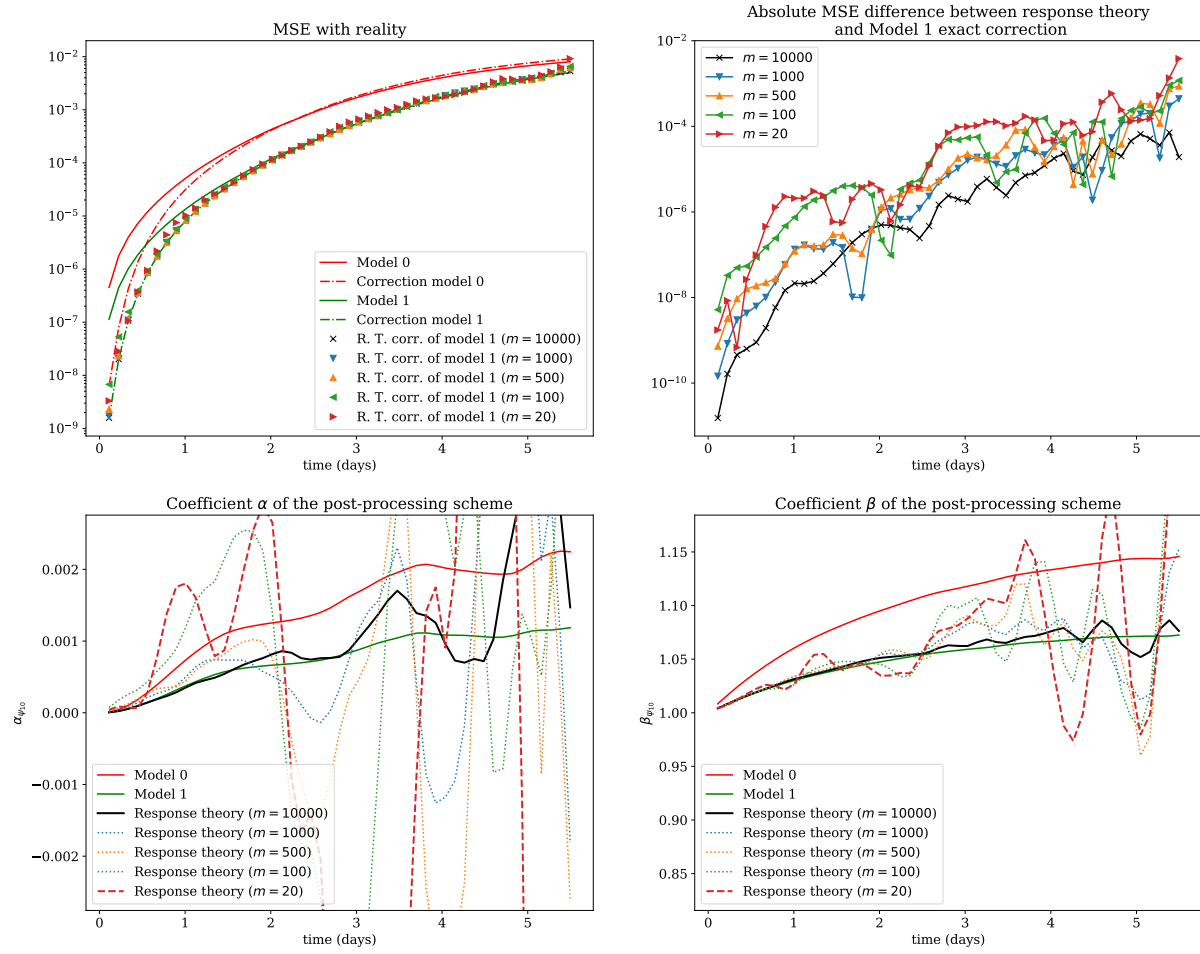
1.10.2 Corrections of the parameters α and β



1.10.3 Performance of the correction

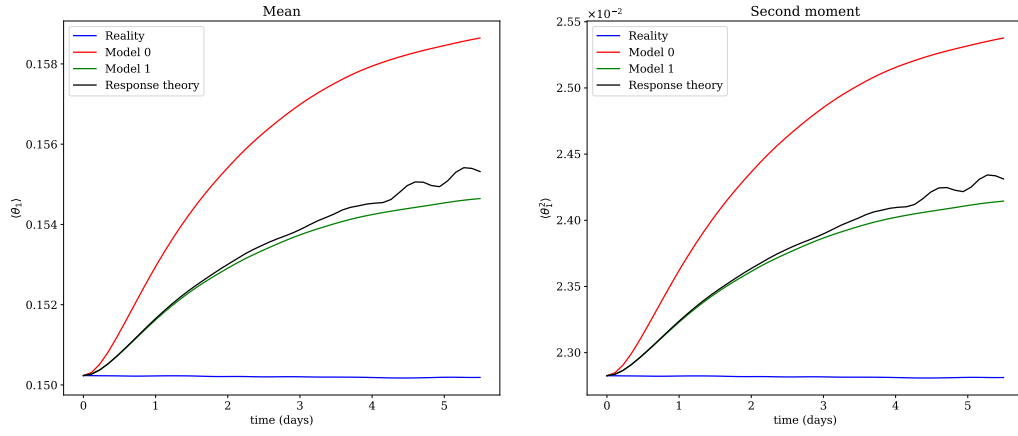


1.10.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

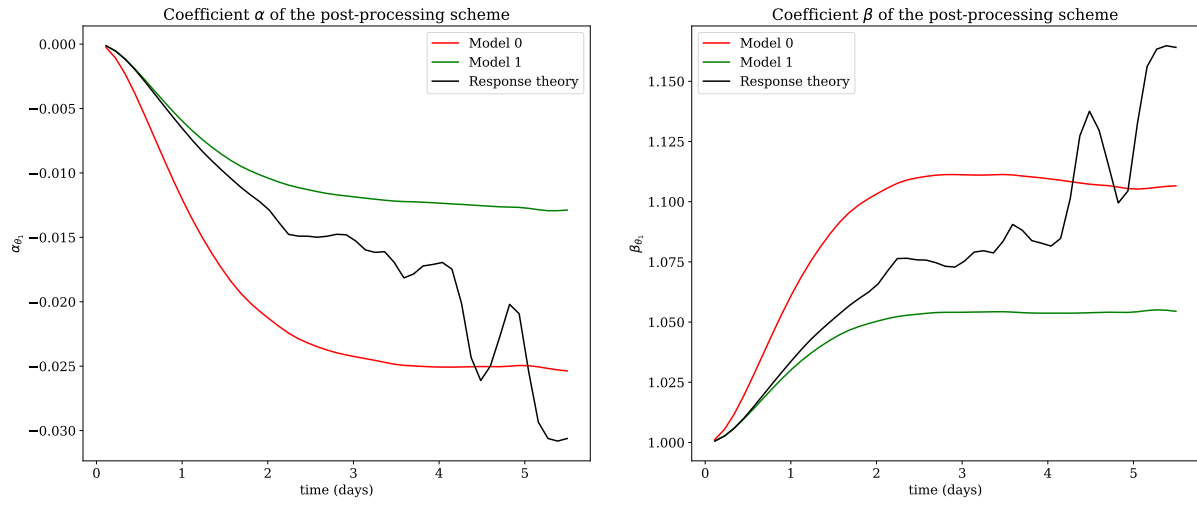


1.11 Variable θ_1

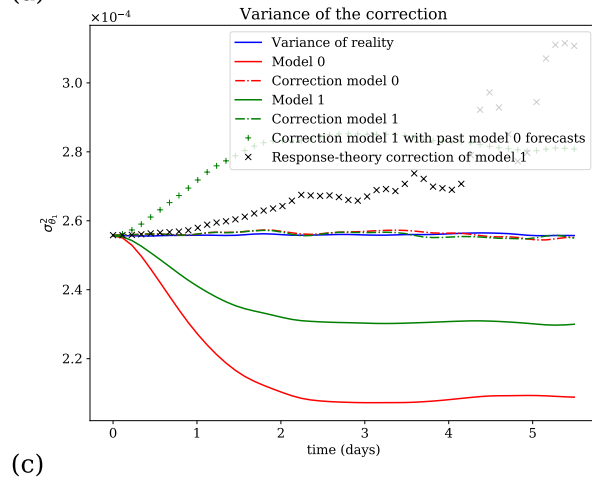
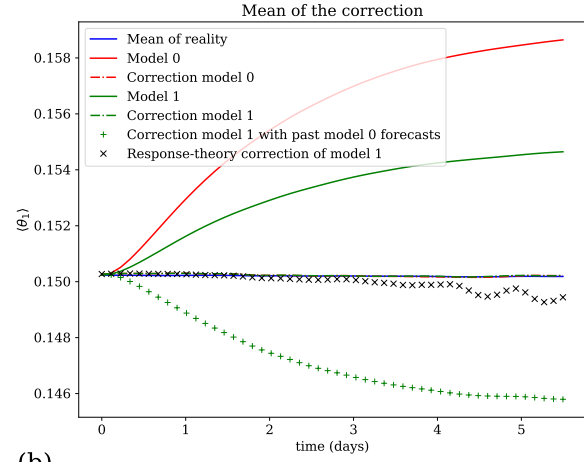
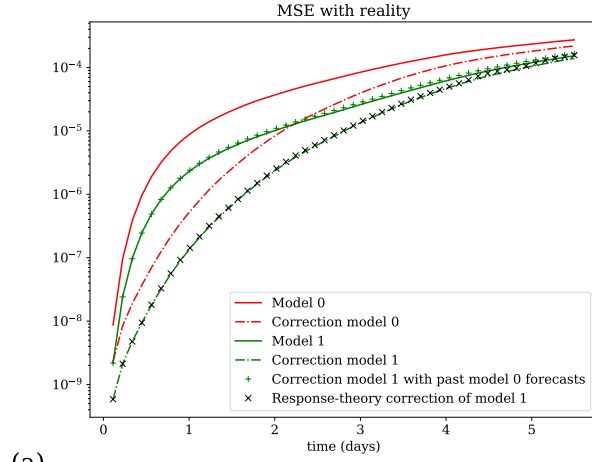
1.11.1 Corrections of the moments of the variable



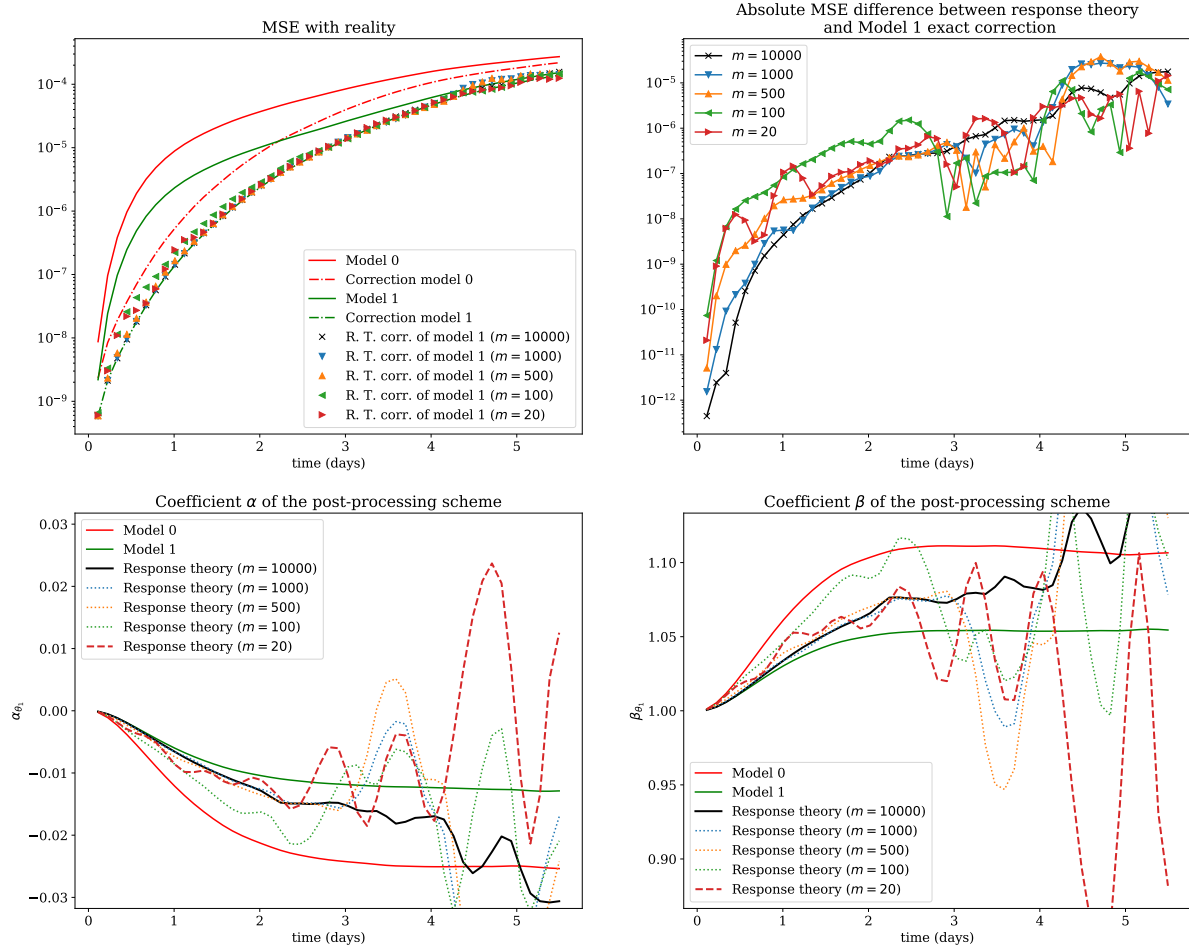
1.11.2 Corrections of the parameters α and β



1.11.3 Performance of the correction

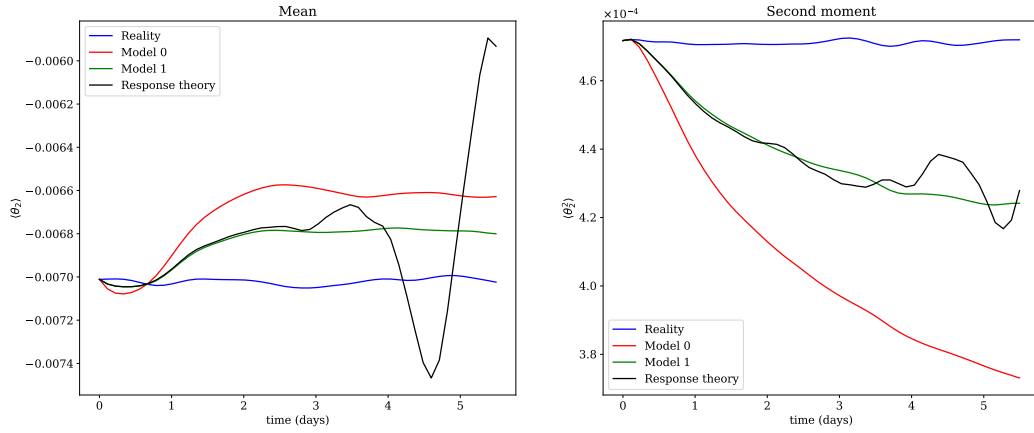


1.11.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

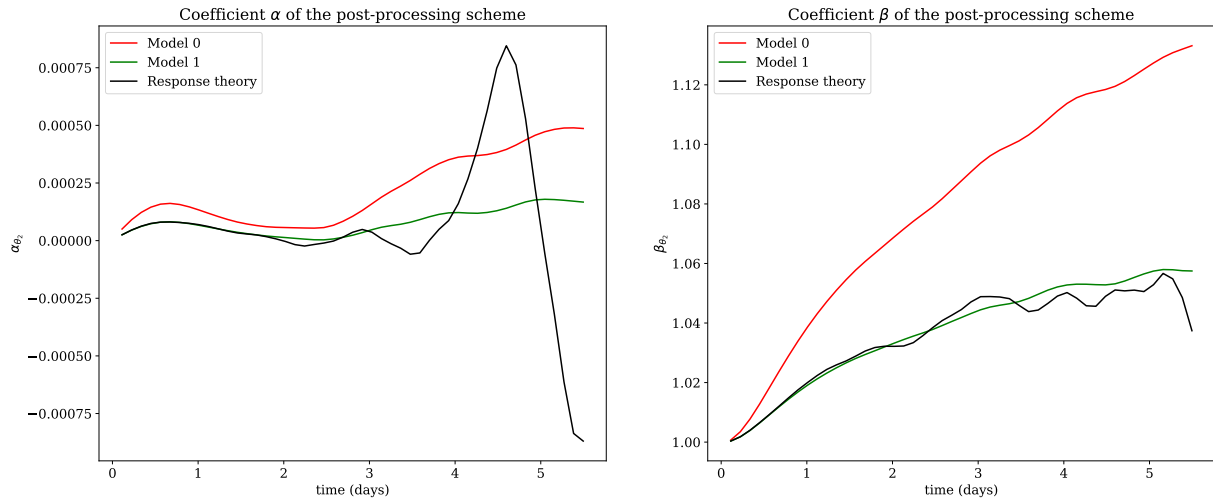


1.12 Variable θ_2

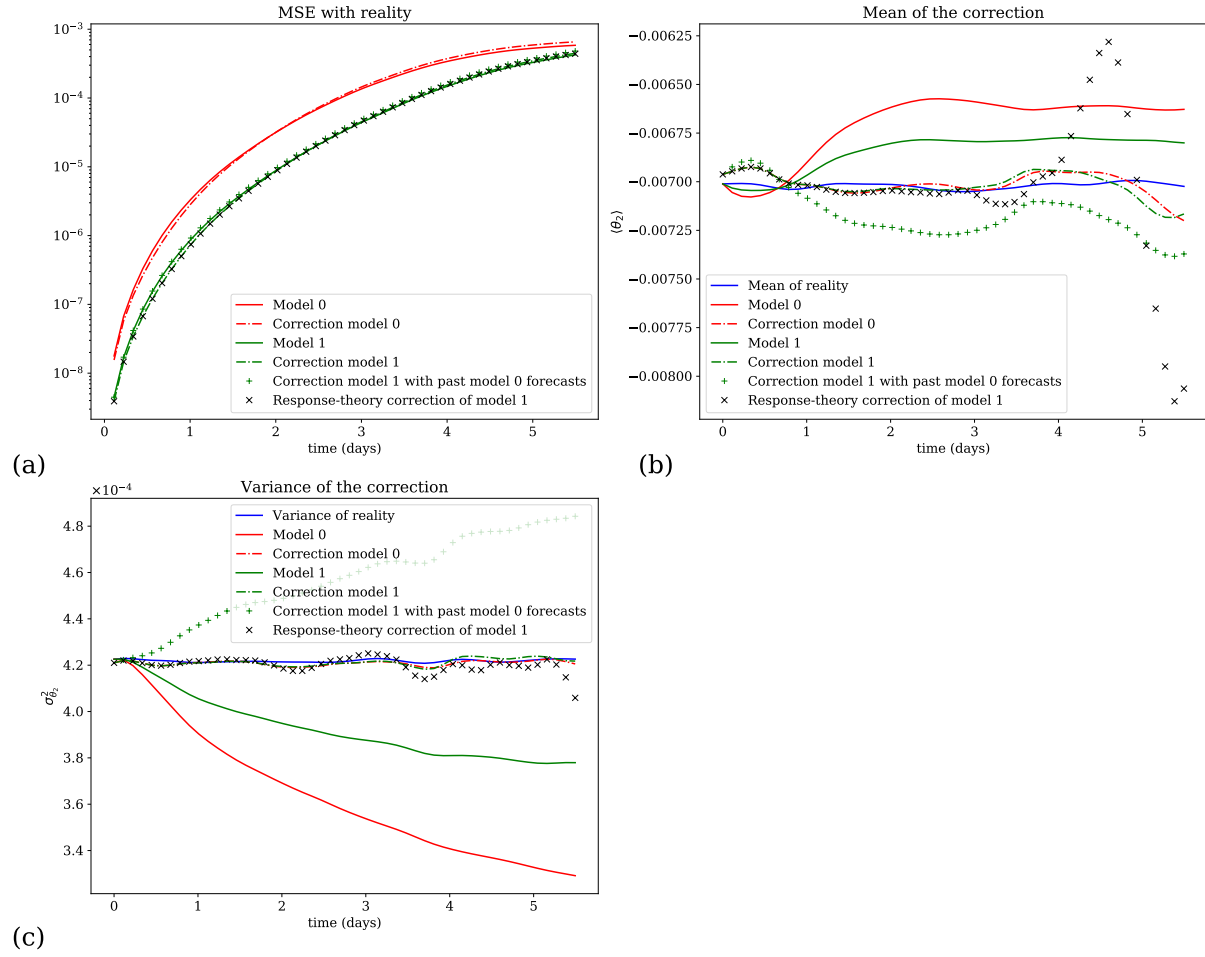
1.12.1 Corrections of the moments of the variable



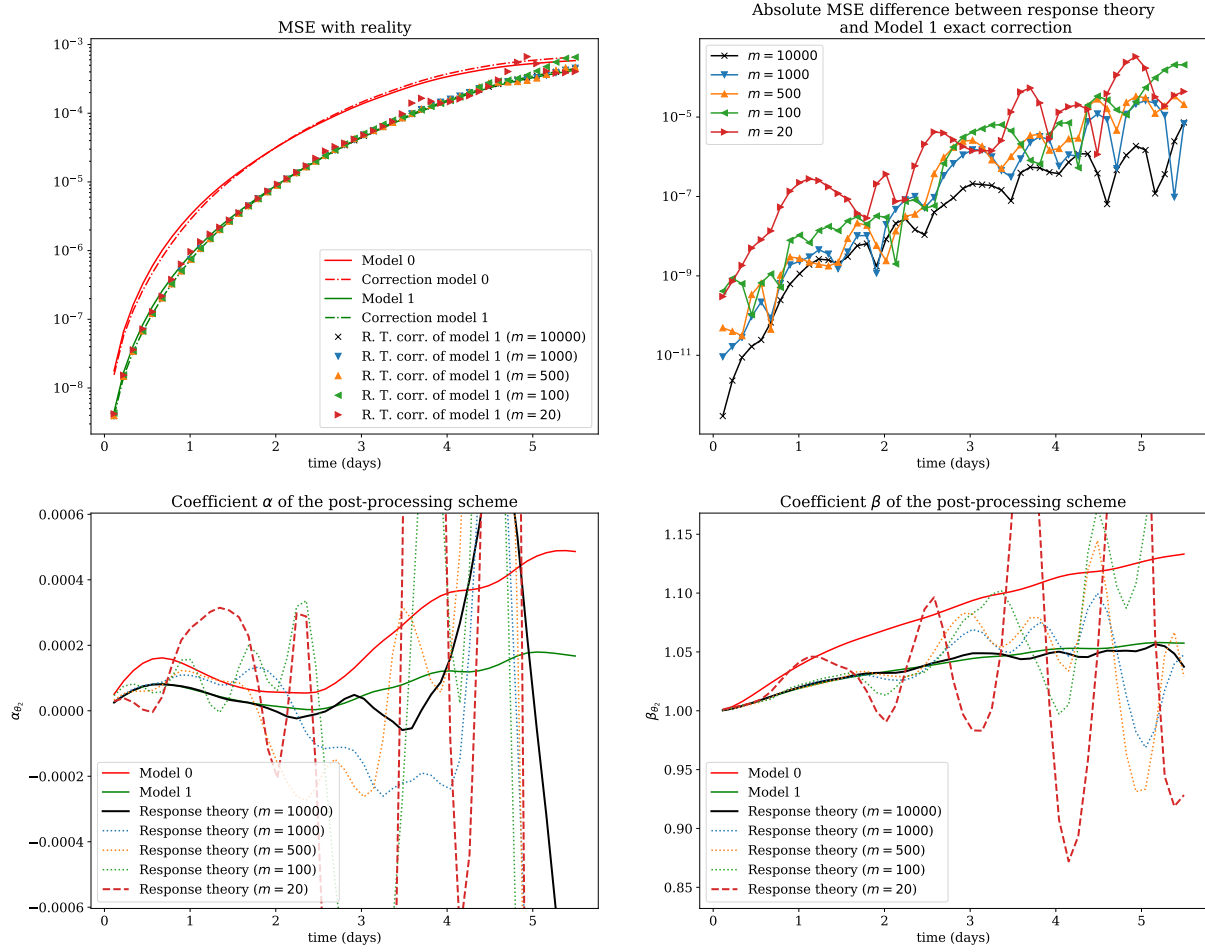
1.12.2 Corrections of the parameters α and β



1.12.3 Performance of the correction

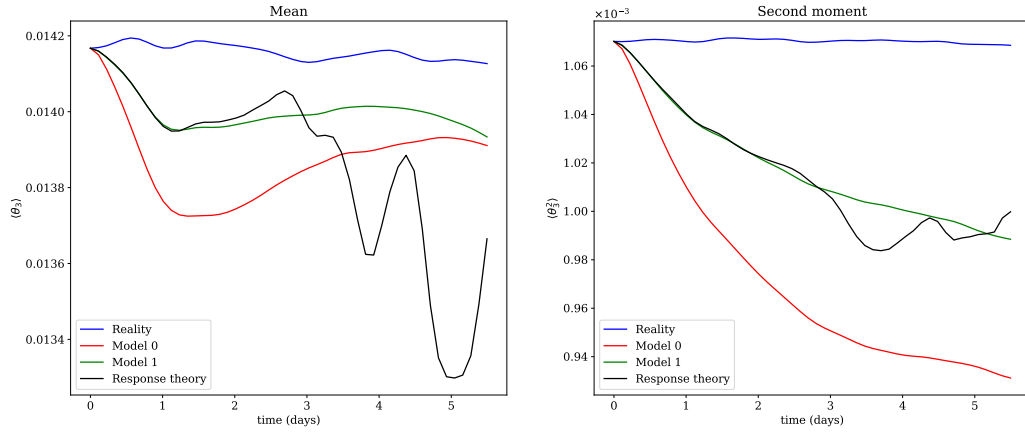


1.12.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

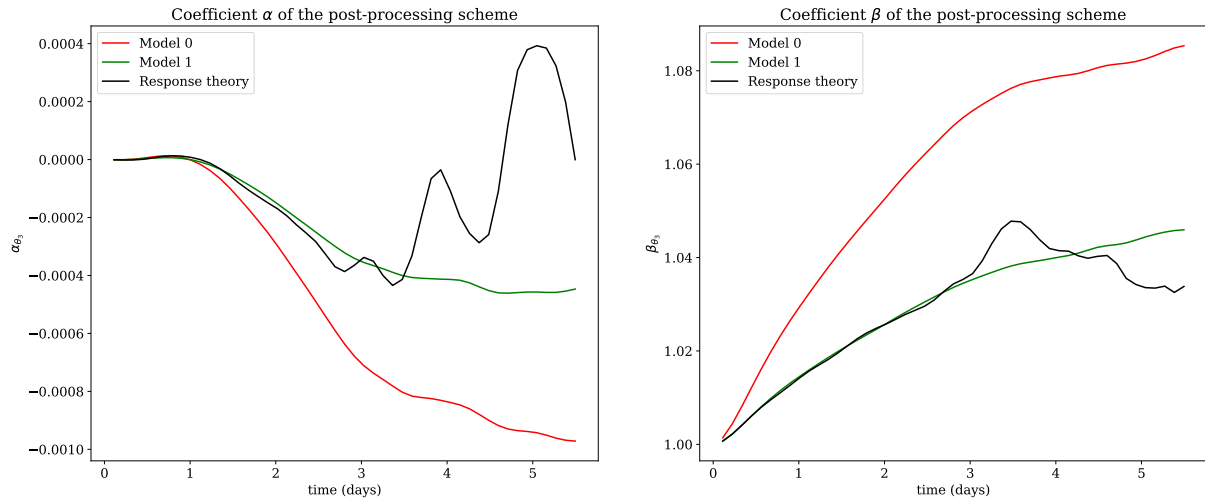


1.13 Variable θ_3

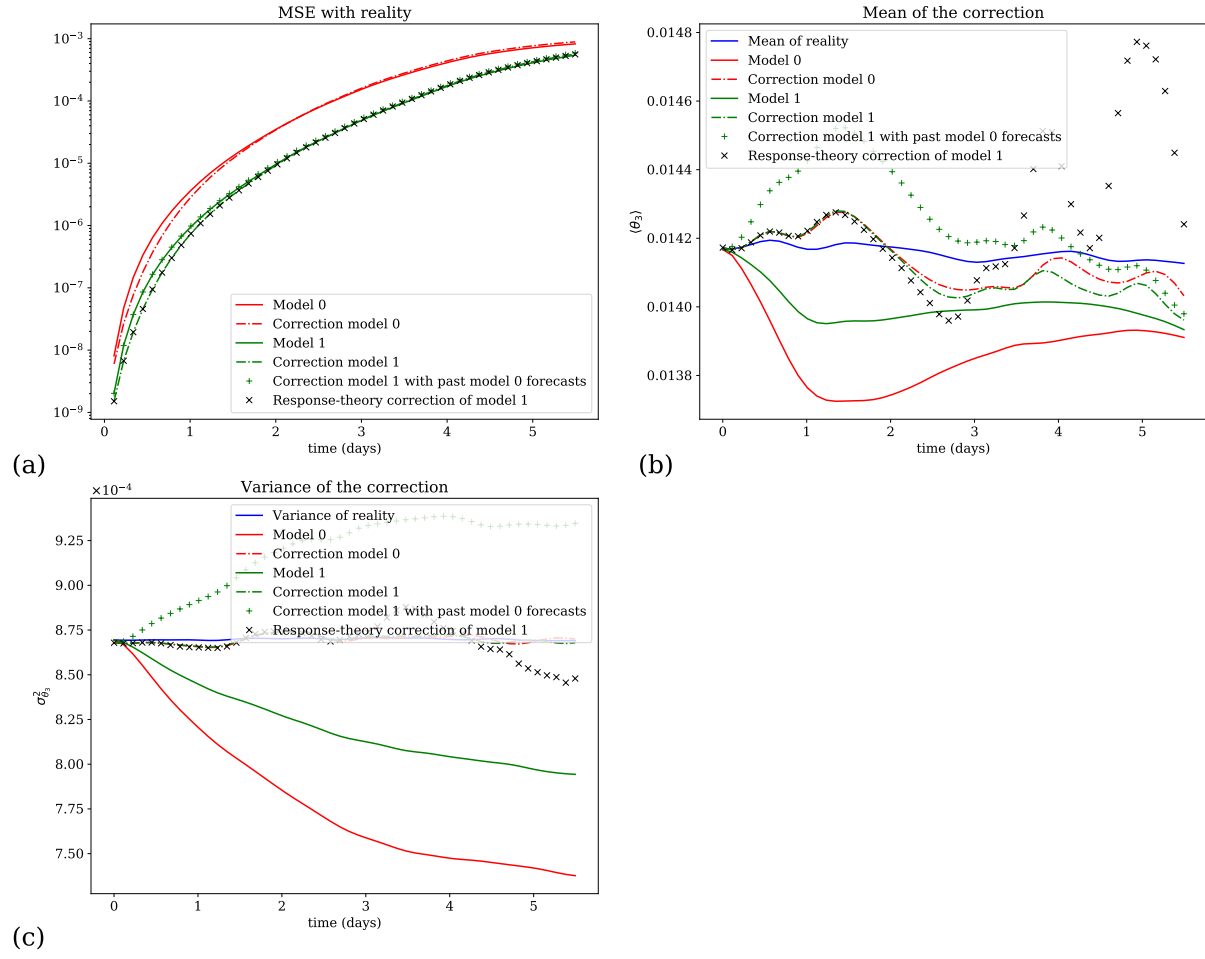
1.13.1 Corrections of the moments of the variable



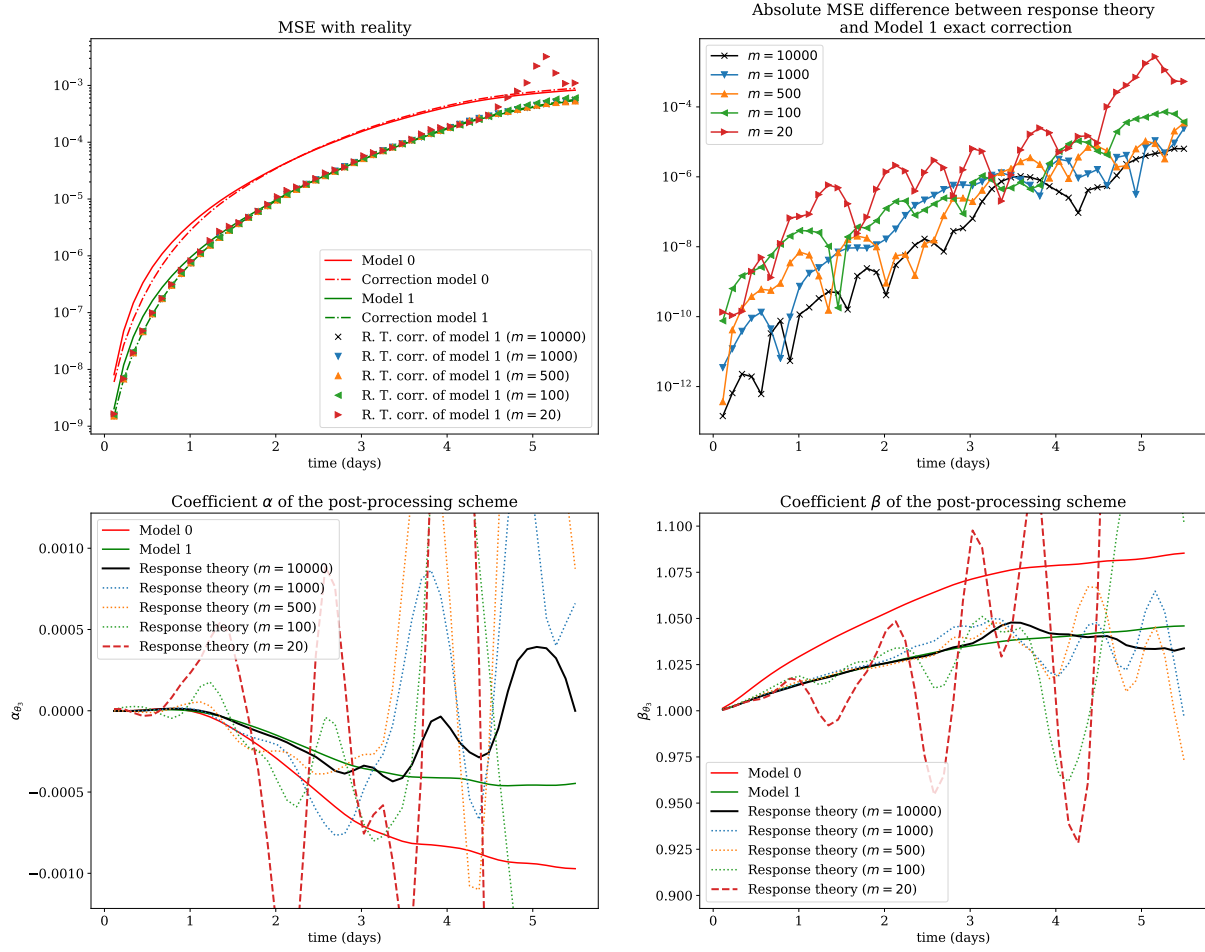
1.13.2 Corrections of the parameters α and β



1.13.3 Performance of the correction

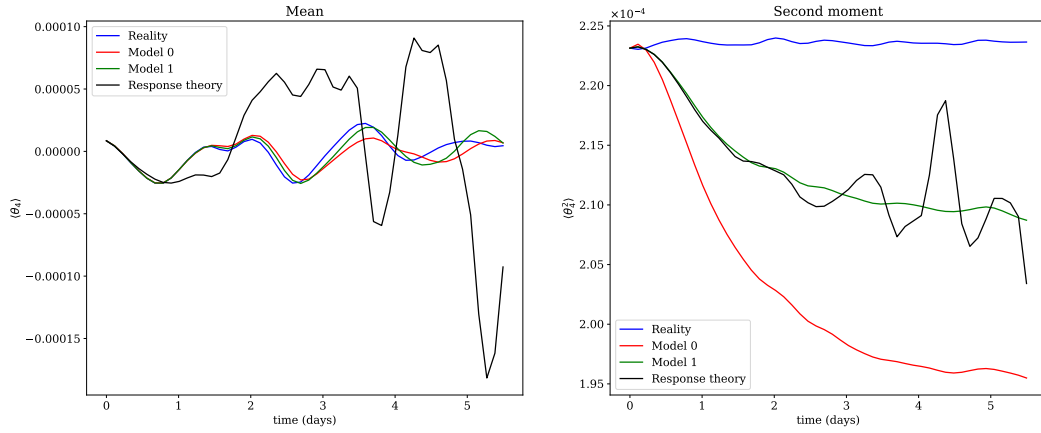


1.13.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

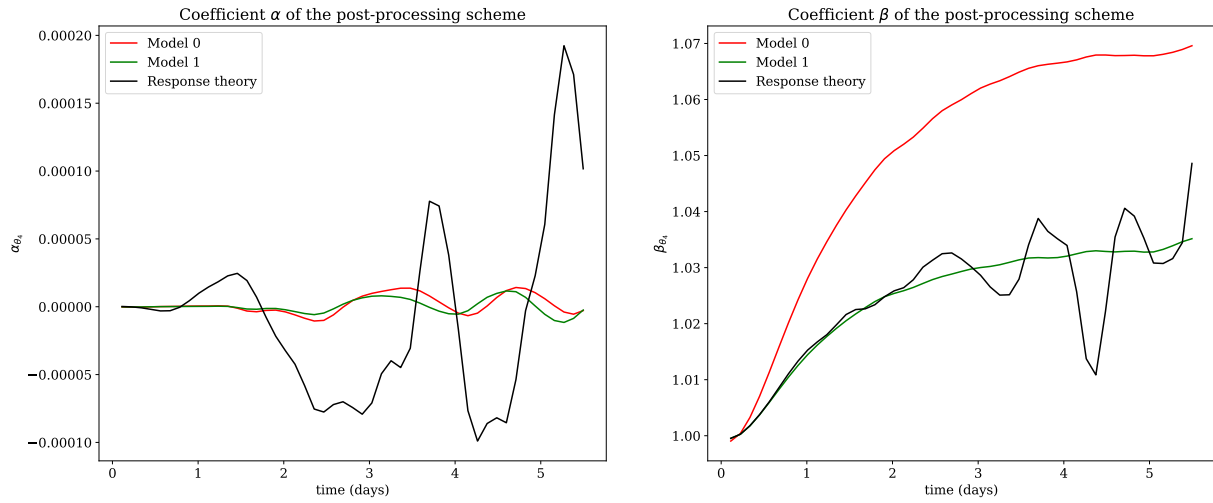


1.14 Variable θ_4

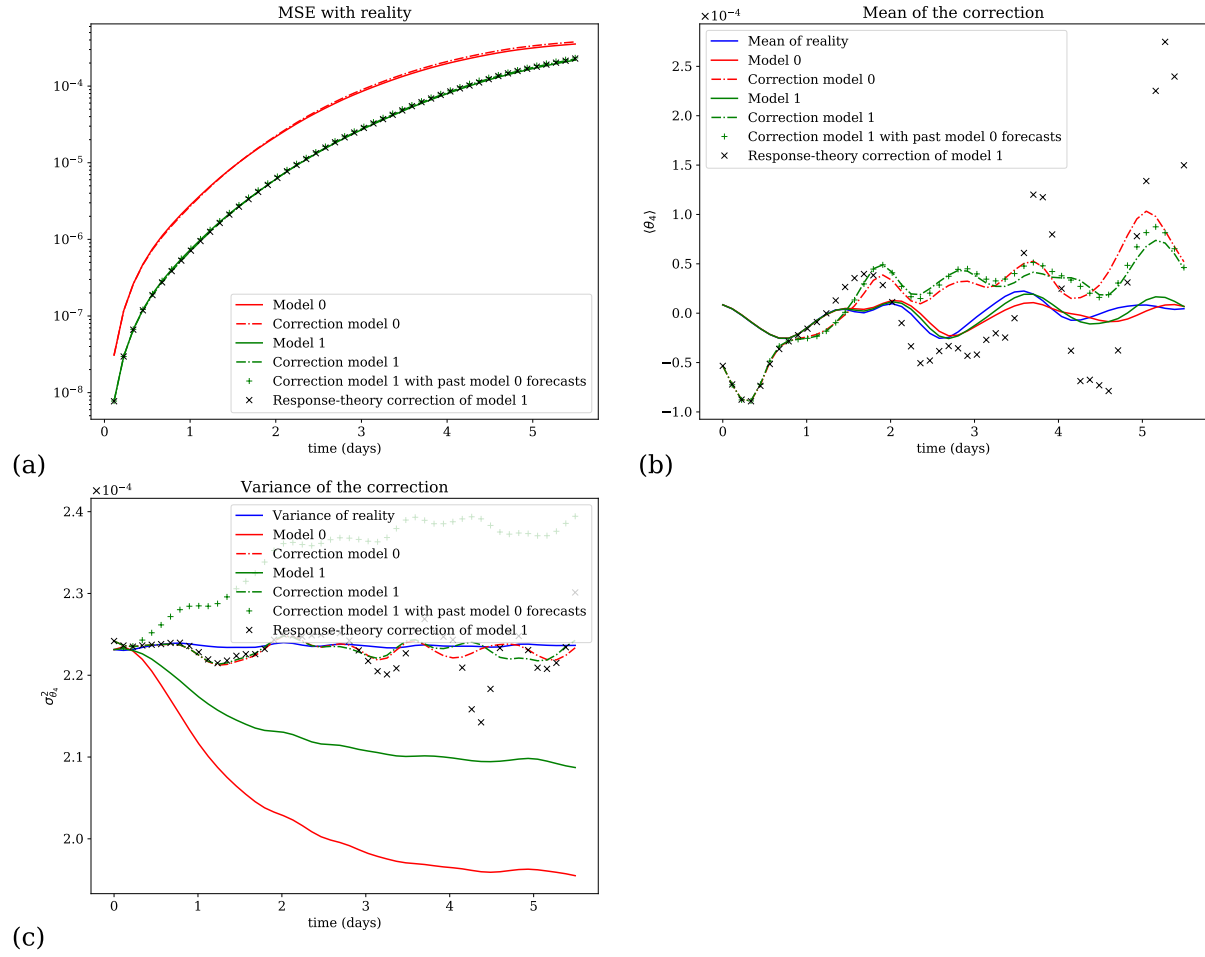
1.14.1 Corrections of the moments of the variable



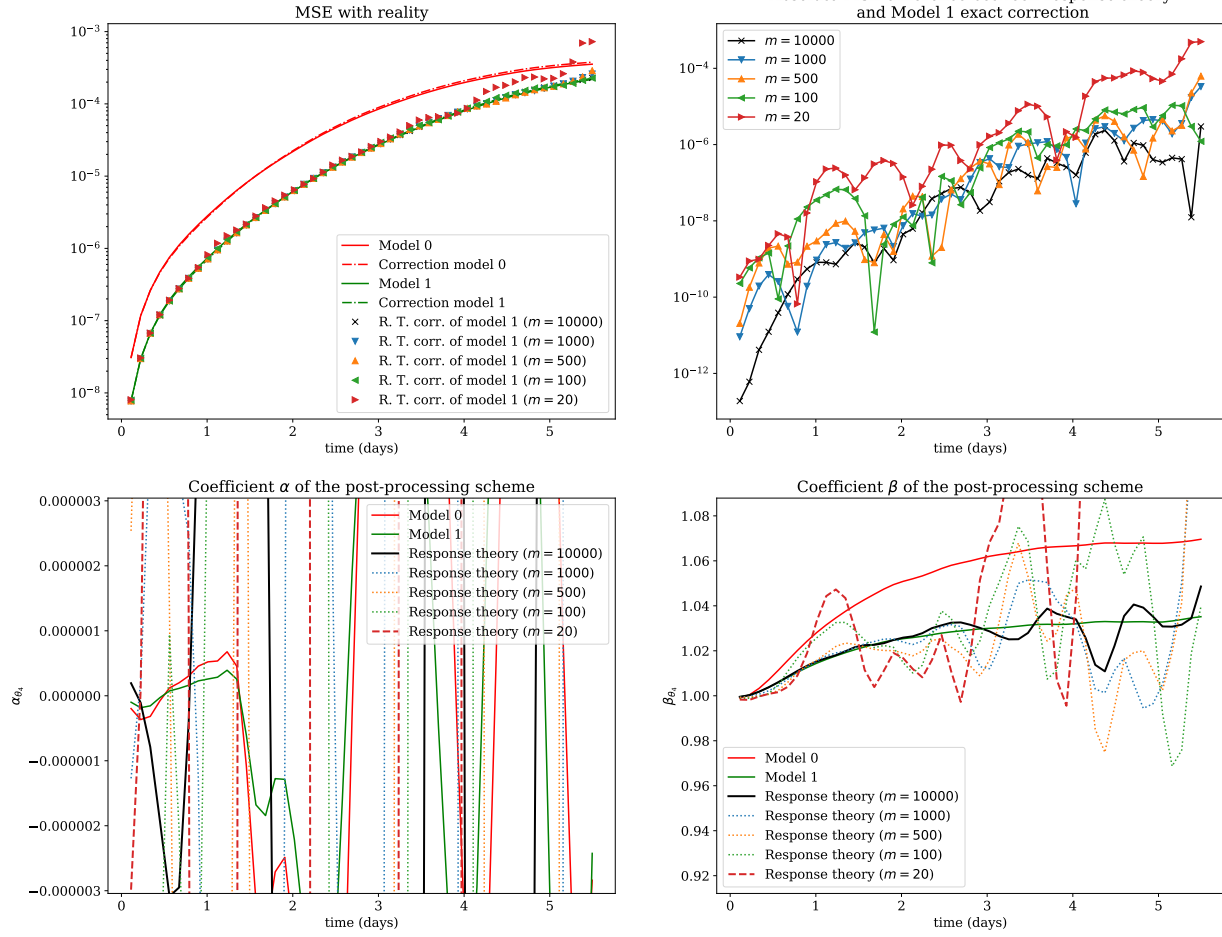
1.14.2 Corrections of the parameters α and β



1.14.3 Performance of the correction

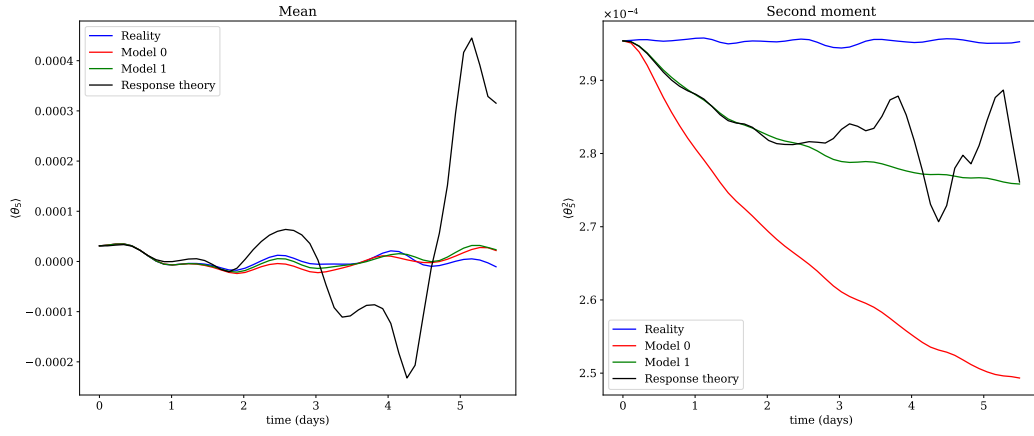


1.14.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

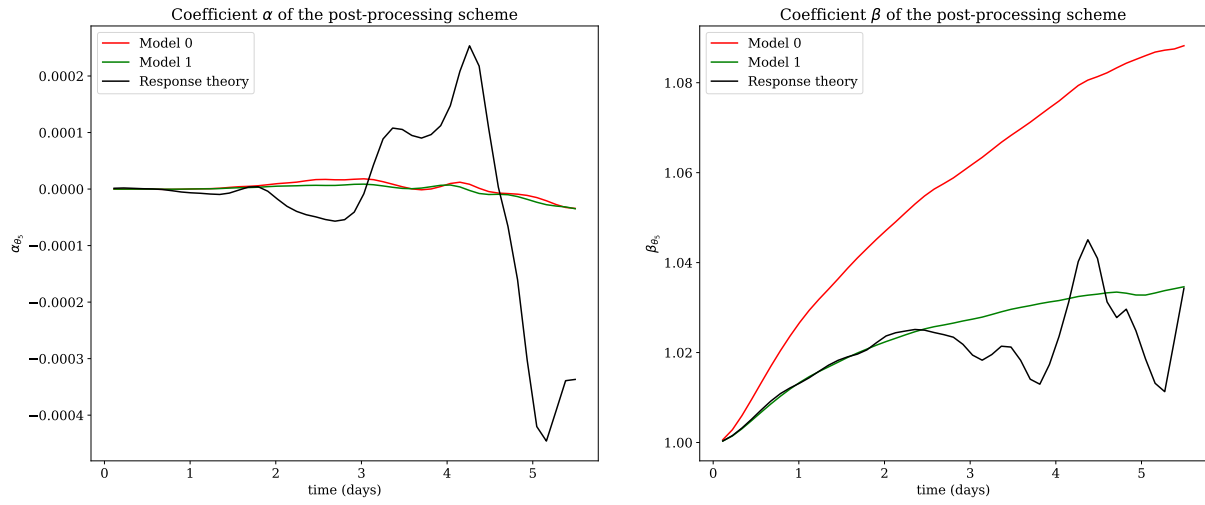


1.15 Variable θ_5

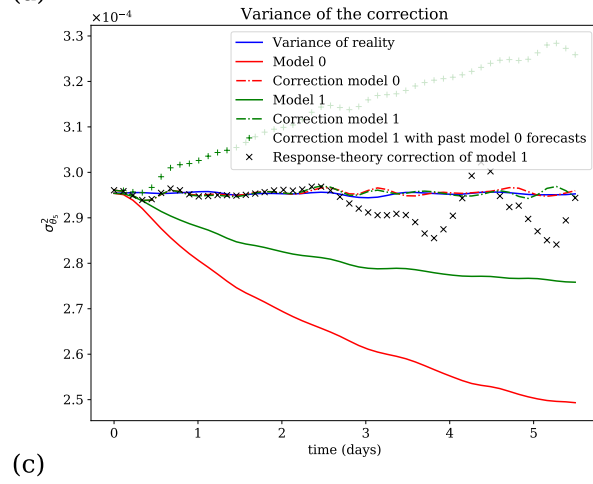
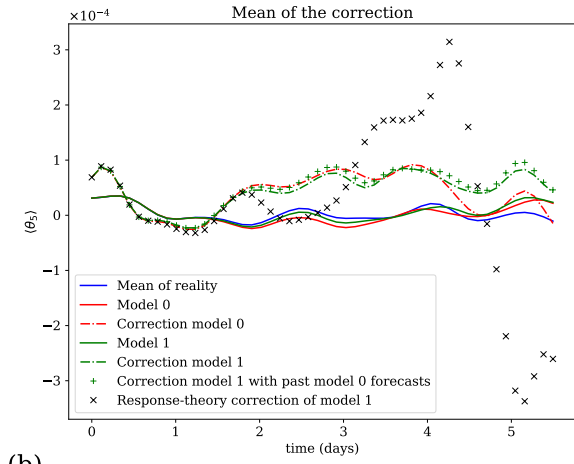
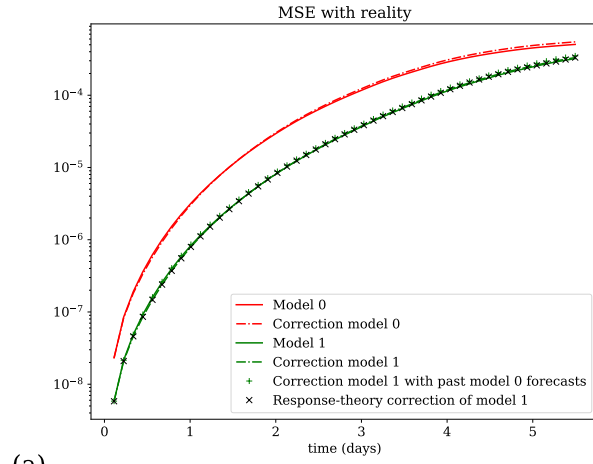
1.15.1 Corrections of the moments of the variable



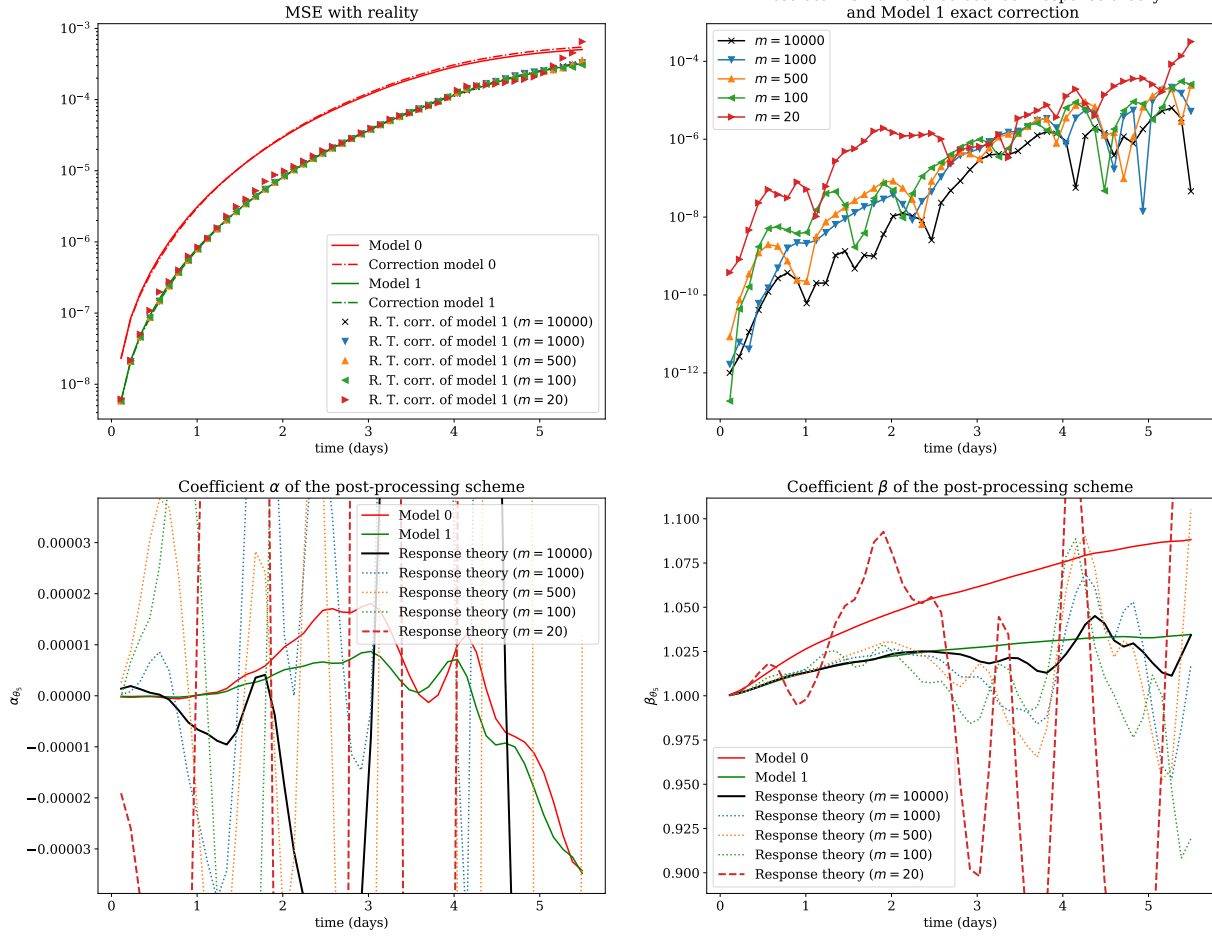
1.15.2 Corrections of the parameters α and β



1.15.3 Performance of the correction

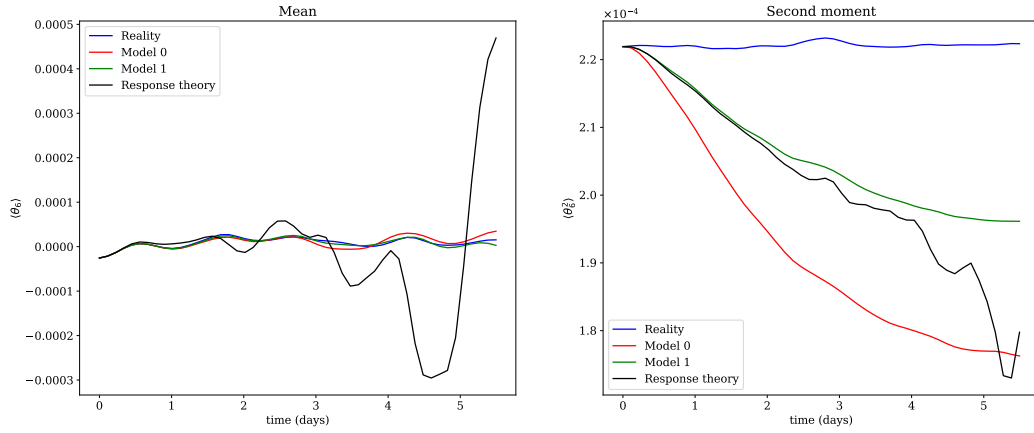


1.15.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

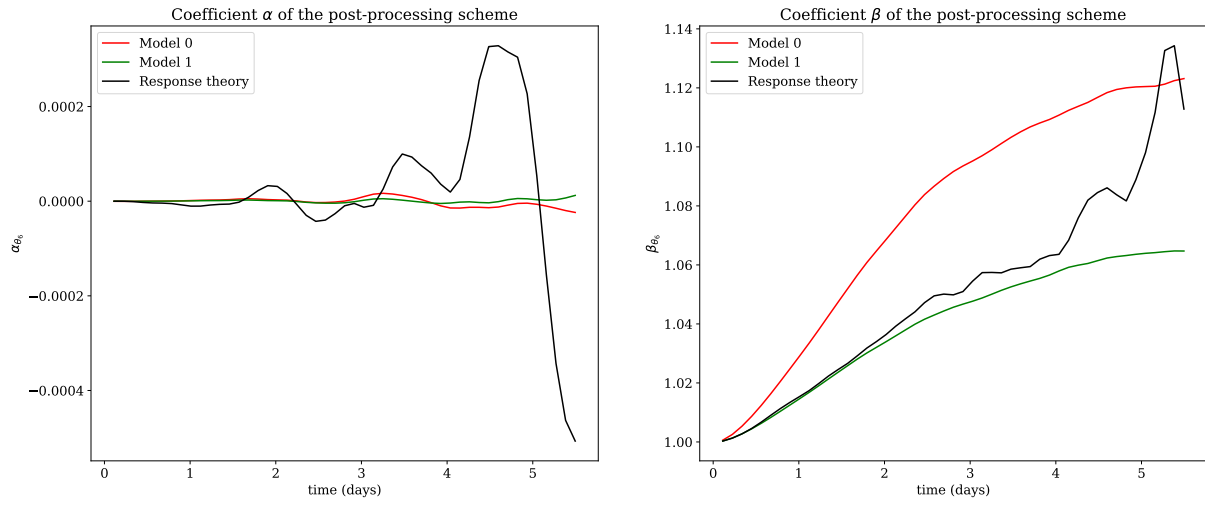


1.16 Variable θ_6

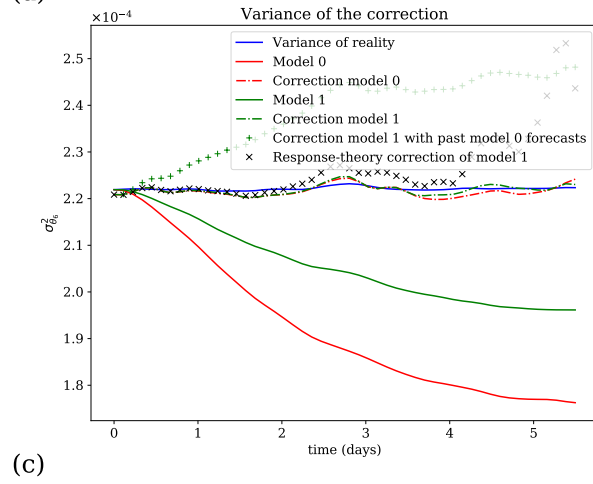
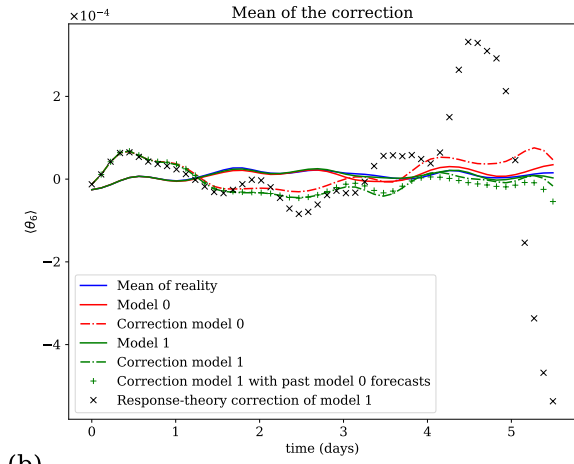
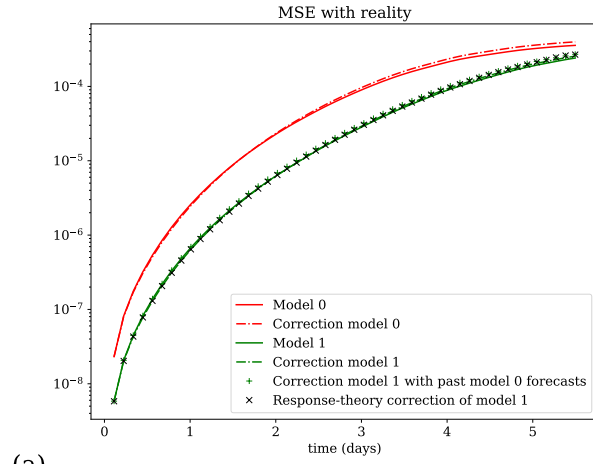
1.16.1 Corrections of the moments of the variable



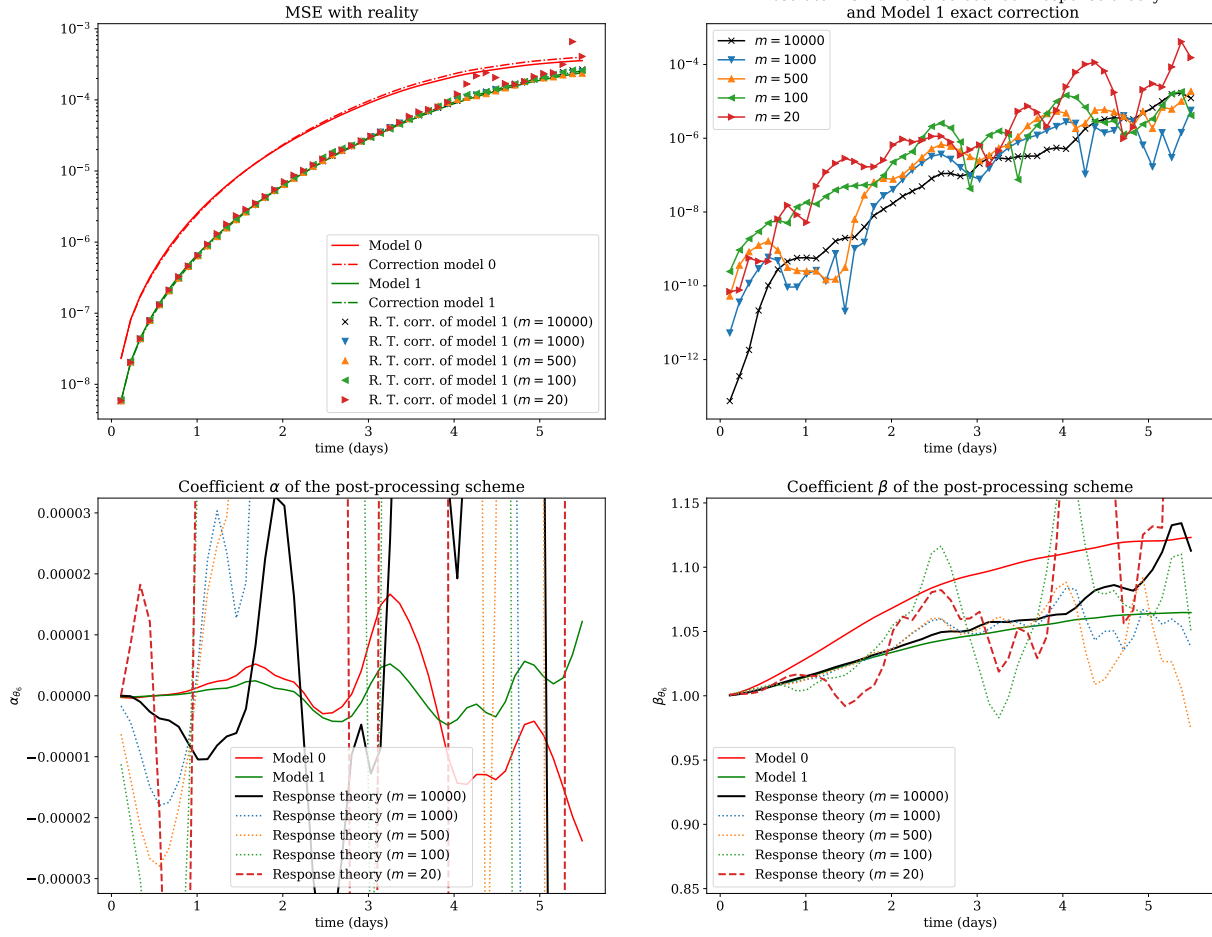
1.16.2 Corrections of the parameters α and β



1.16.3 Performance of the correction

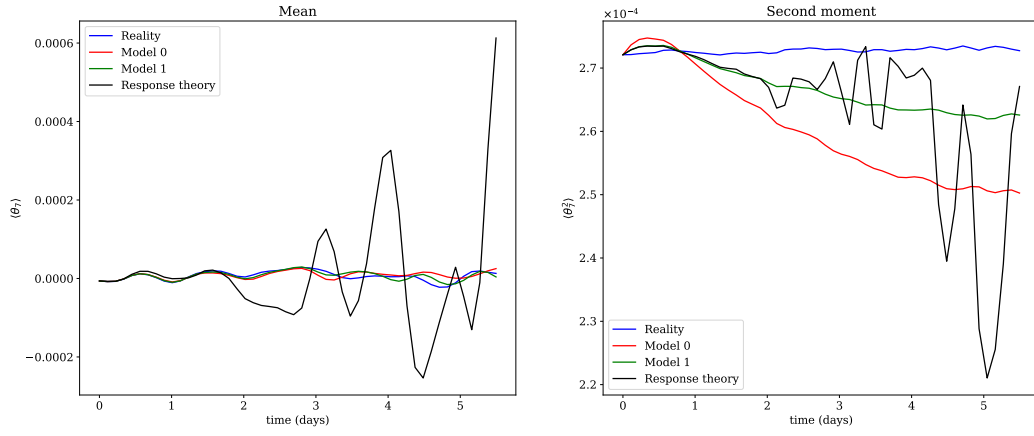


1.16.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

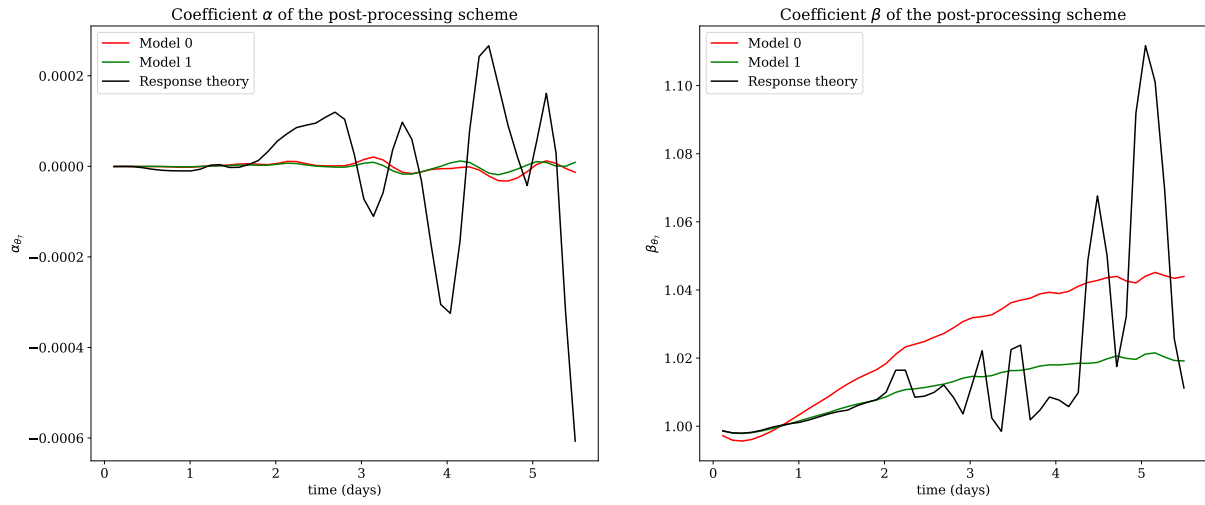


1.17 Variable θ_7

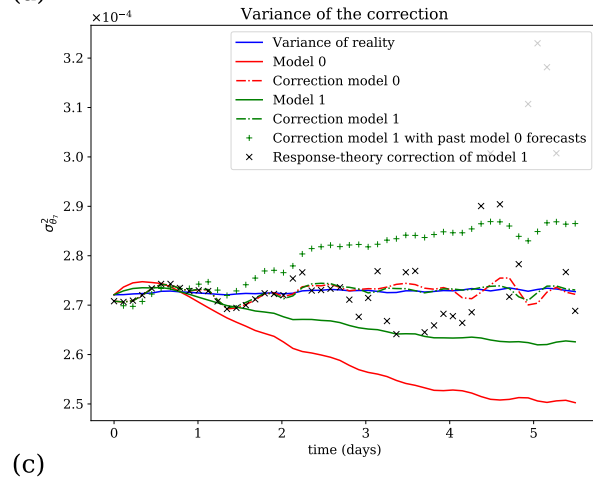
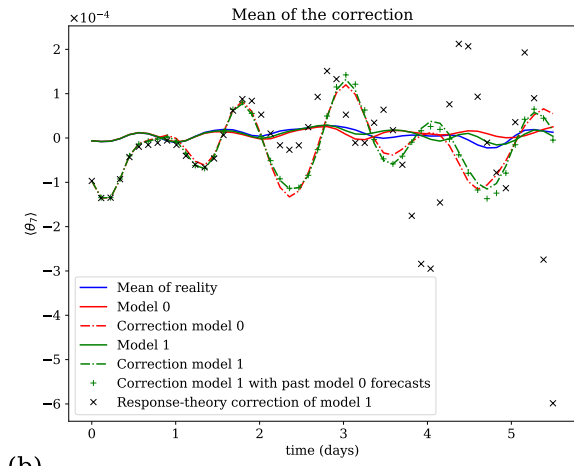
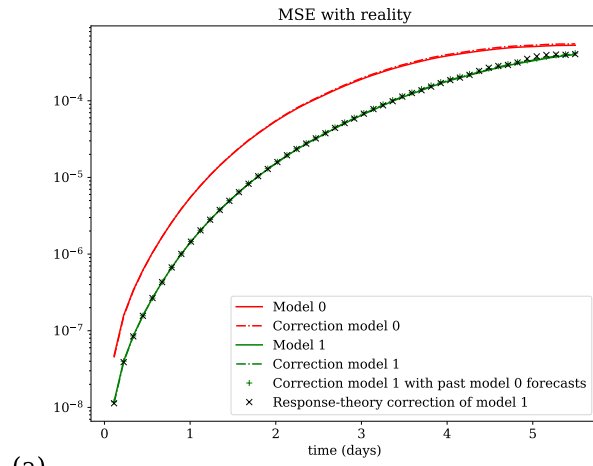
1.17.1 Corrections of the moments of the variable



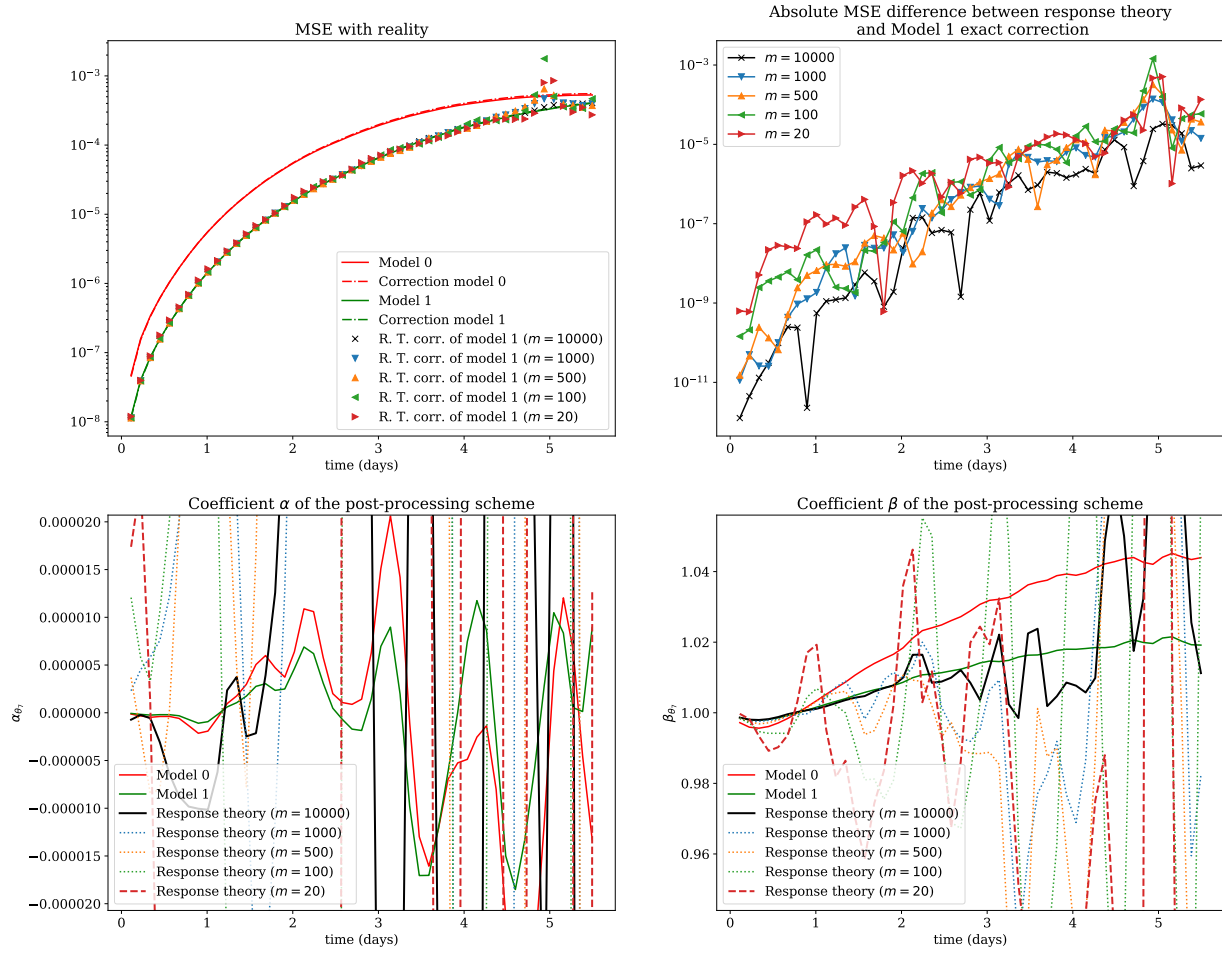
1.17.2 Corrections of the parameters α and β



1.17.3 Performance of the correction

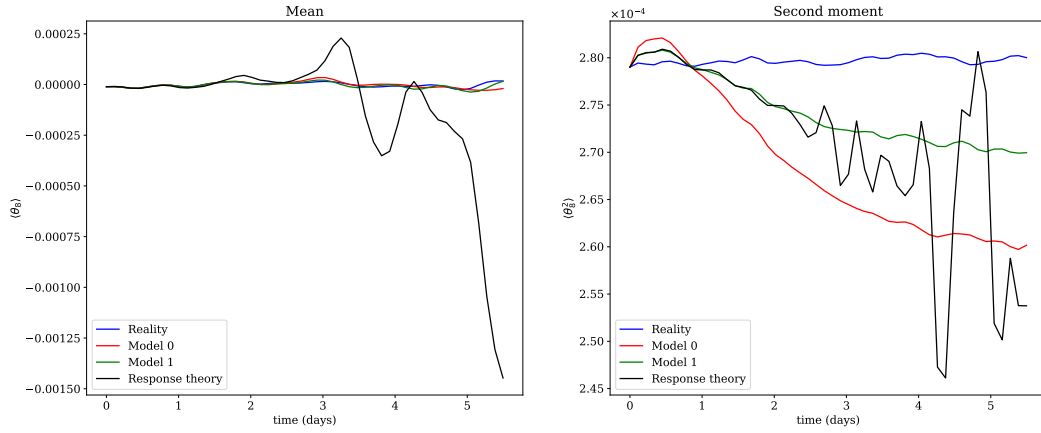


1.17.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

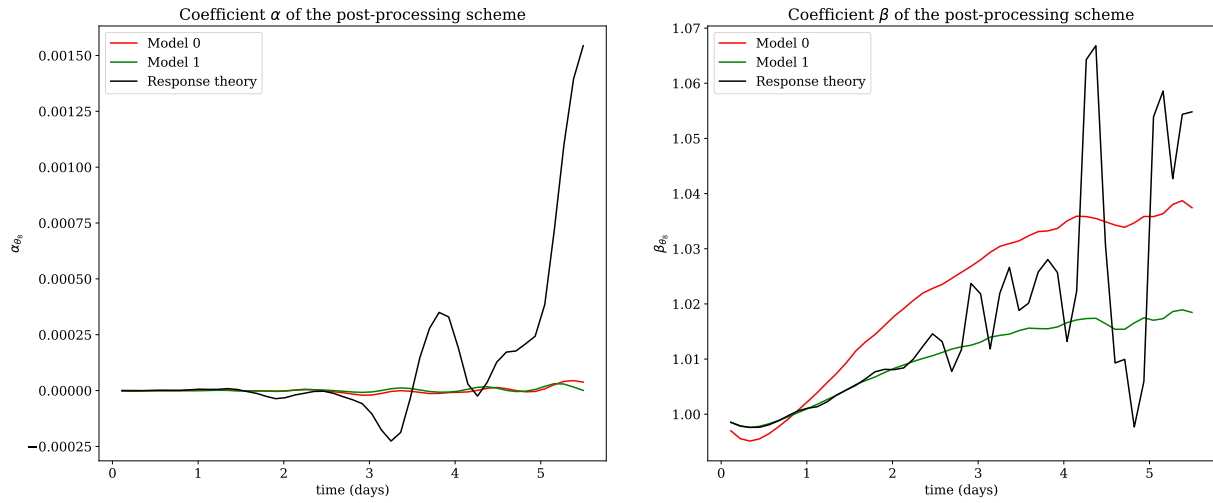


1.18 Variable θ_8

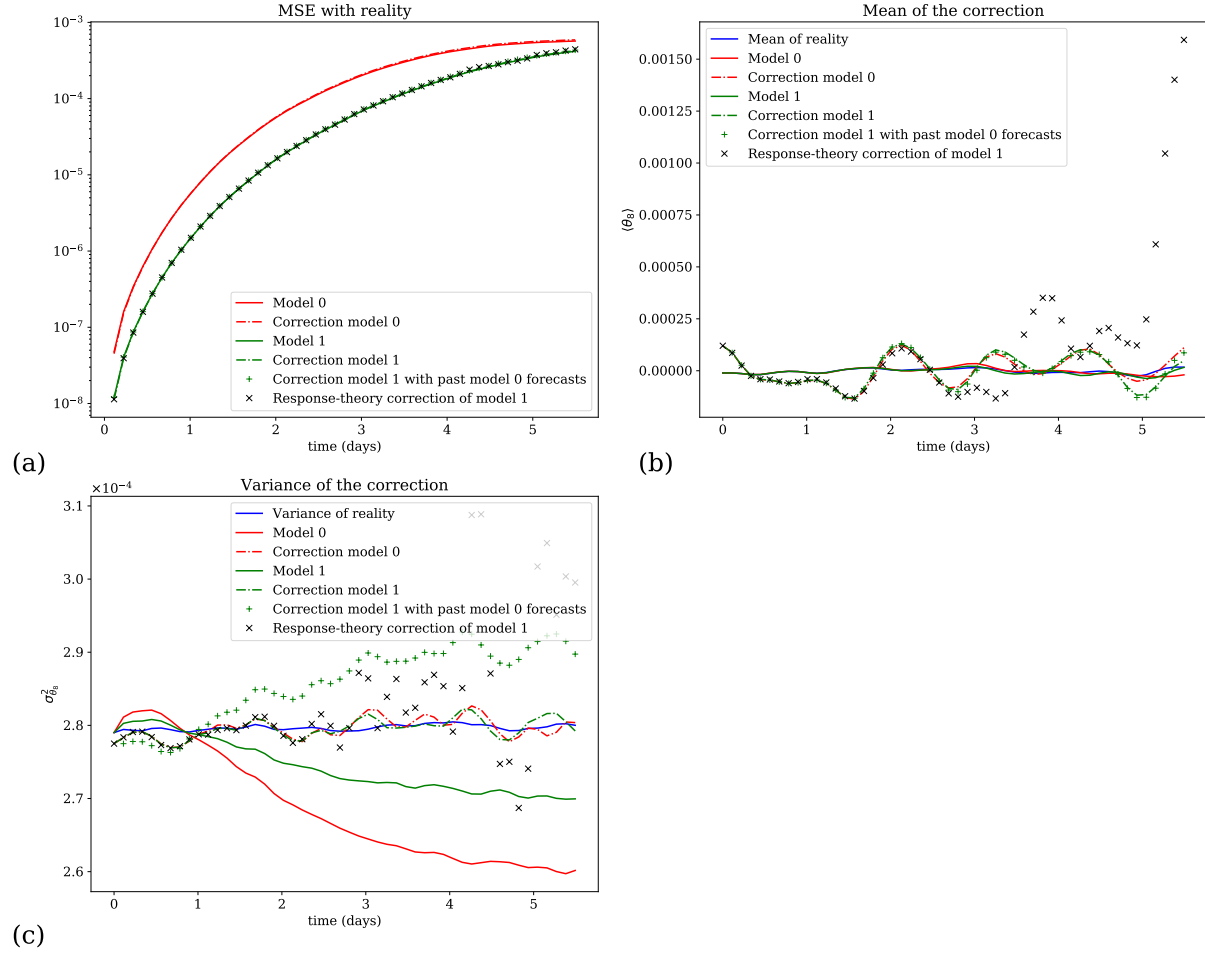
1.18.1 Corrections of the moments of the variable



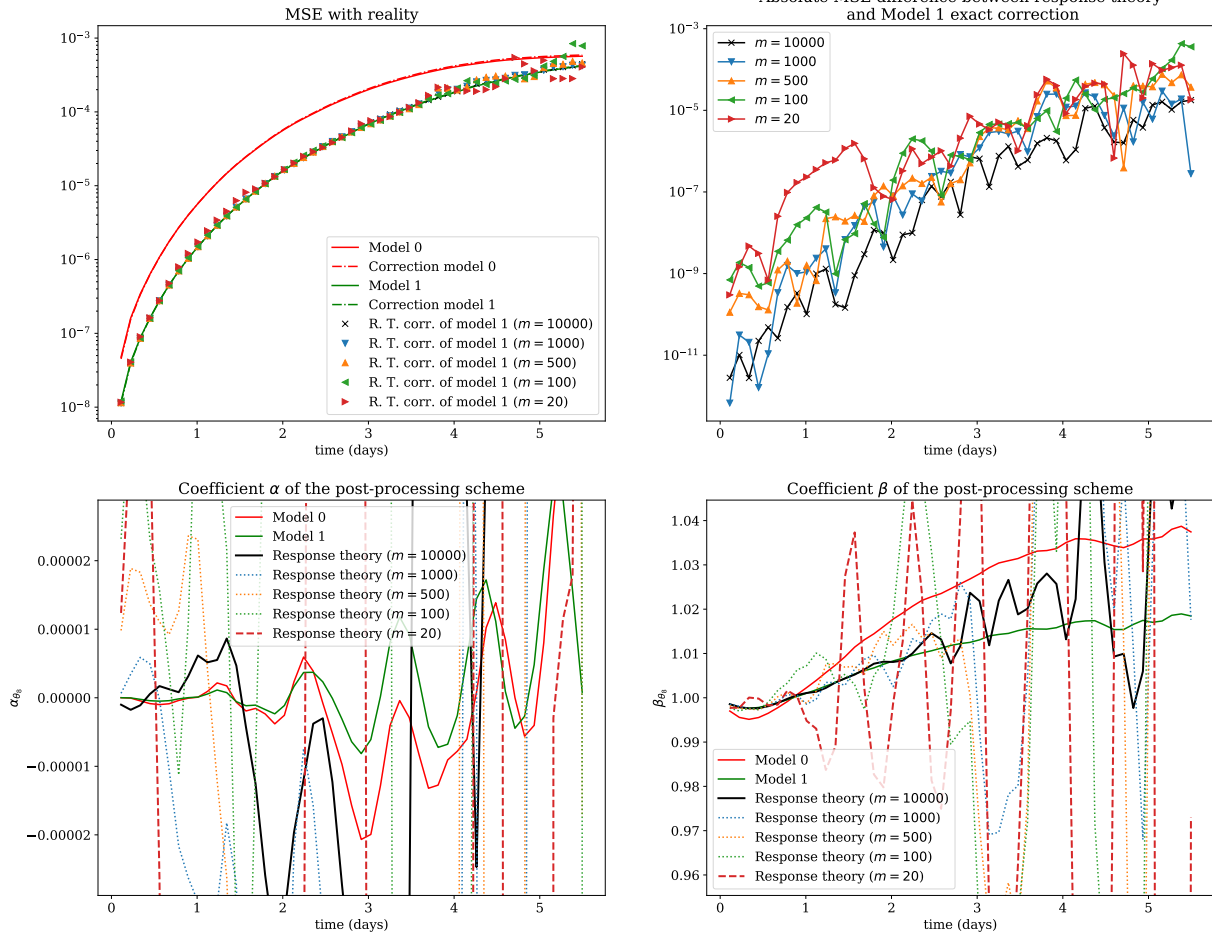
1.18.2 Corrections of the parameters α and β



1.18.3 Performance of the correction

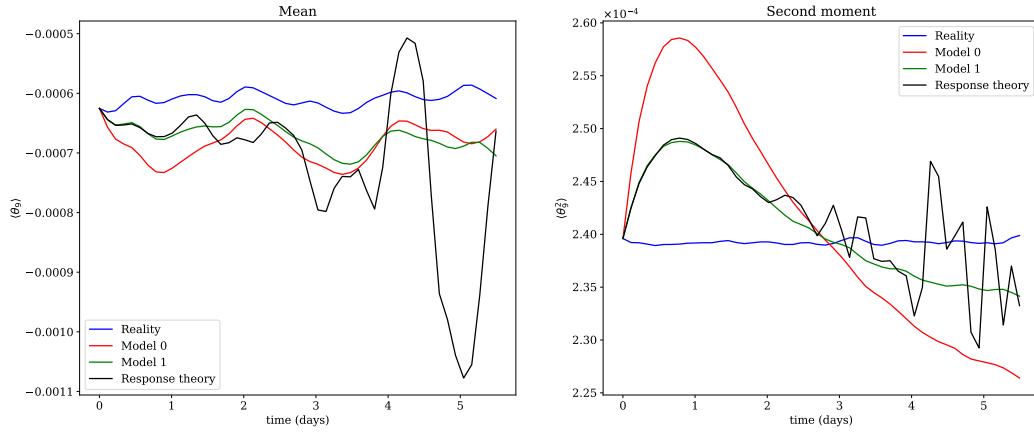


1.18.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

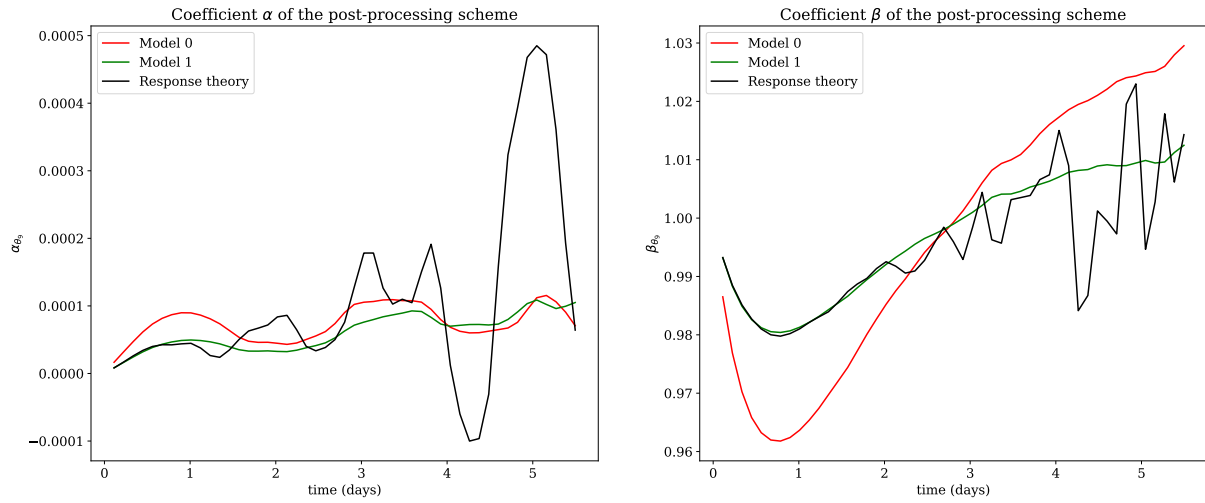


1.19 Variable θ_9

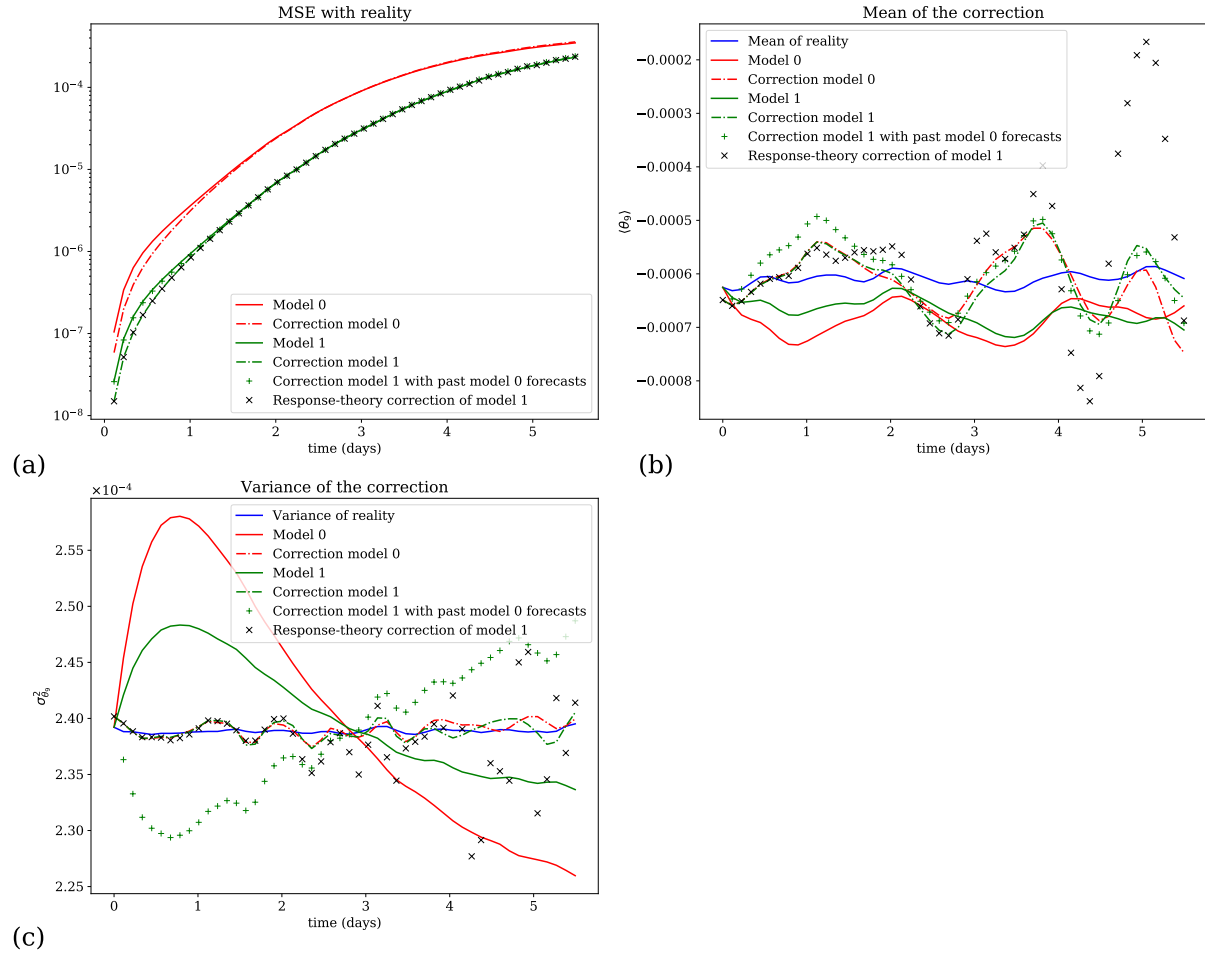
1.19.1 Corrections of the moments of the variable



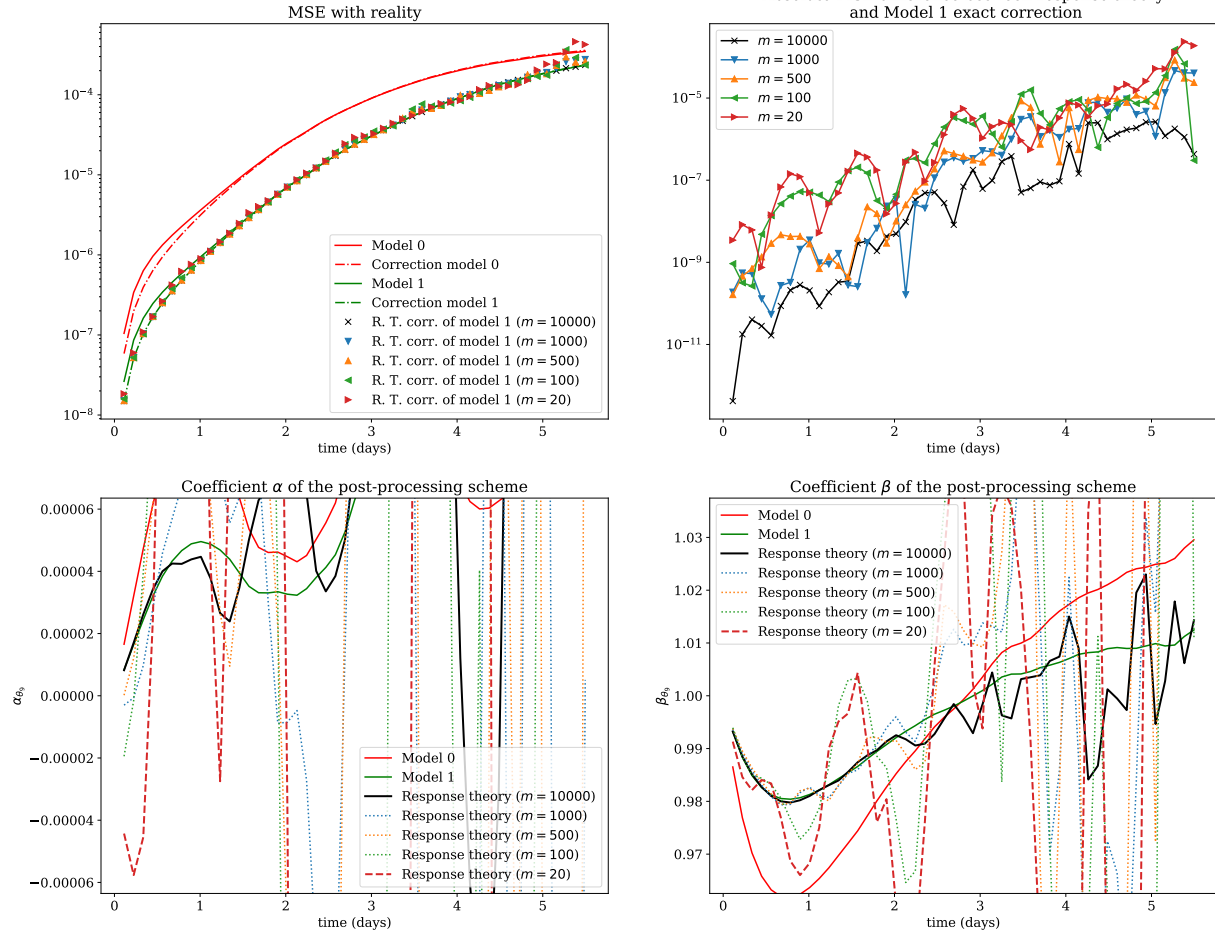
1.19.2 Corrections of the parameters α and β



1.19.3 Performance of the correction

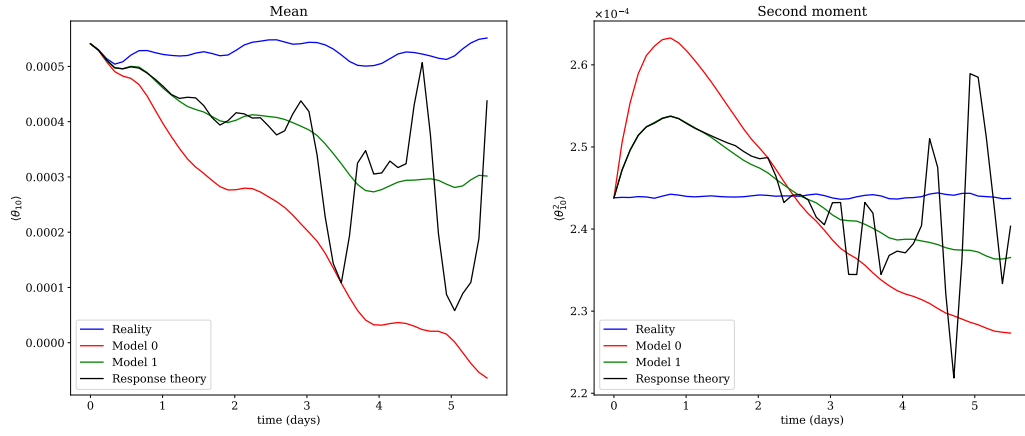


1.19.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

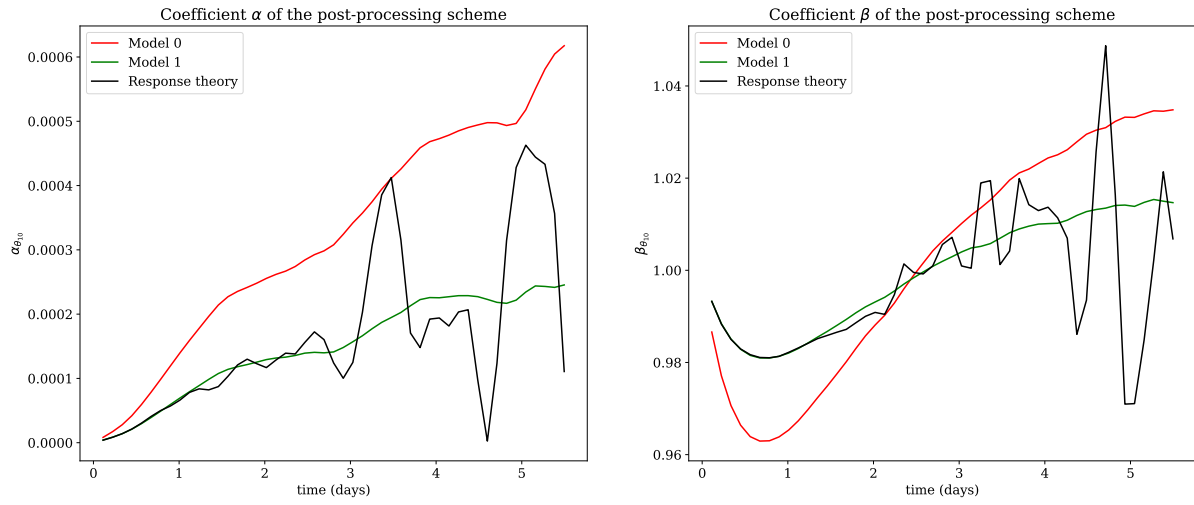


1.20 Variable θ_{10}

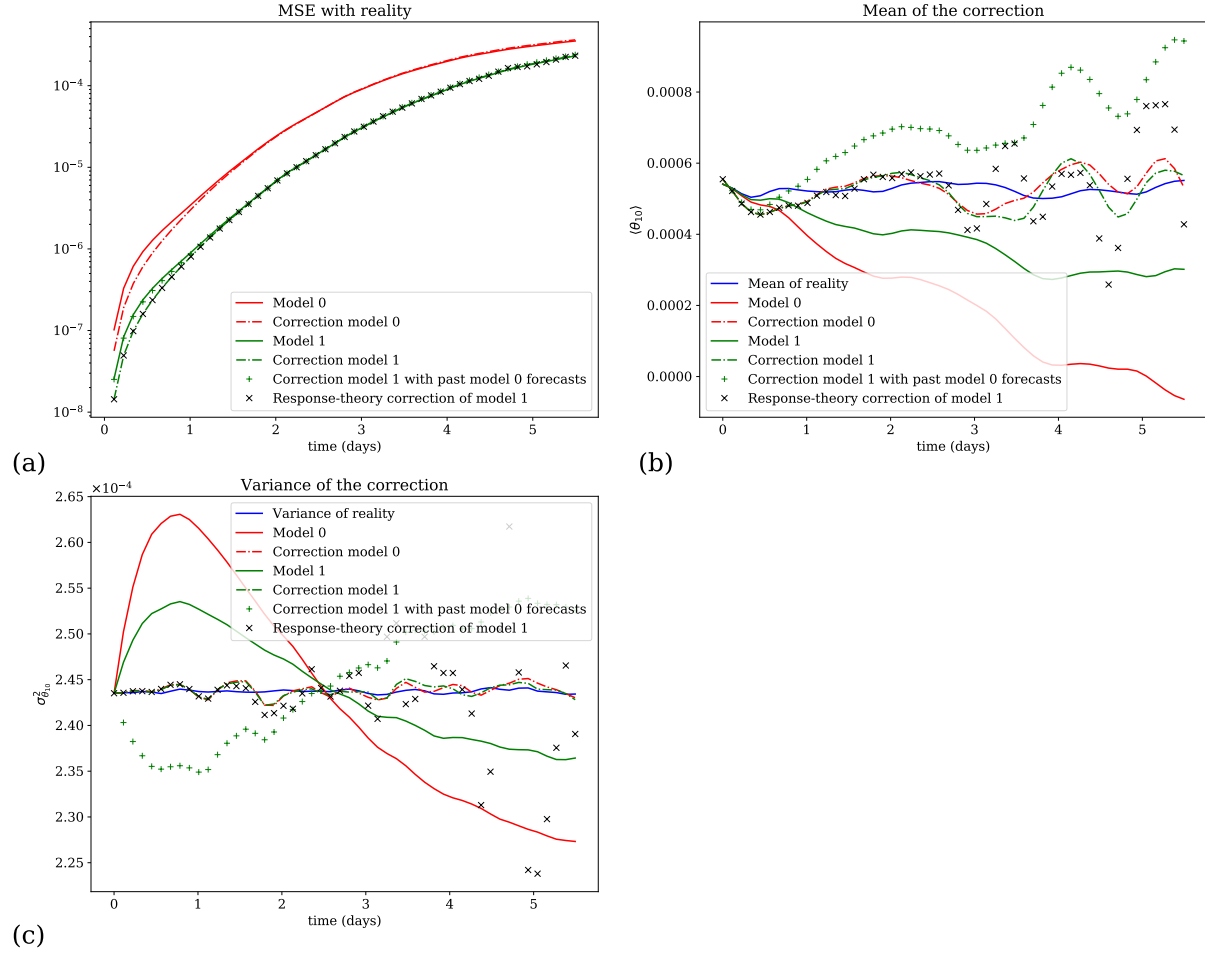
1.20.1 Corrections of the moments of the variable



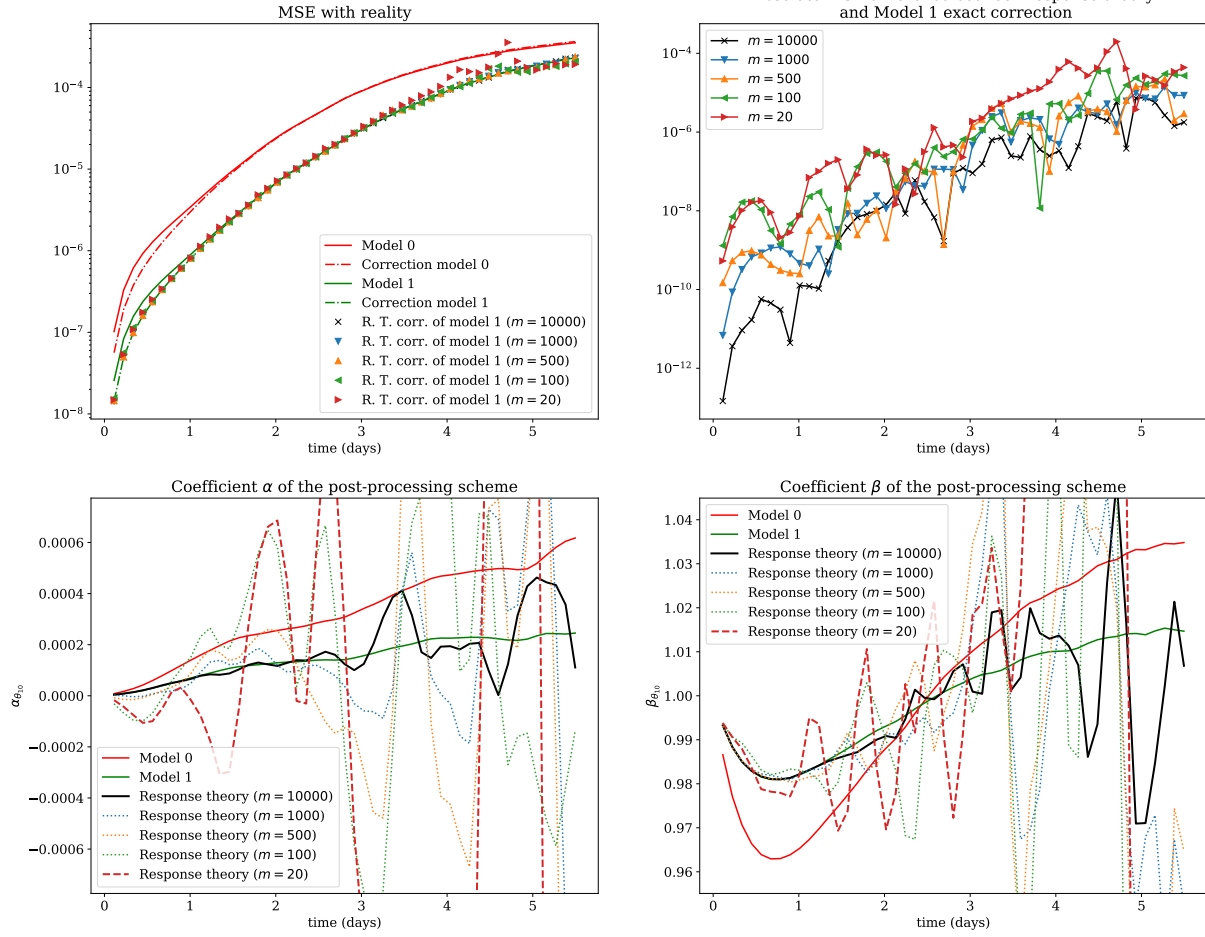
1.20.2 Corrections of the parameters α and β



1.20.3 Performance of the correction



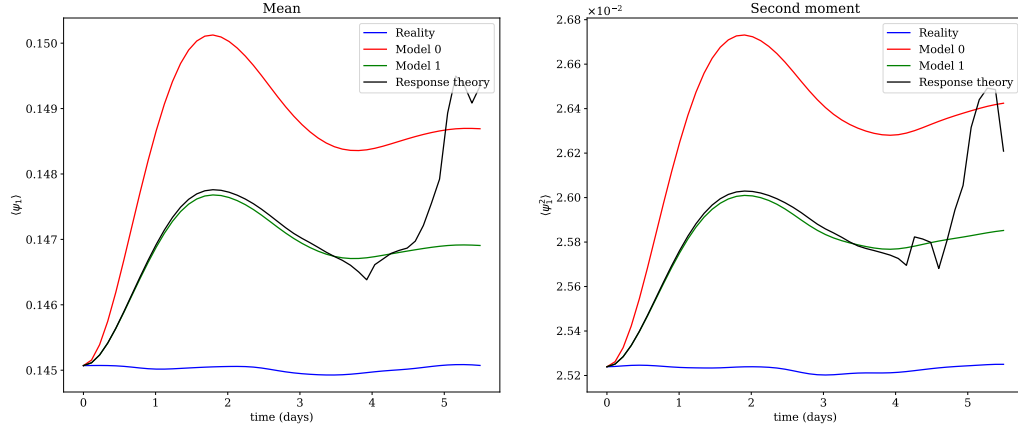
1.20.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories



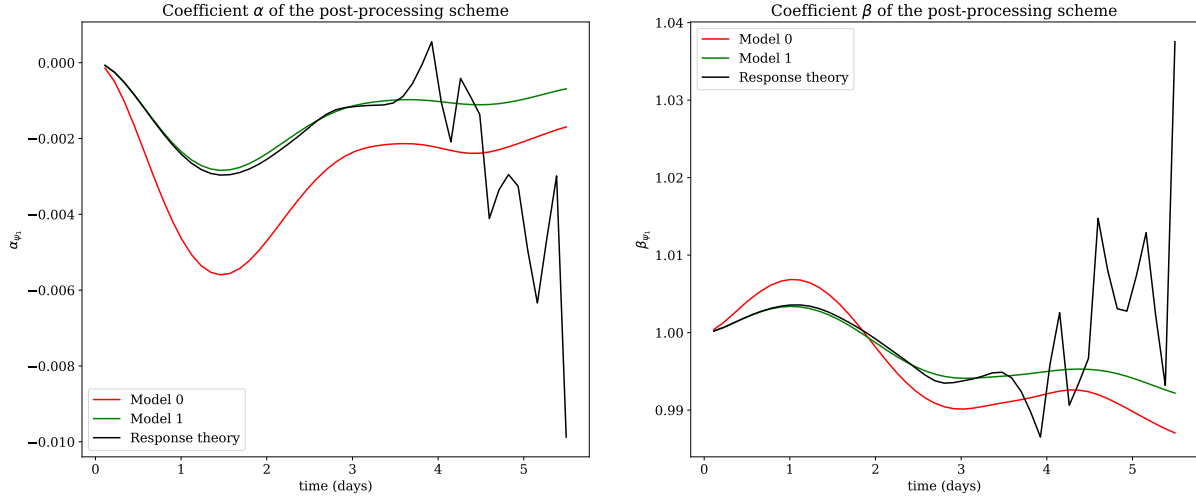
2 Experiment varying the Newtonian cooling coefficient

2.1 Variable ψ_1

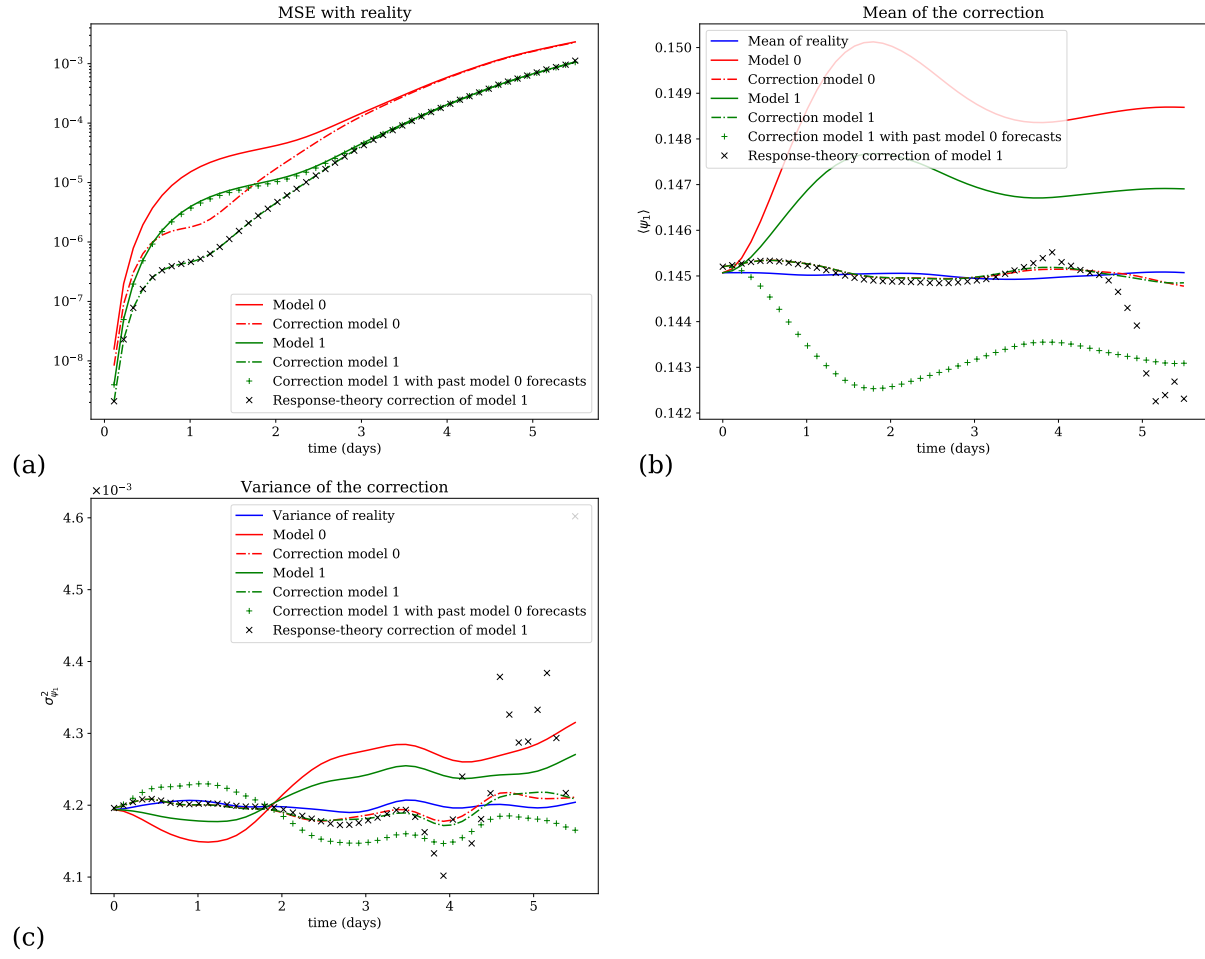
2.1.1 Corrections of the moments of the variable



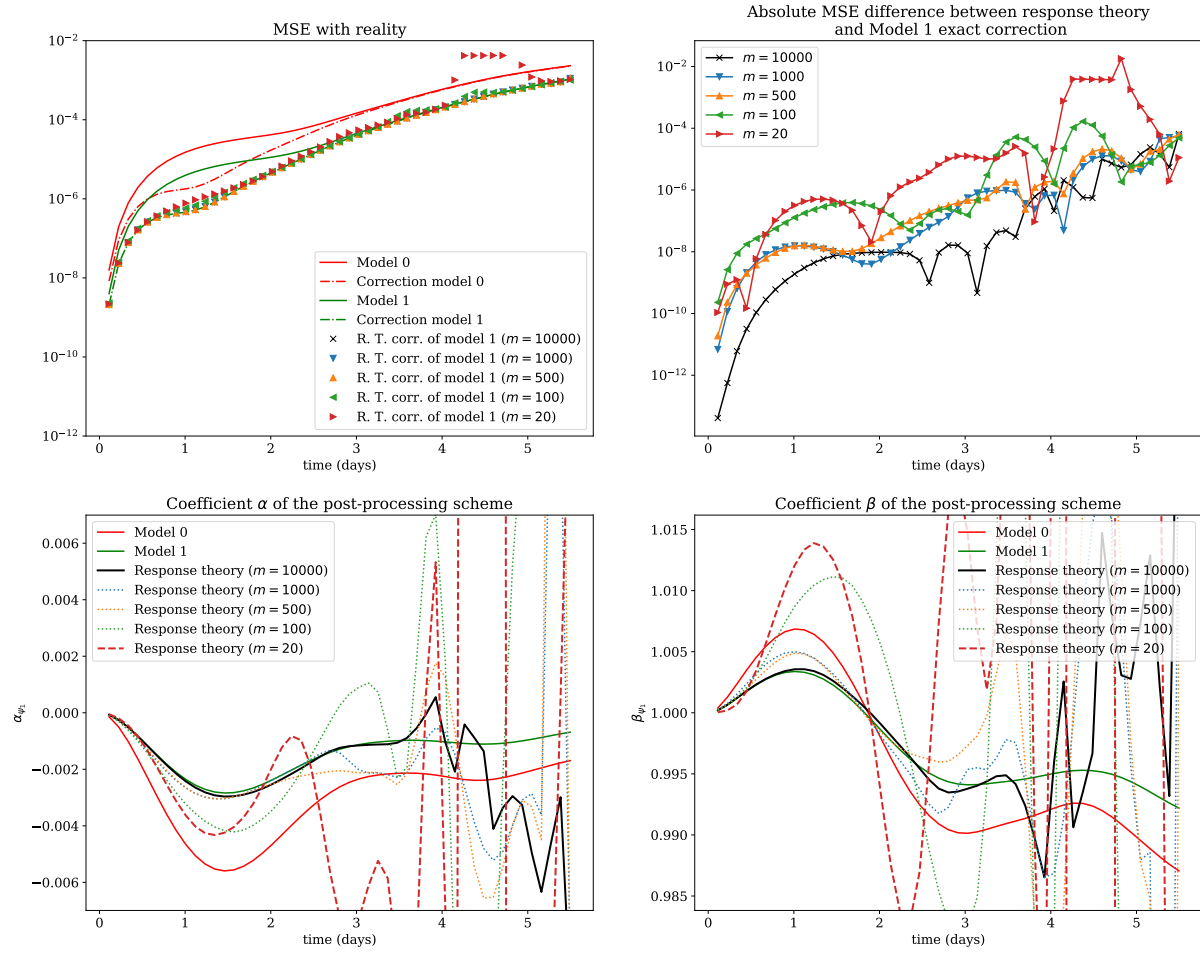
2.1.2 Corrections of the parameters α and β



2.1.3 Performance of the correction

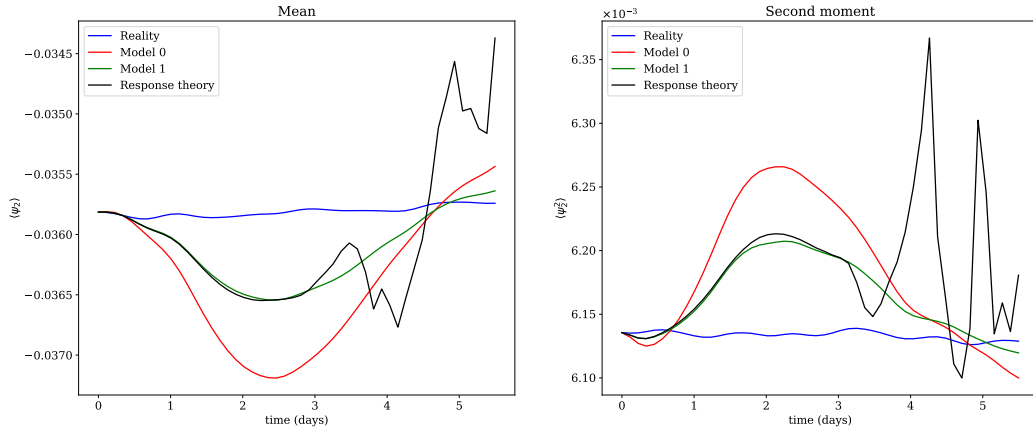


2.1.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

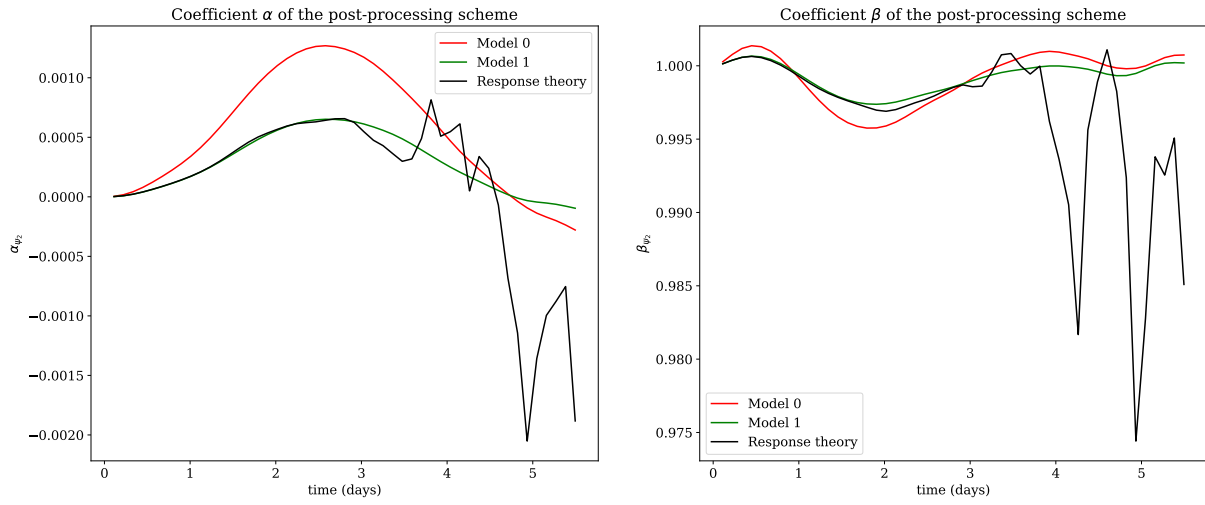


2.2 Variable ψ_2

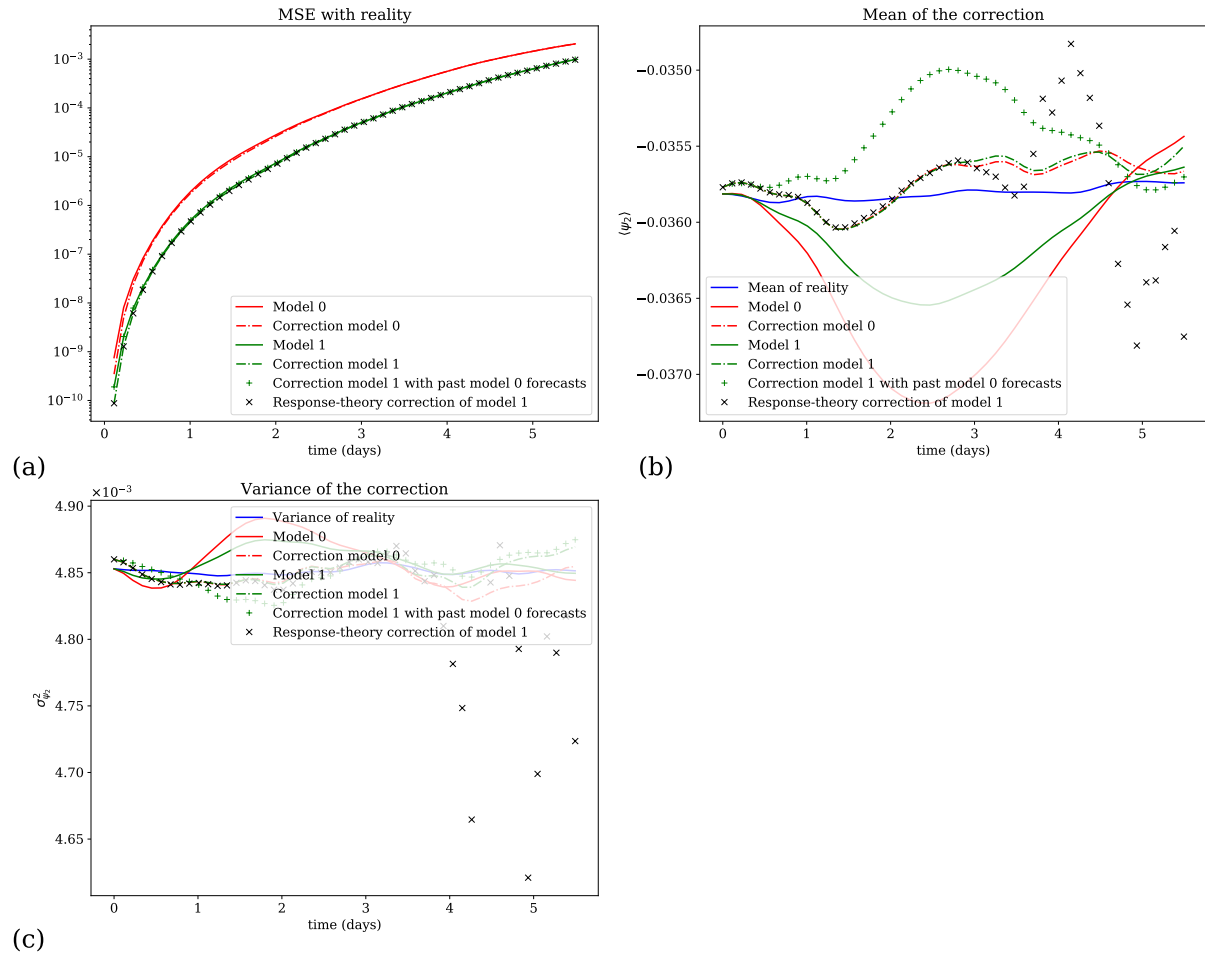
2.2.1 Corrections of the moments of the variable



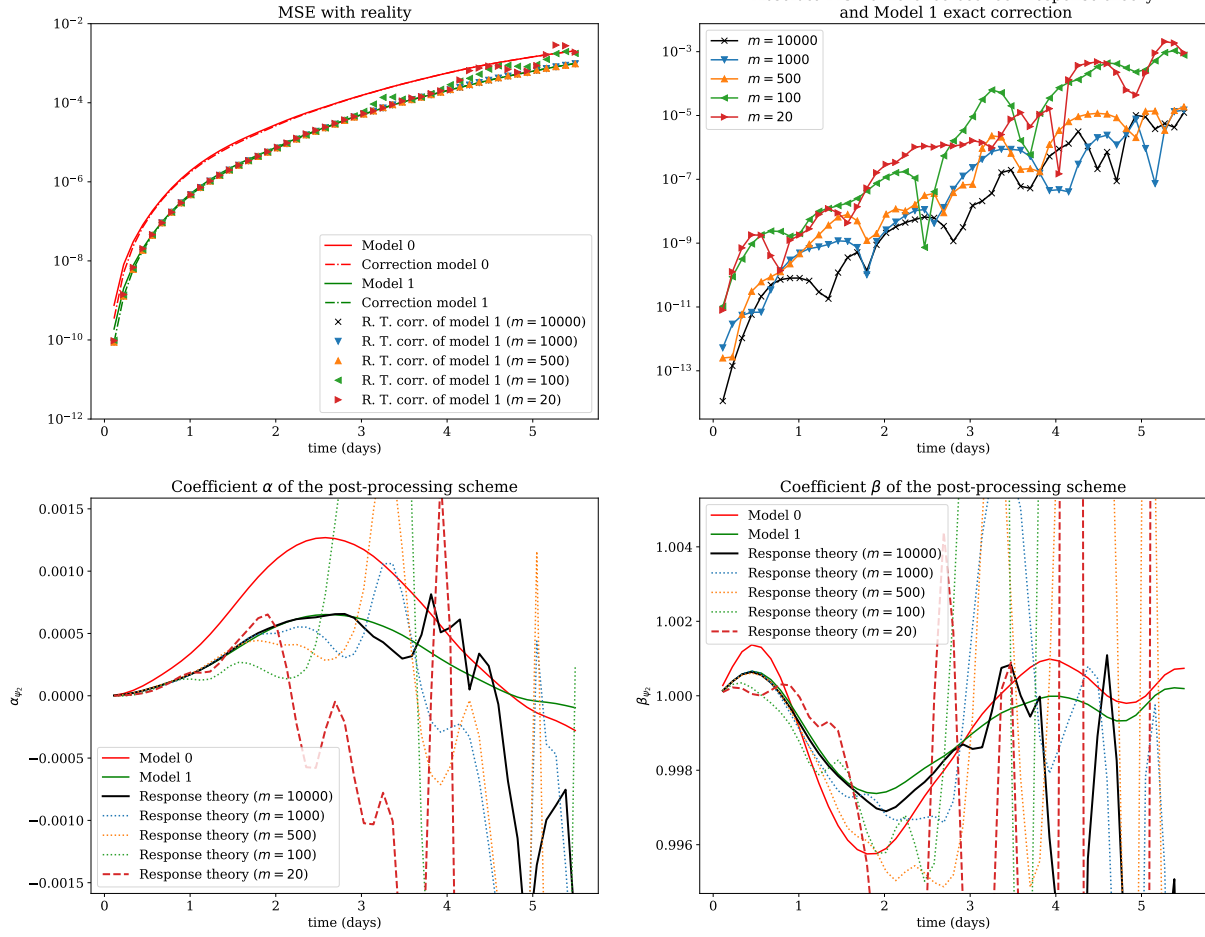
2.2.2 Corrections of the parameters α and β



2.2.3 Performance of the correction

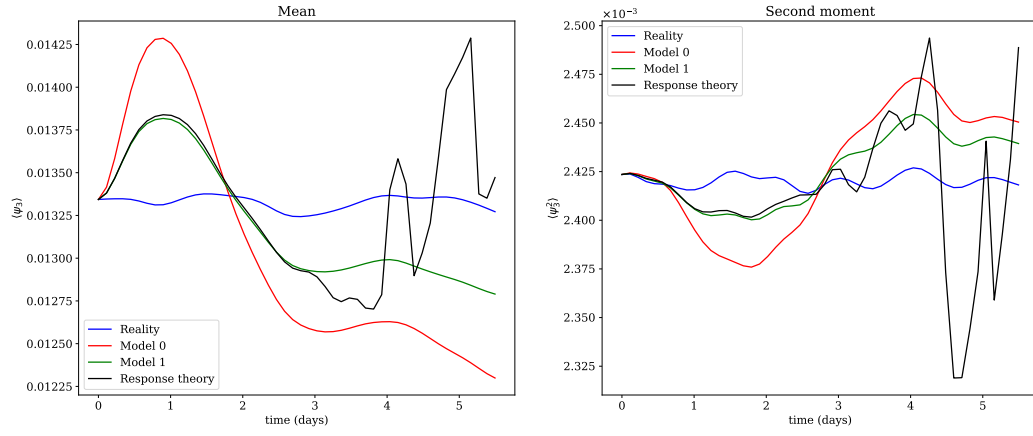


2.2.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

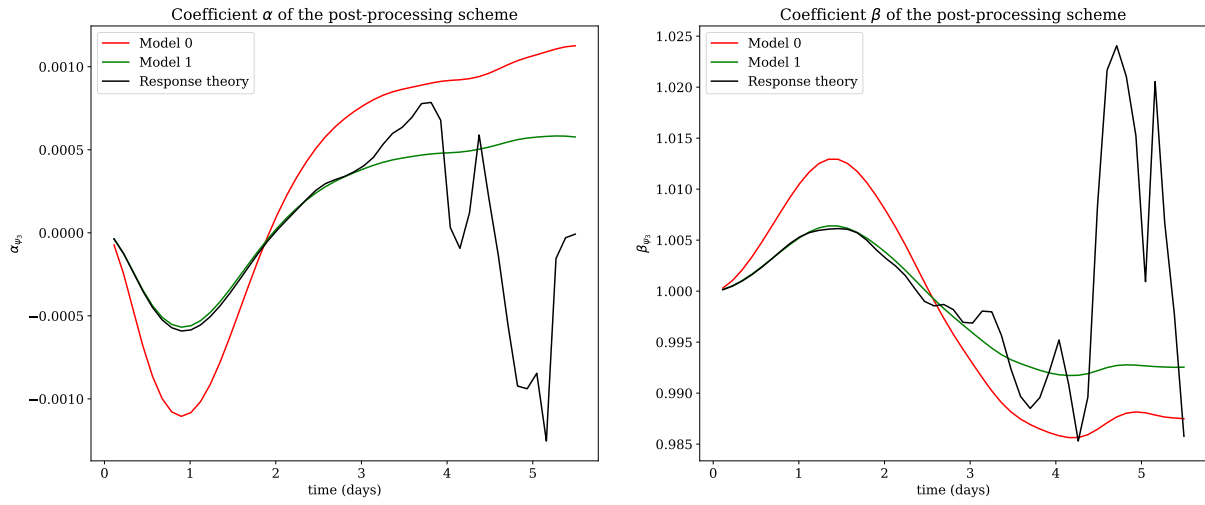


2.3 Variable ψ_3

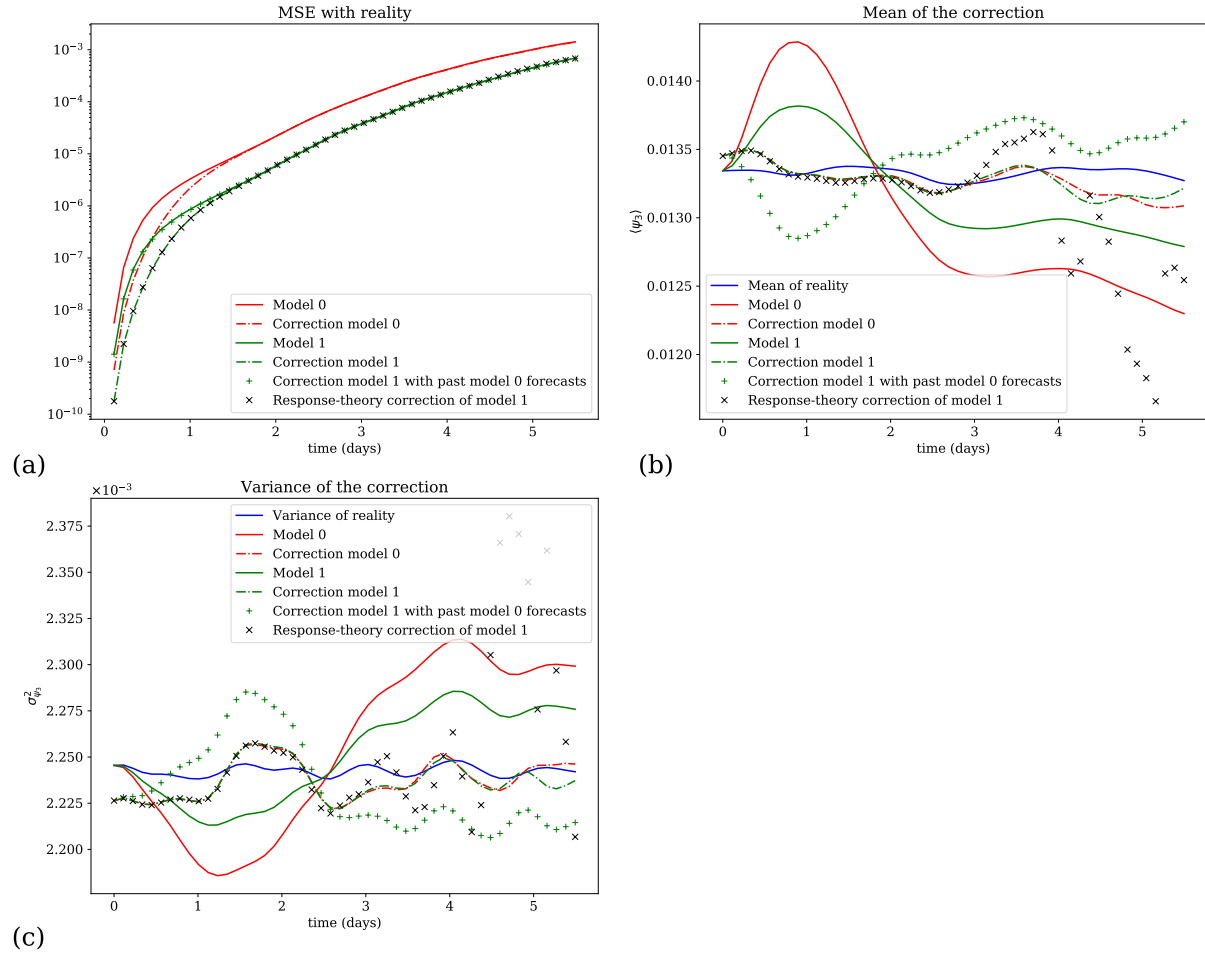
2.3.1 Corrections of the moments of the variable



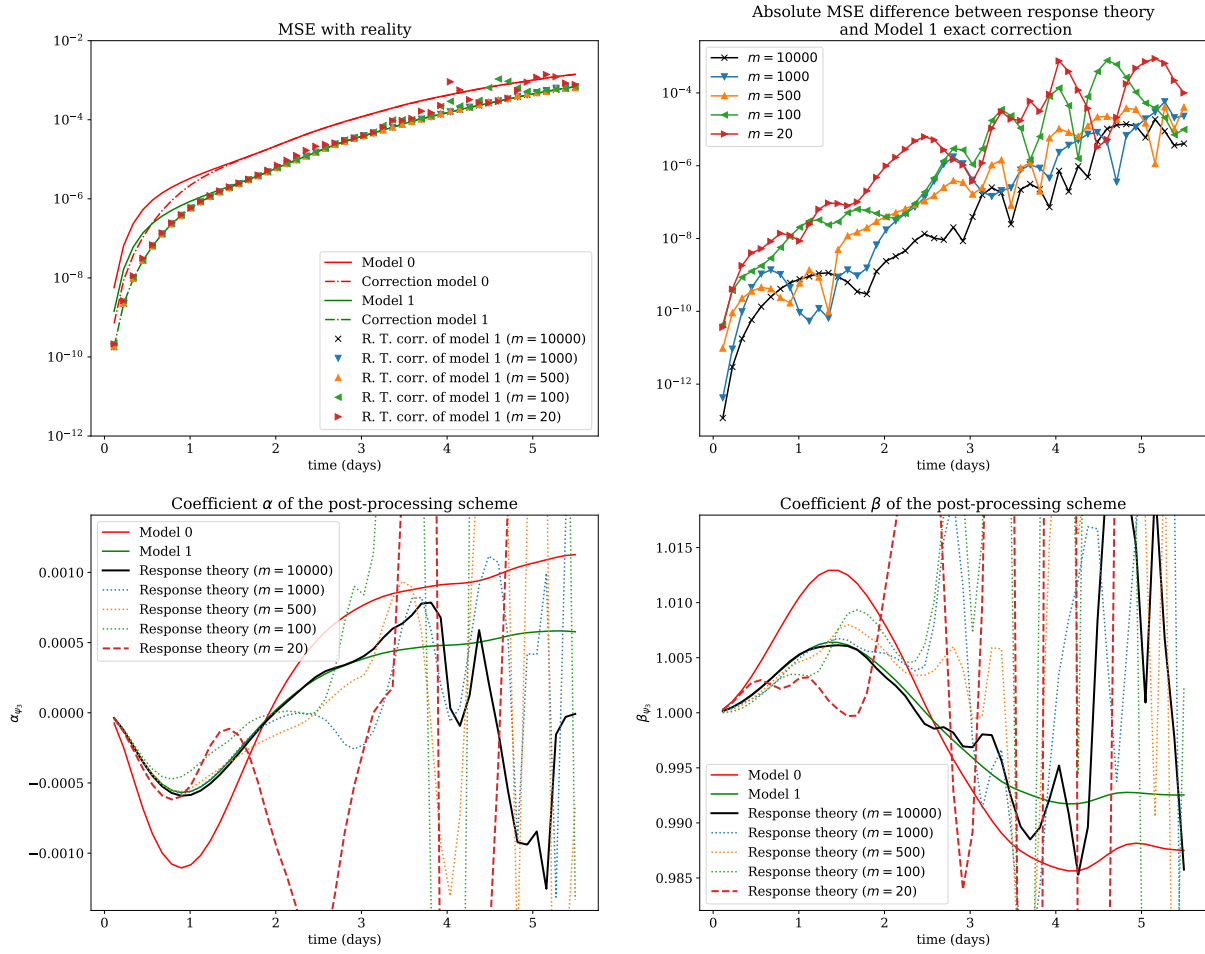
2.3.2 Corrections of the parameters α and β



2.3.3 Performance of the correction

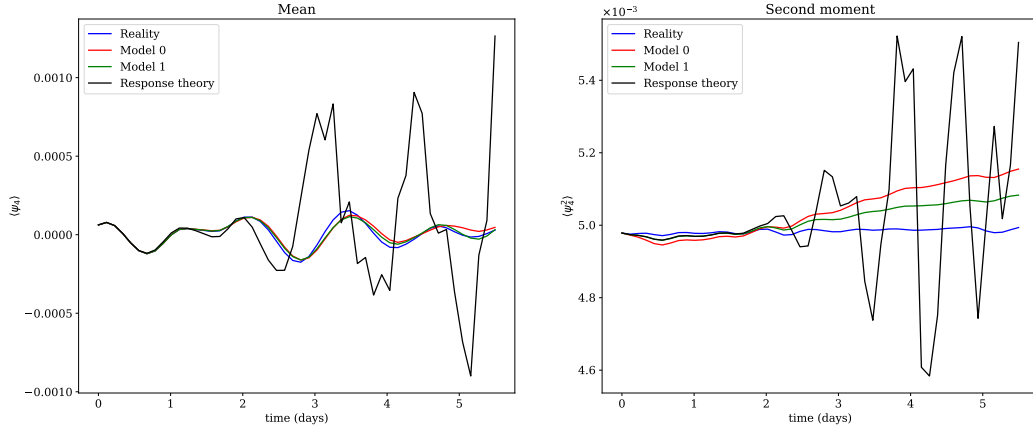


2.3.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

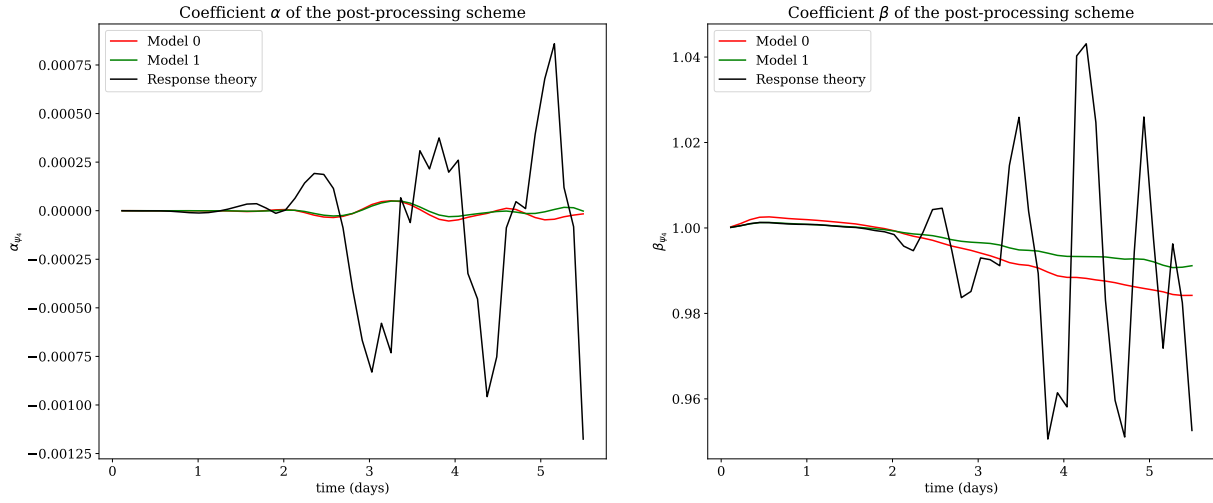


2.4 Variable ψ_4

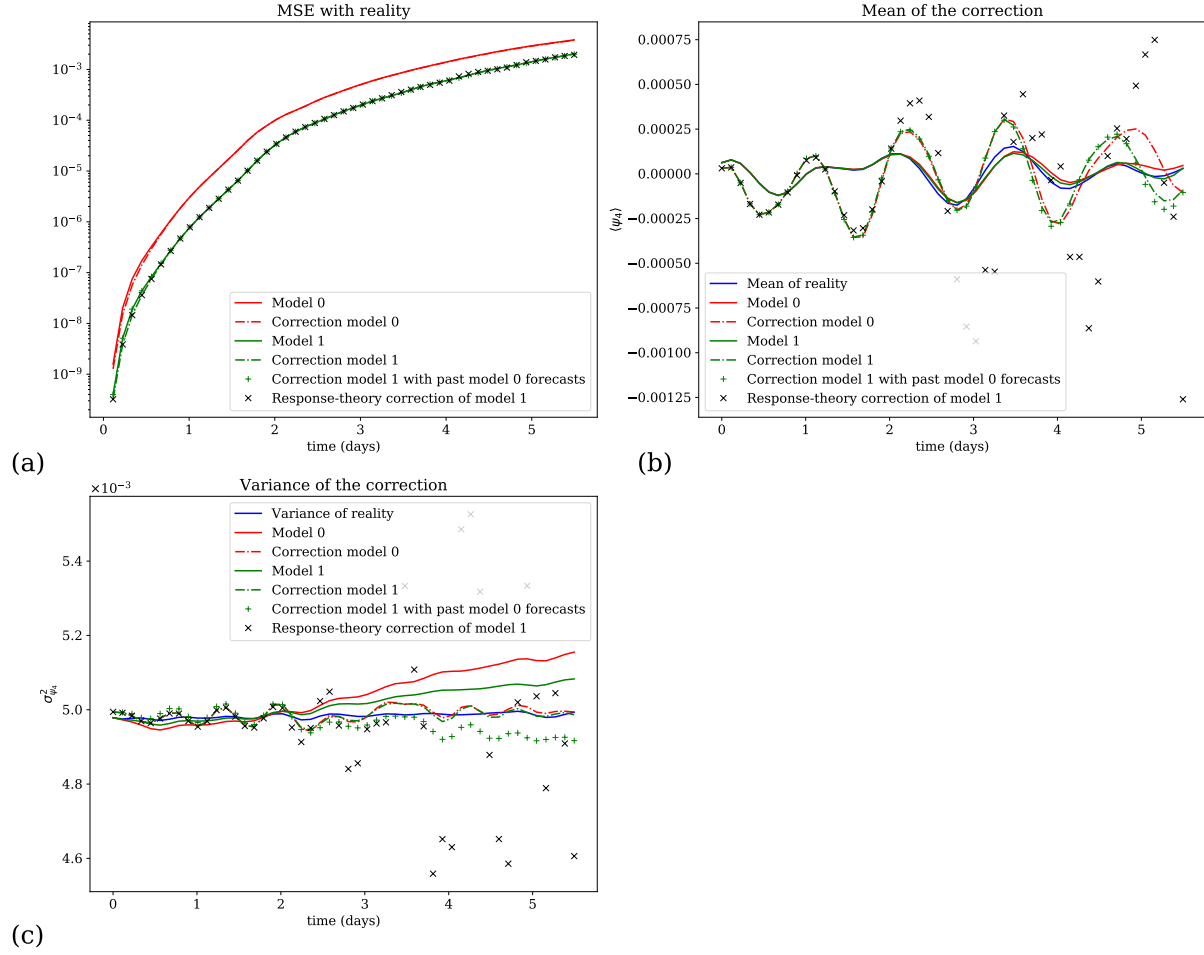
2.4.1 Corrections of the moments of the variable



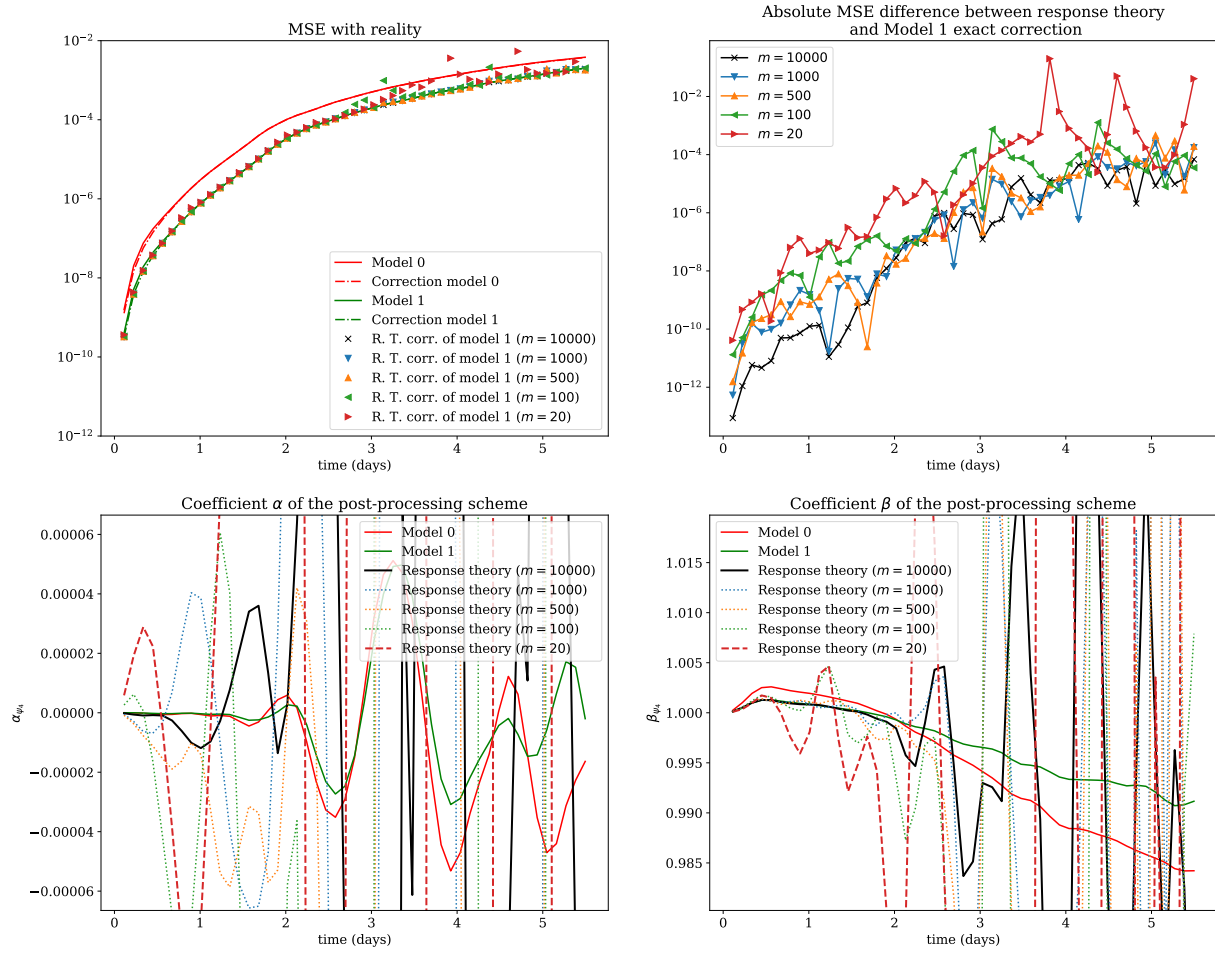
2.4.2 Corrections of the parameters α and β



2.4.3 Performance of the correction

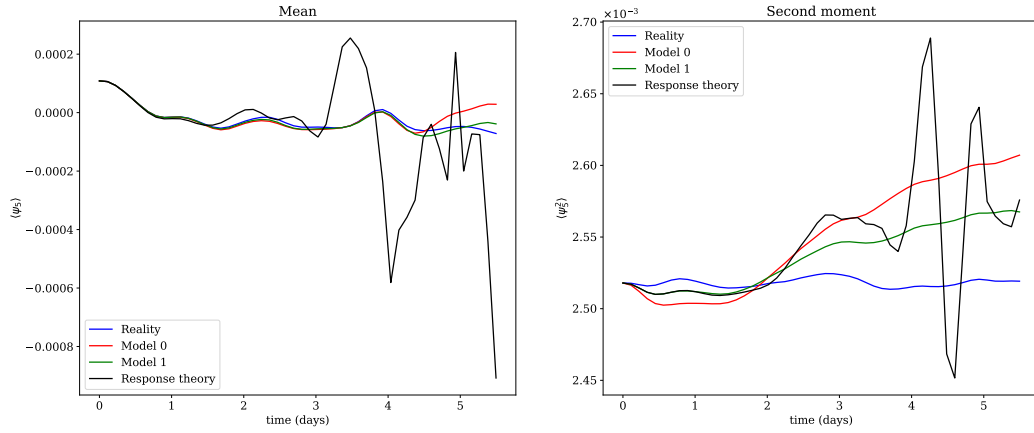


2.4.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

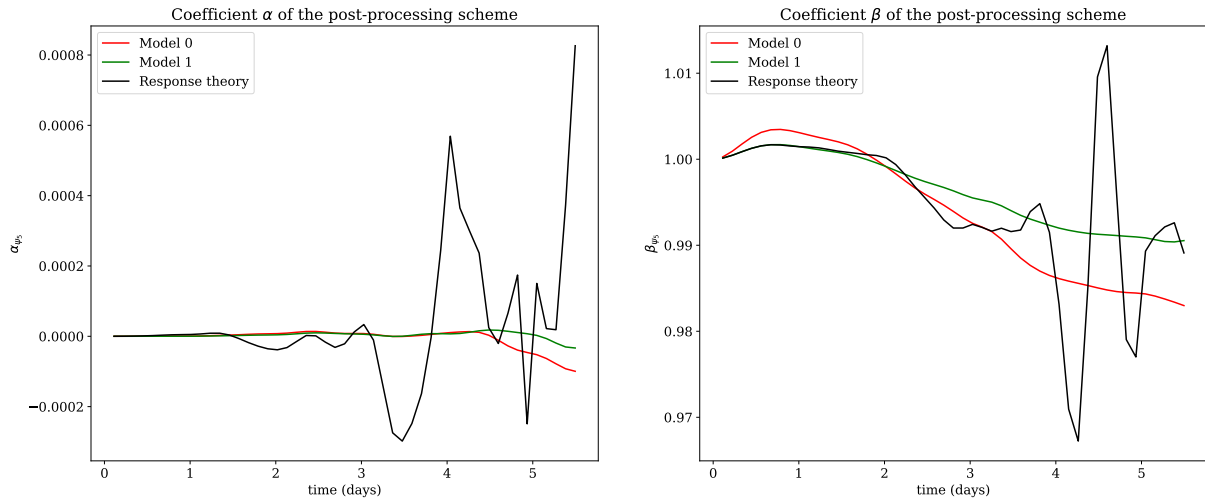


2.5 Variable ψ_5

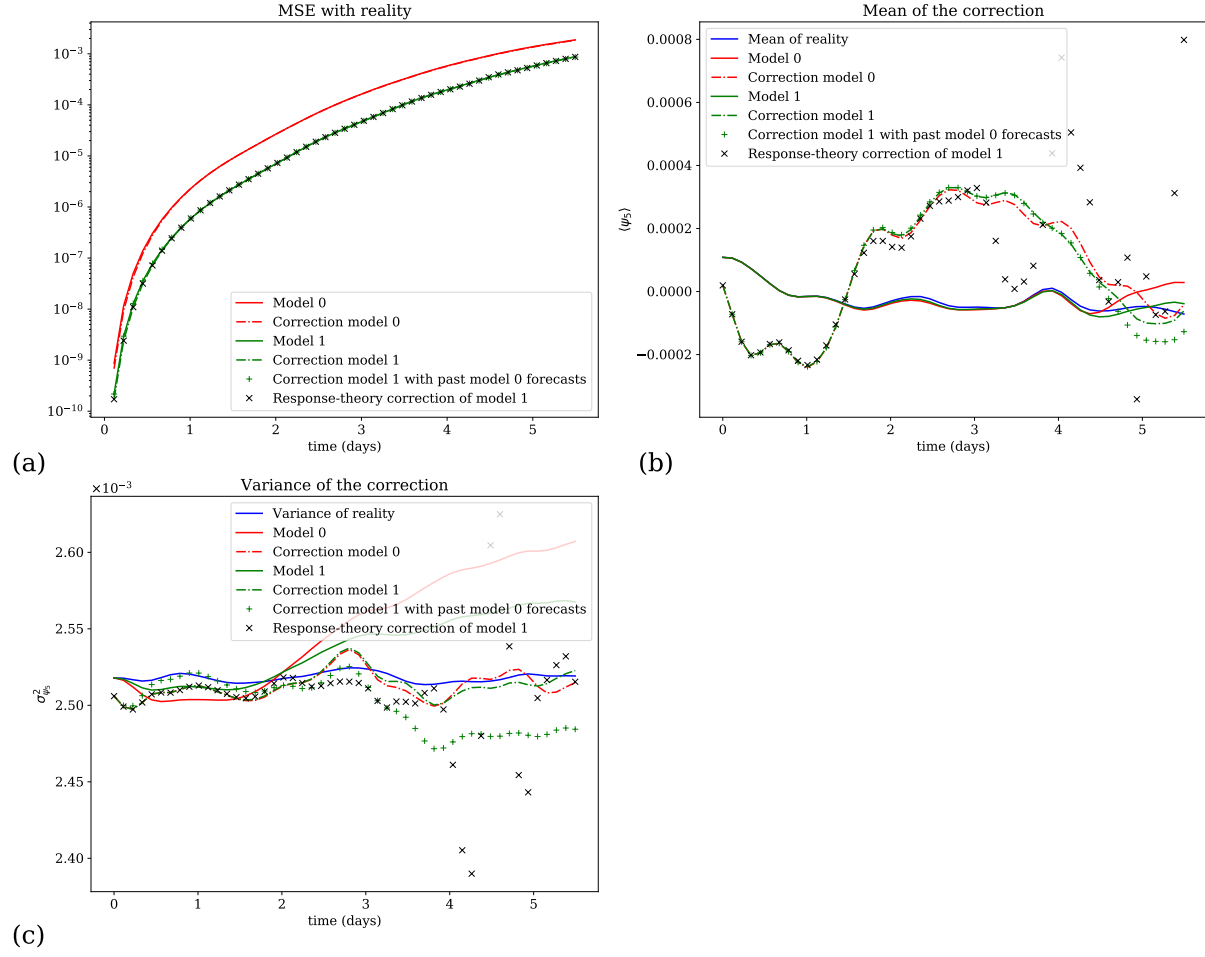
2.5.1 Corrections of the moments of the variable



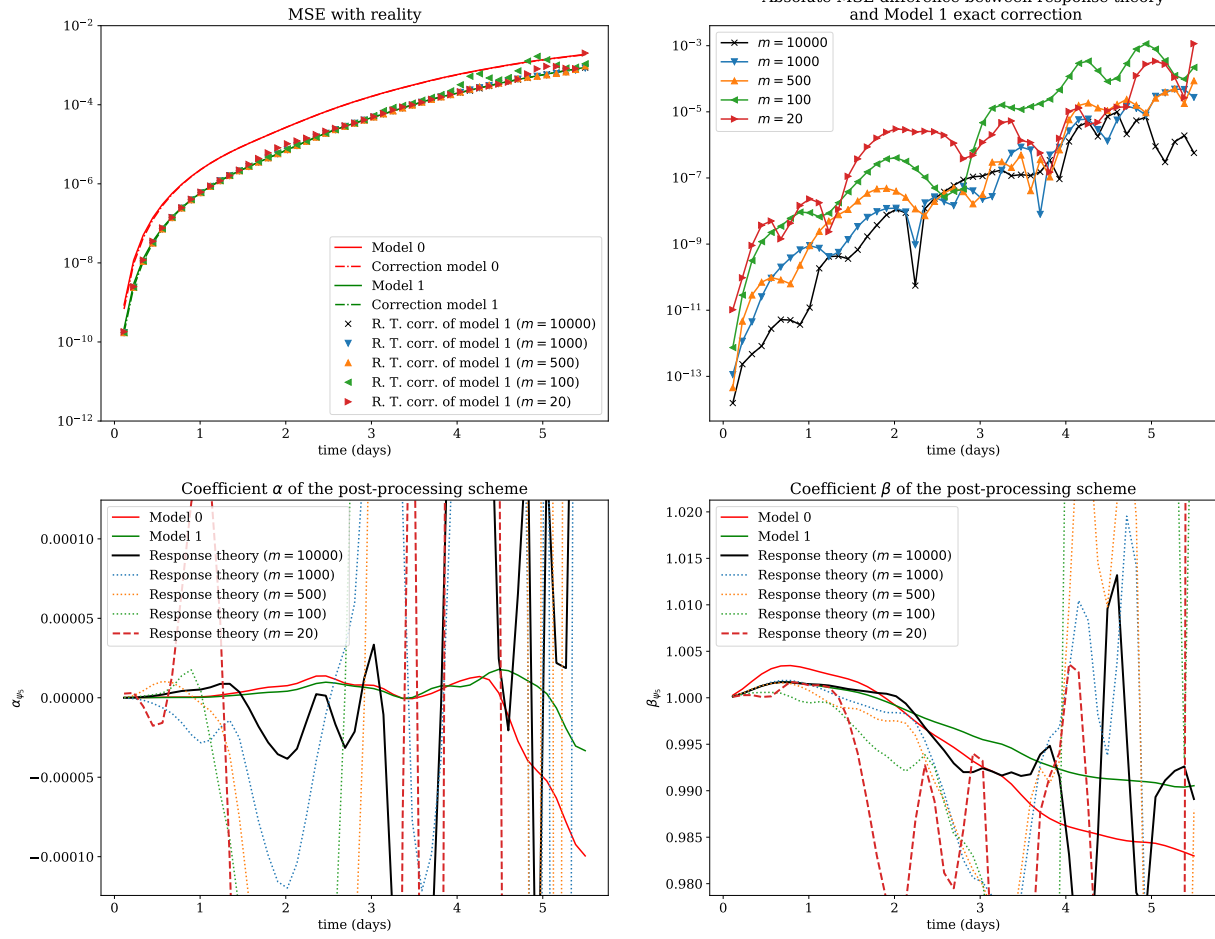
2.5.2 Corrections of the parameters α and β



2.5.3 Performance of the correction

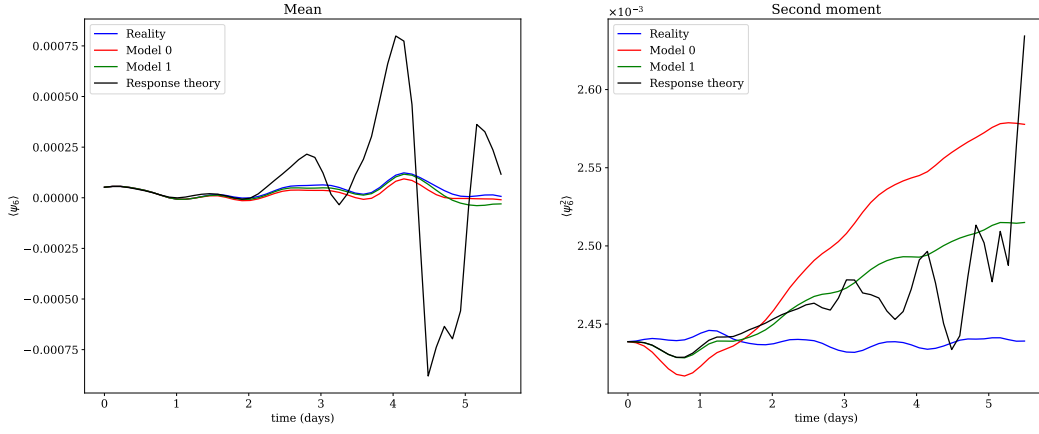


2.5.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

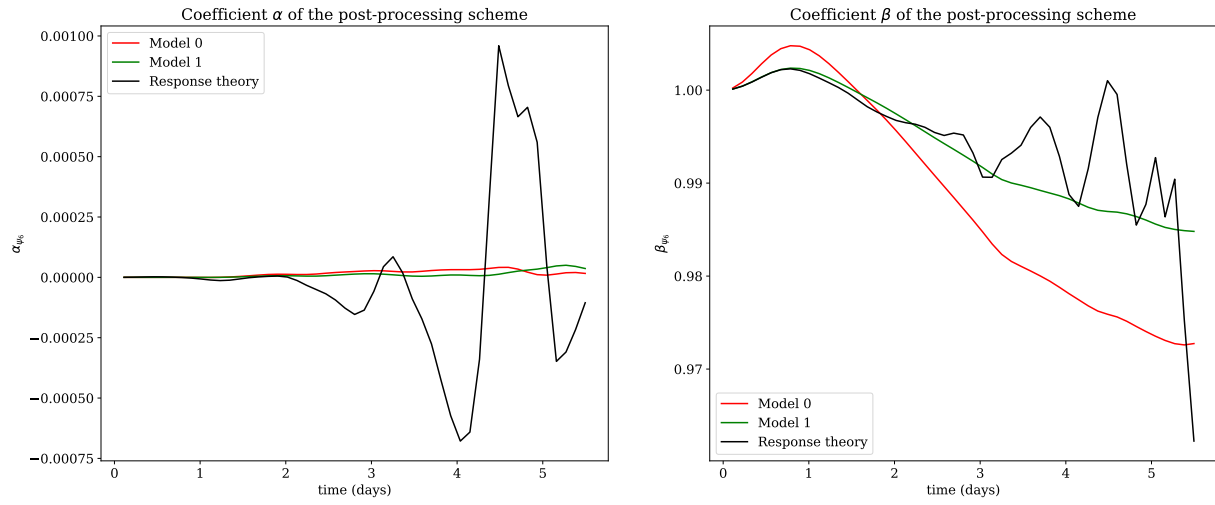


2.6 Variable ψ_6

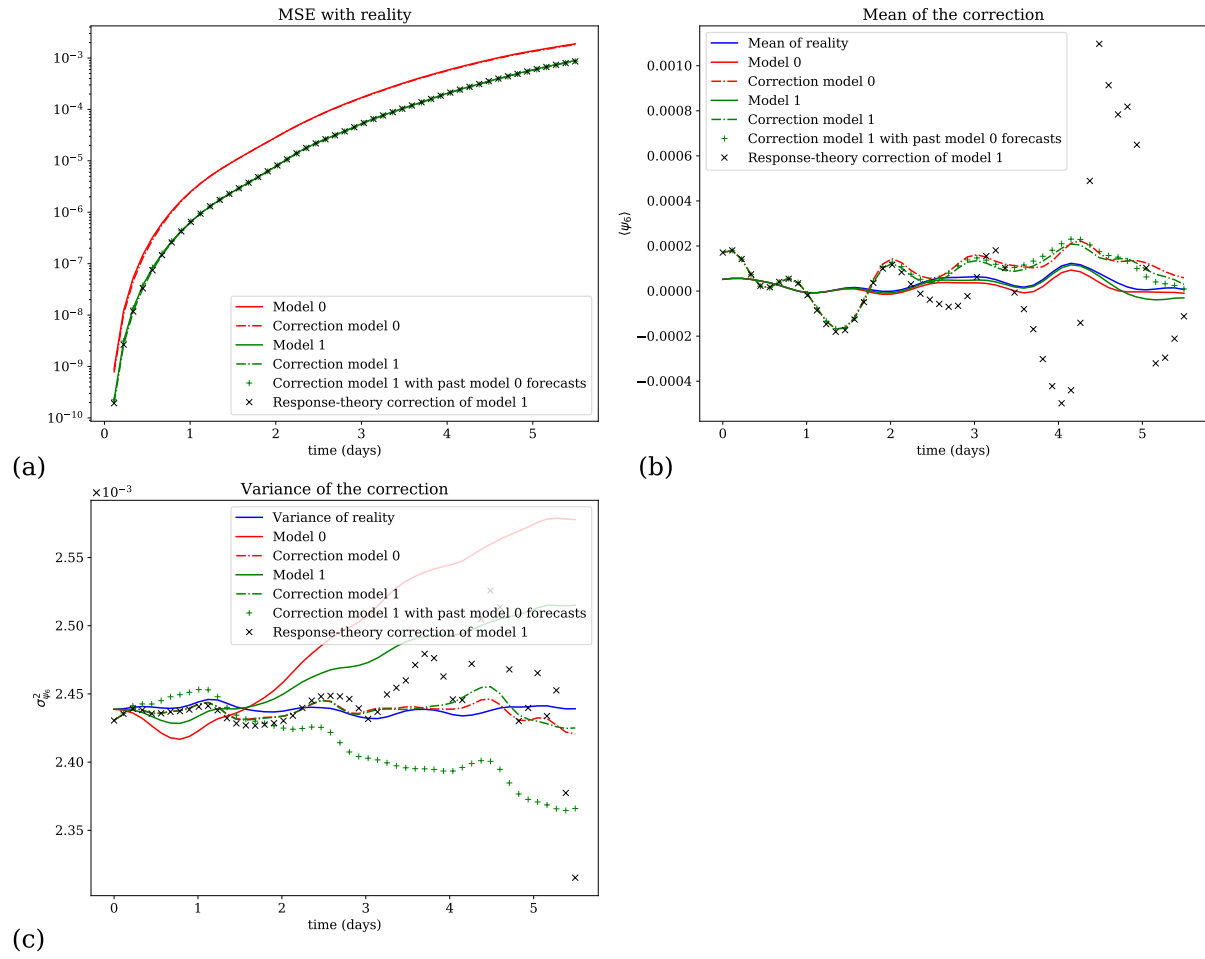
2.6.1 Corrections of the moments of the variable



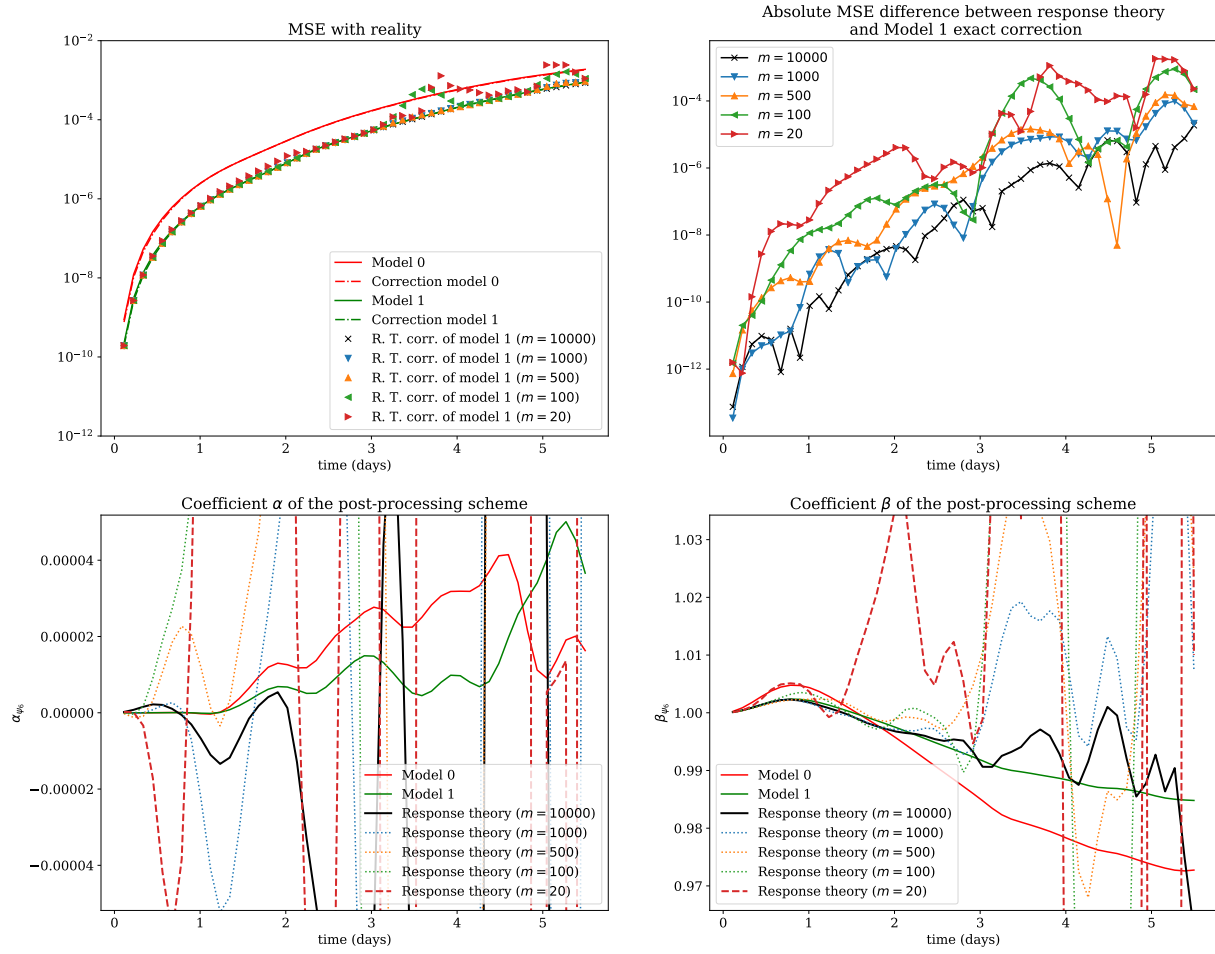
2.6.2 Corrections of the parameters α and β



2.6.3 Performance of the correction

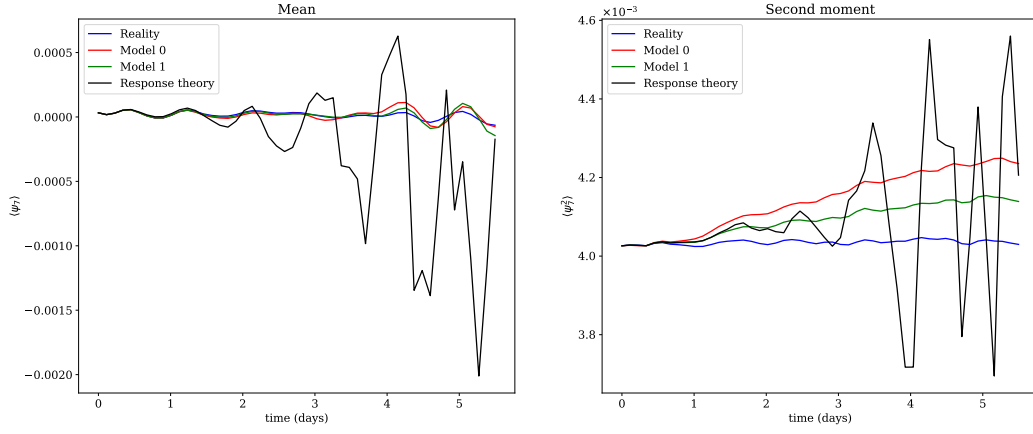


2.6.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

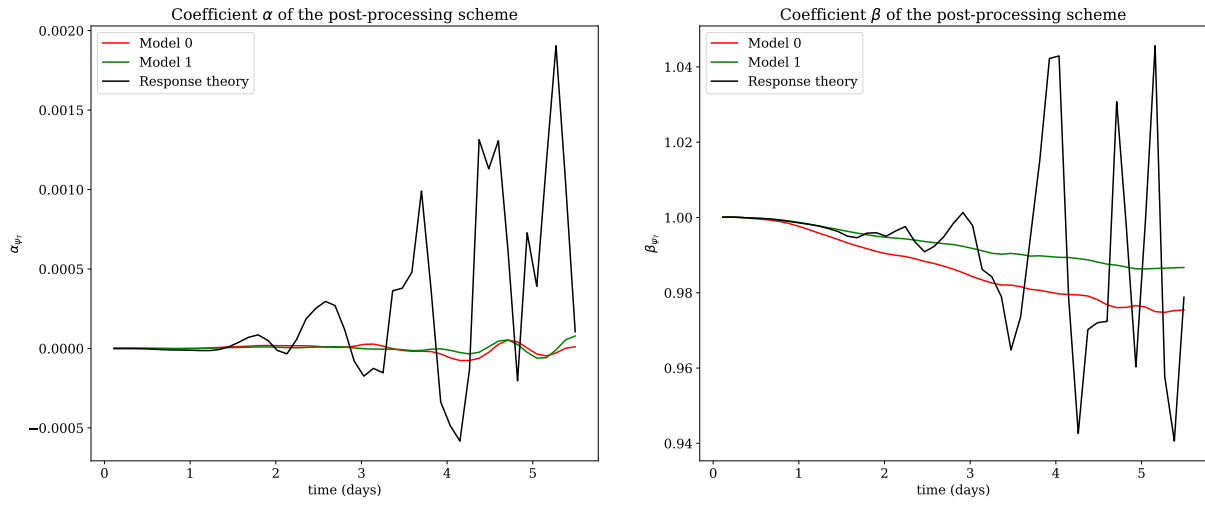


2.7 Variable ψ_7

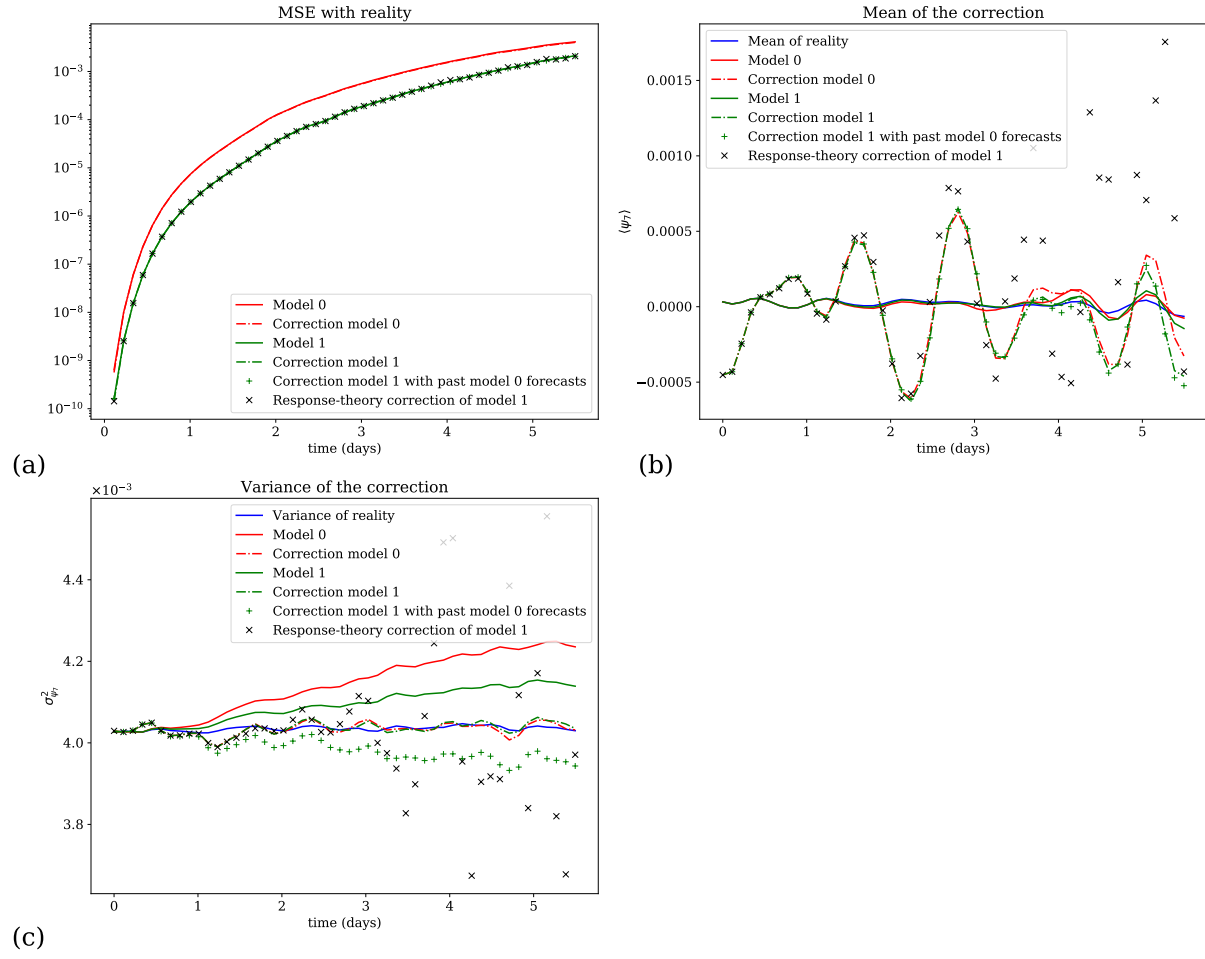
2.7.1 Corrections of the moments of the variable



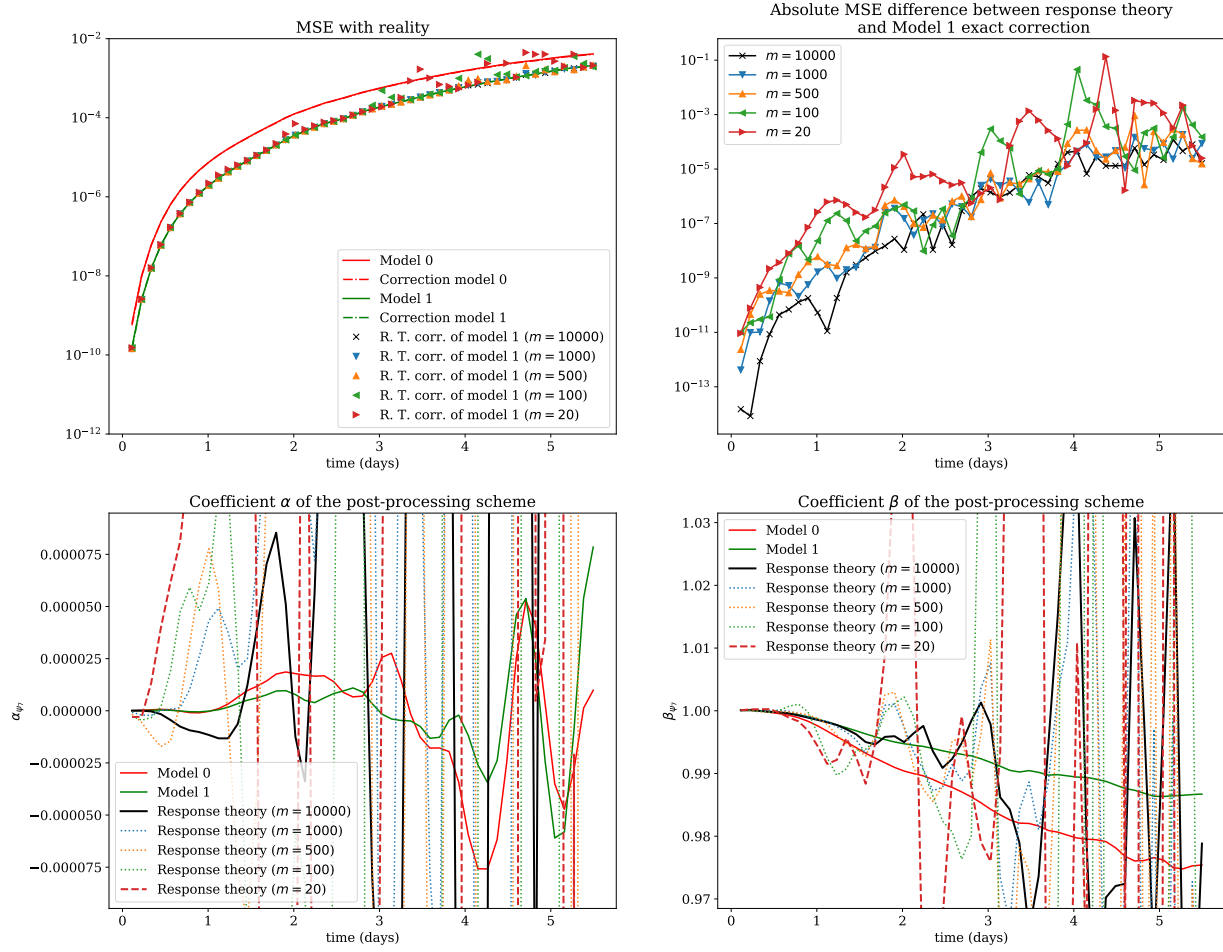
2.7.2 Corrections of the parameters α and β



2.7.3 Performance of the correction

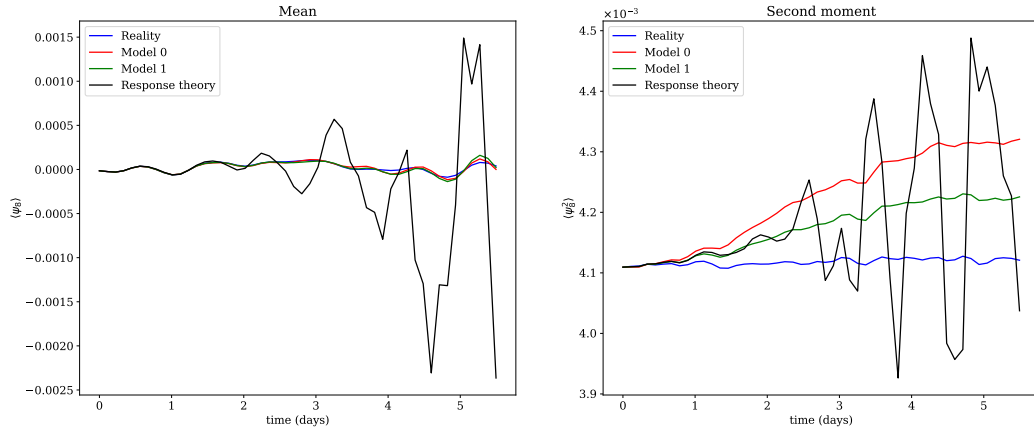


2.7.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

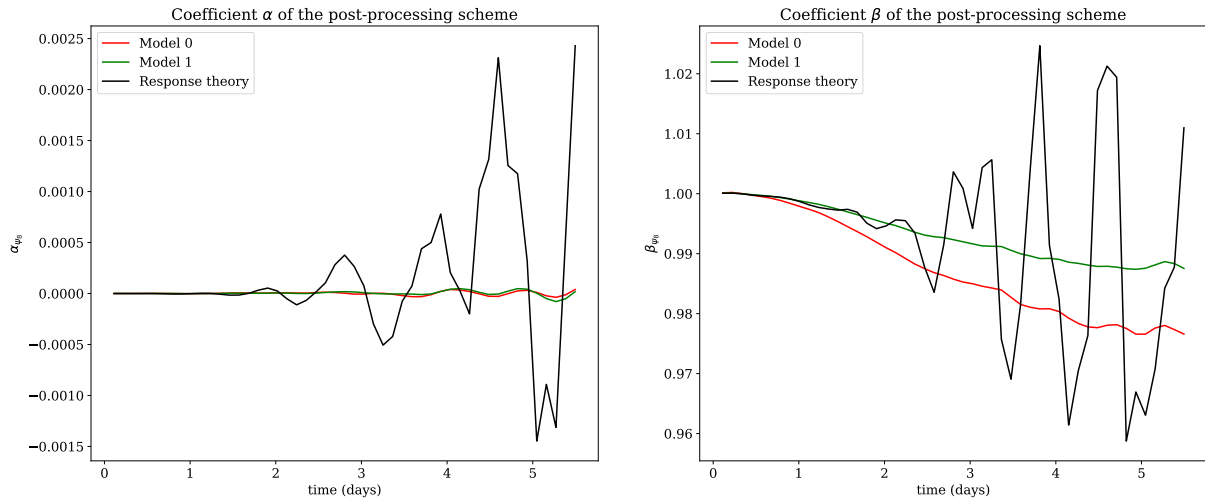


2.8 Variable ψ_8

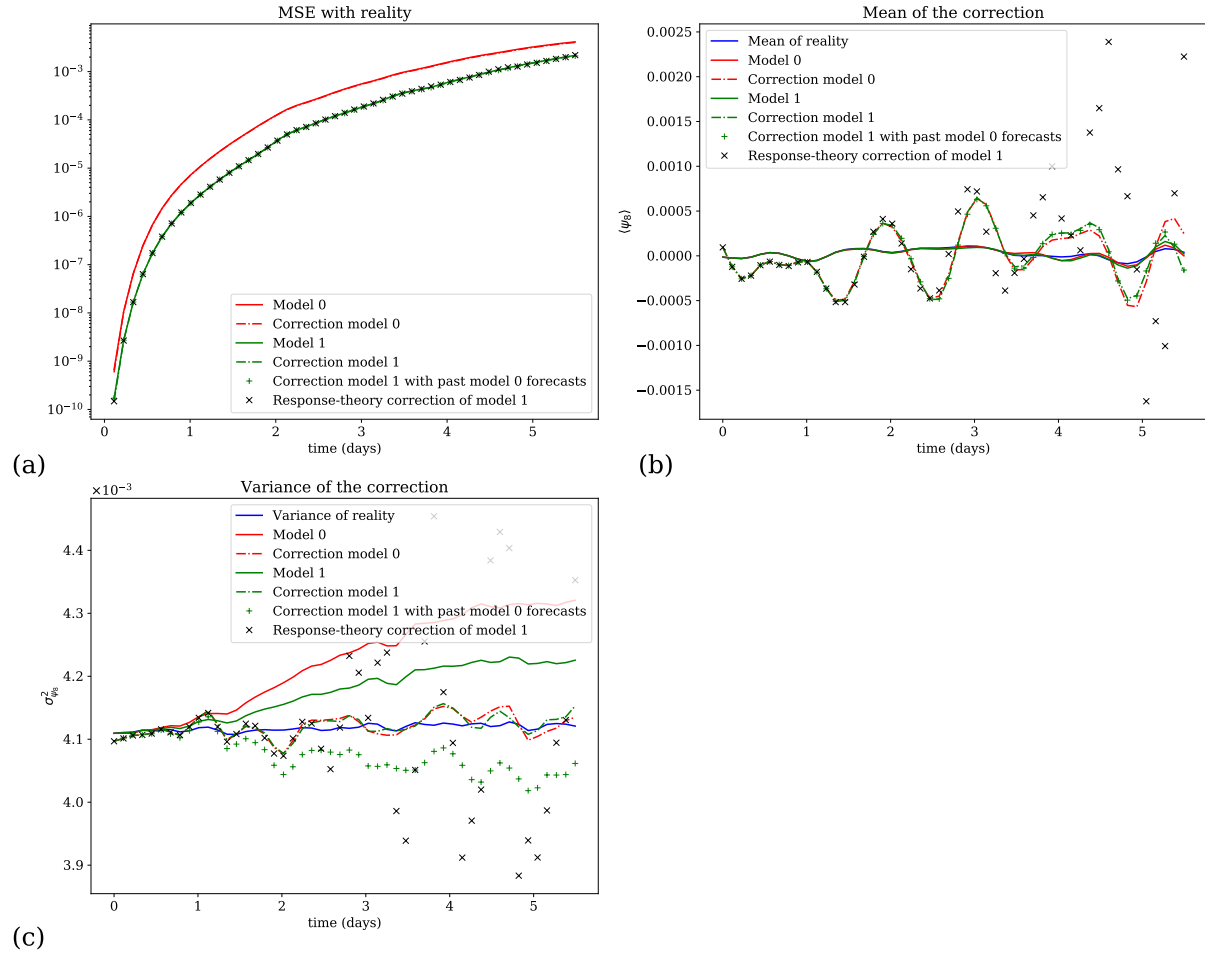
2.8.1 Corrections of the moments of the variable



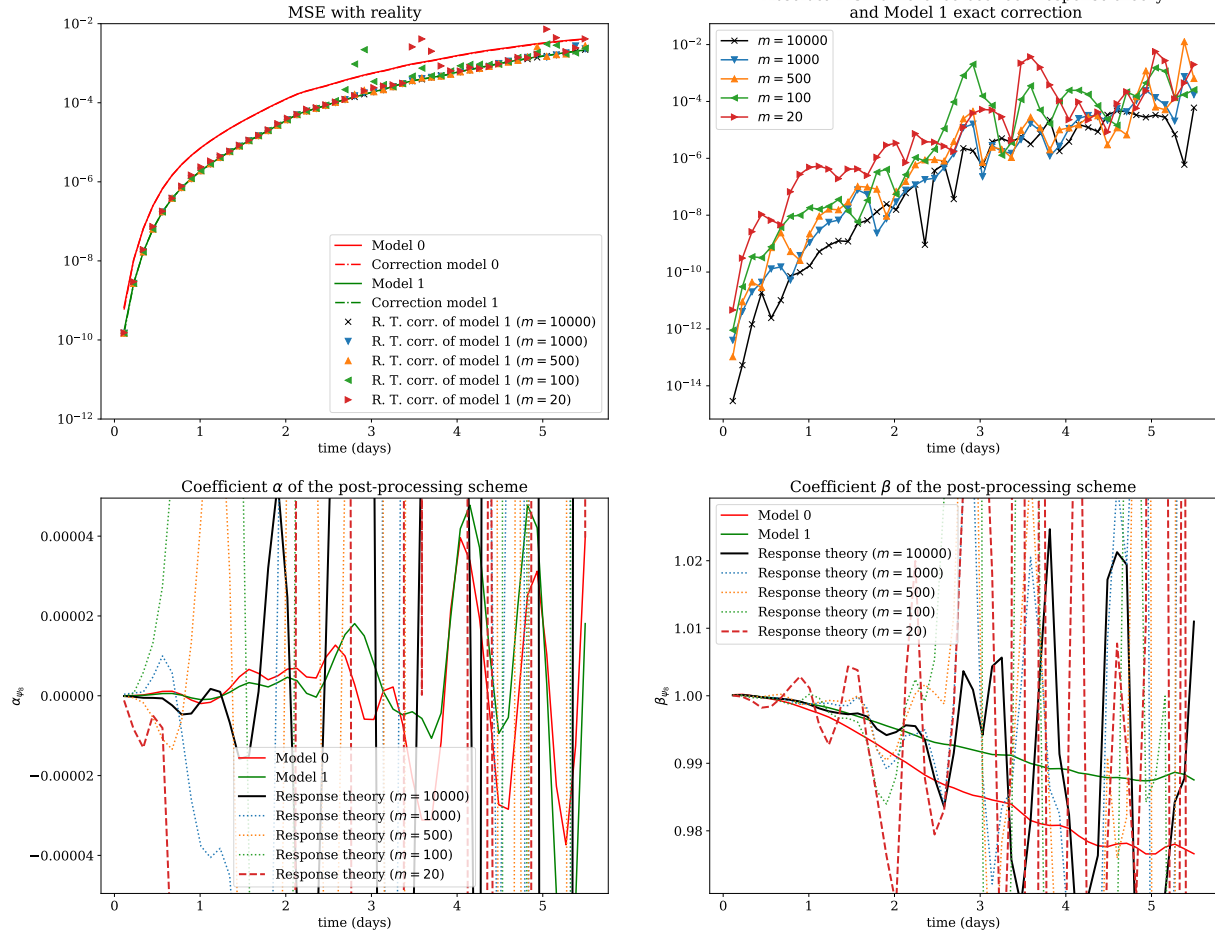
2.8.2 Corrections of the parameters α and β



2.8.3 Performance of the correction

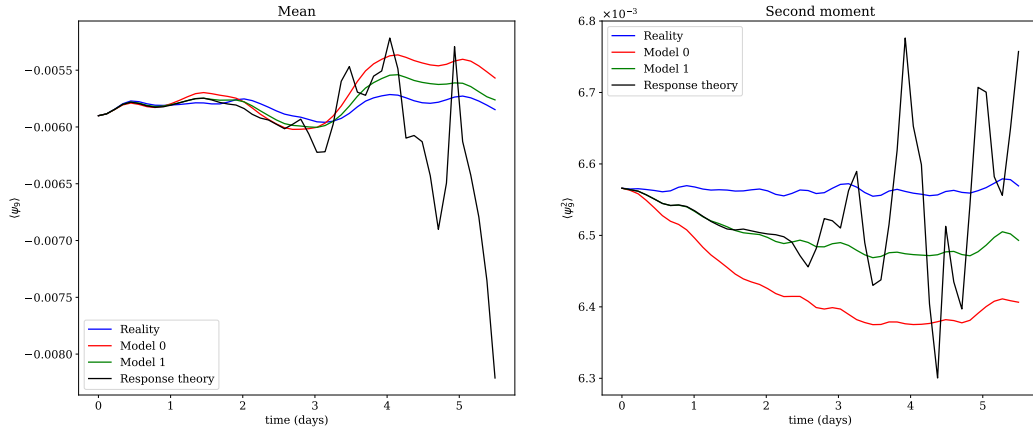


2.8.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

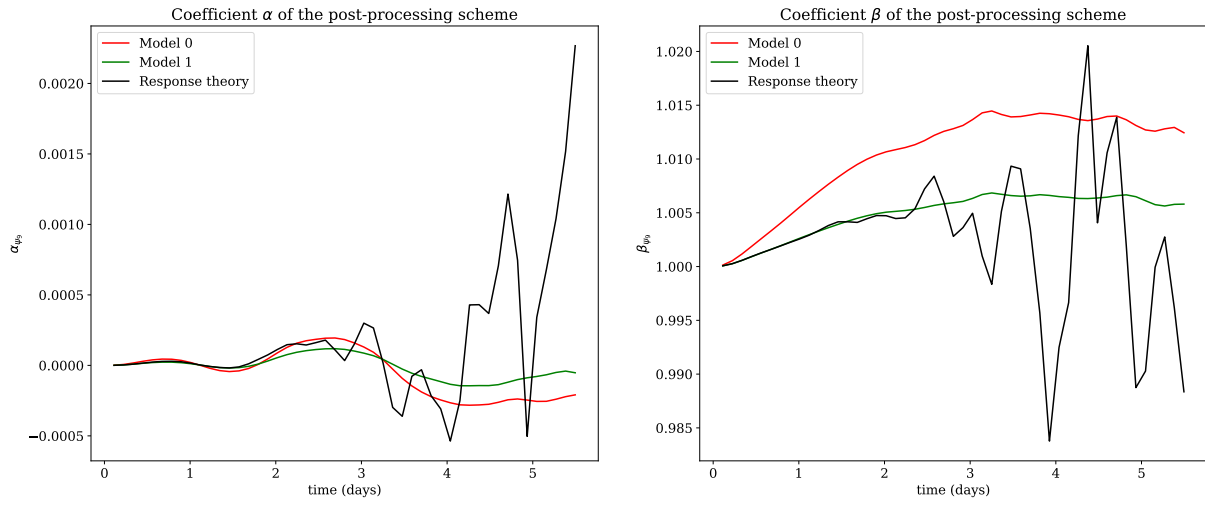


2.9 Variable ψ_9

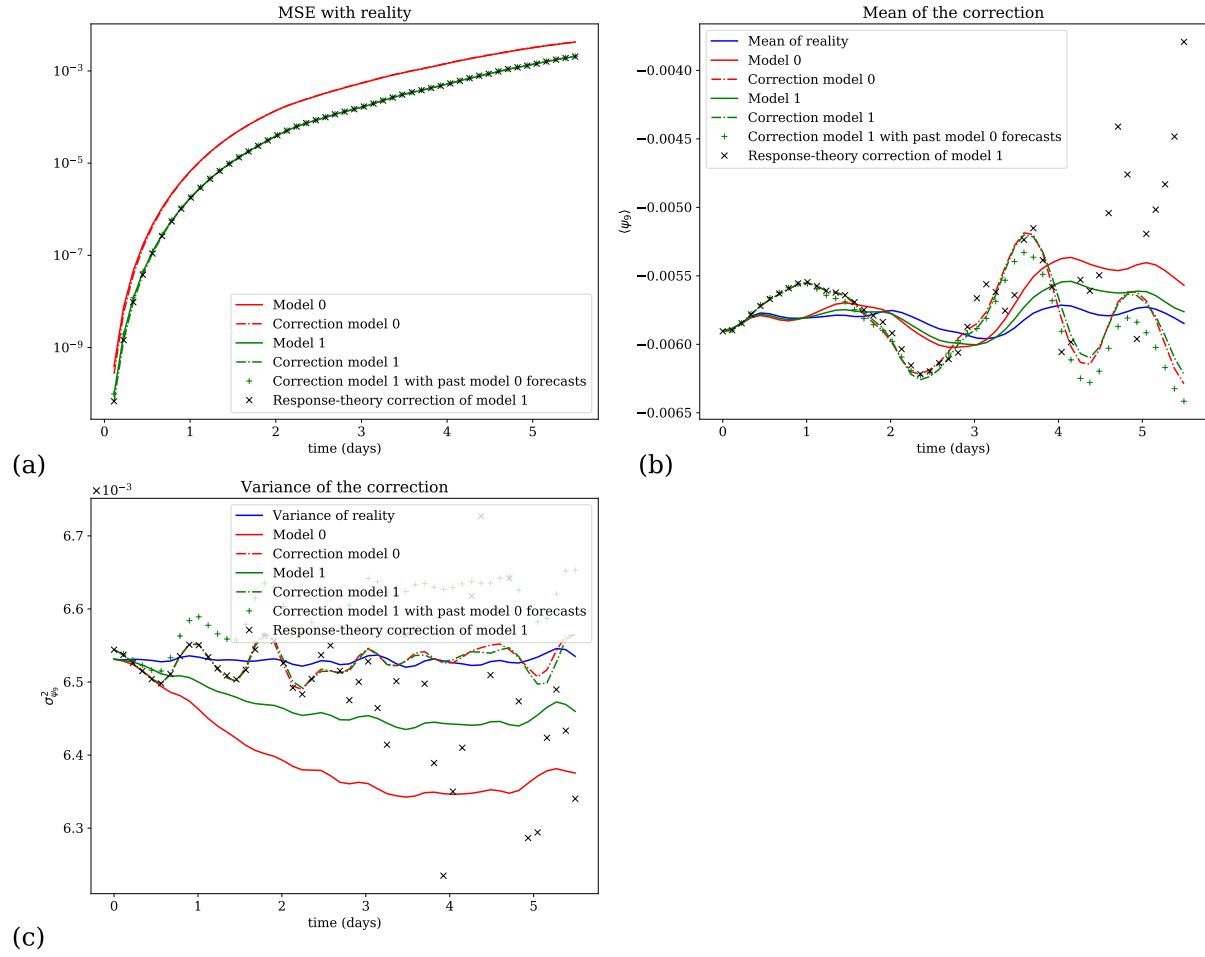
2.9.1 Corrections of the moments of the variable



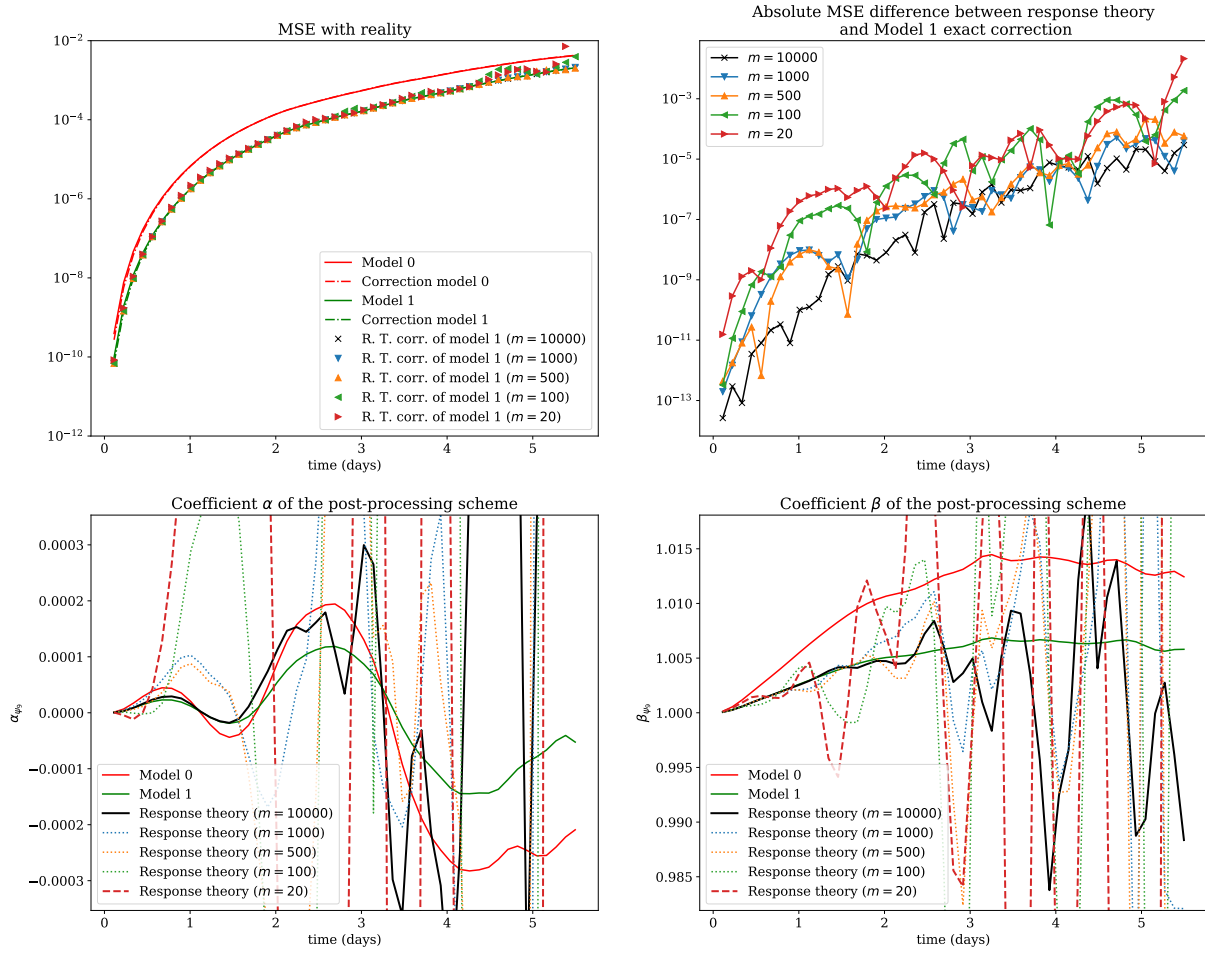
2.9.2 Corrections of the parameters α and β



2.9.3 Performance of the correction

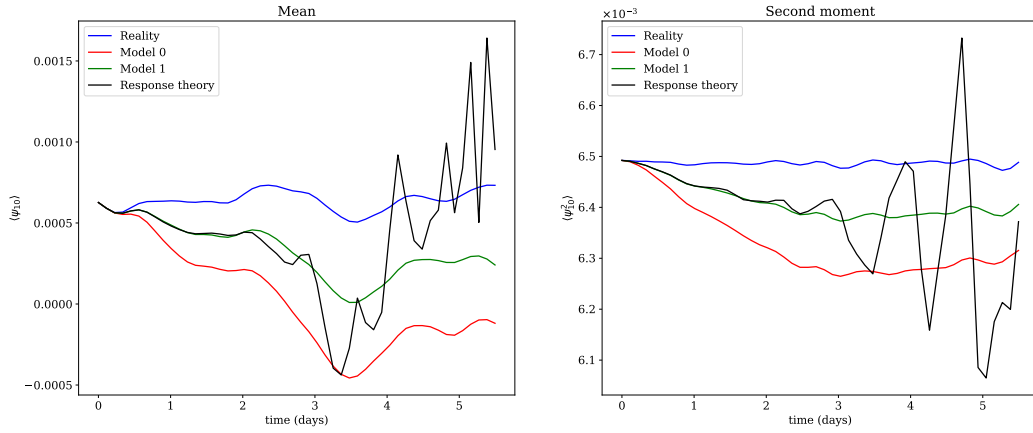


2.9.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

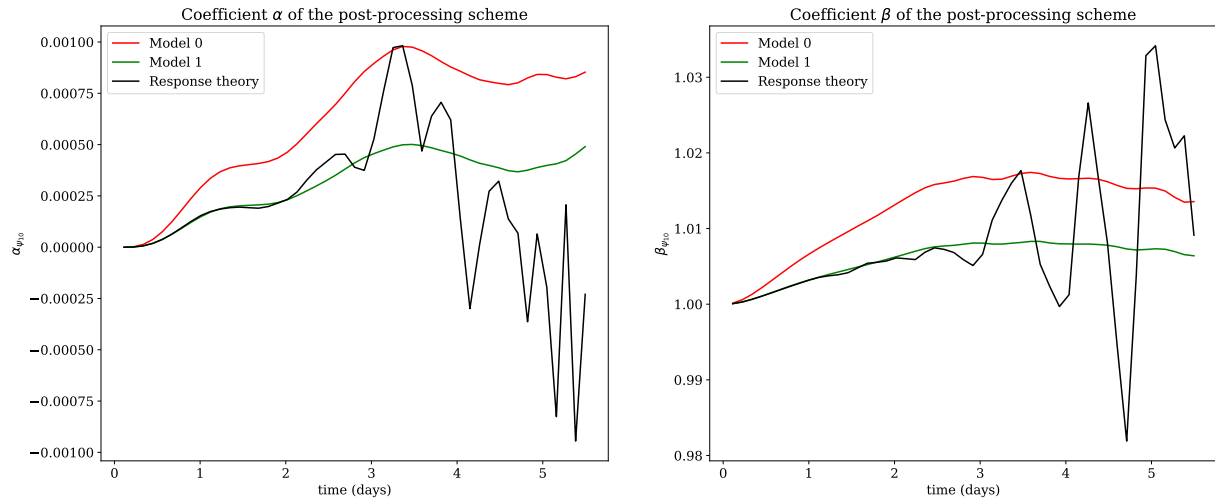


2.10 Variable ψ_{10}

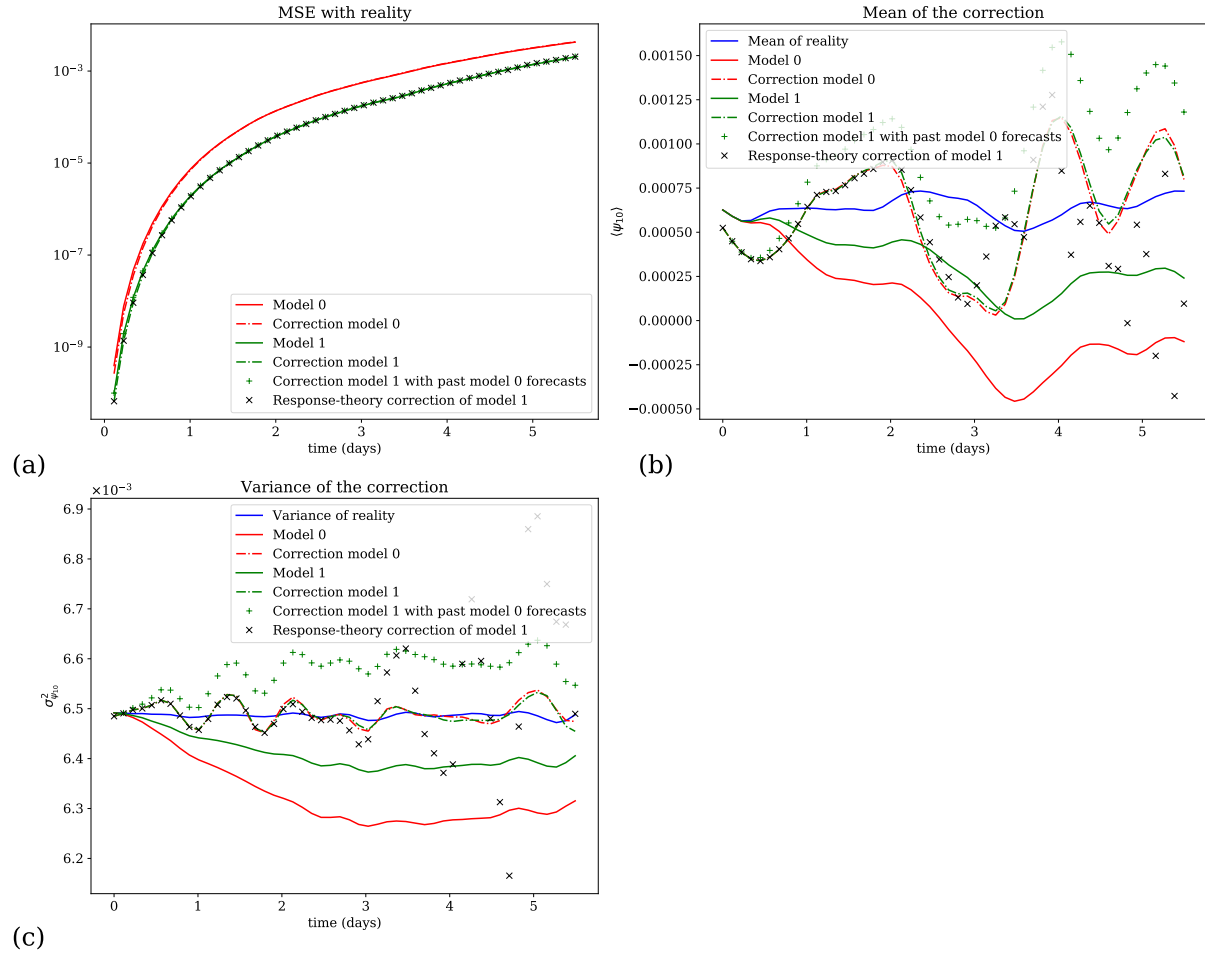
2.10.1 Corrections of the moments of the variable



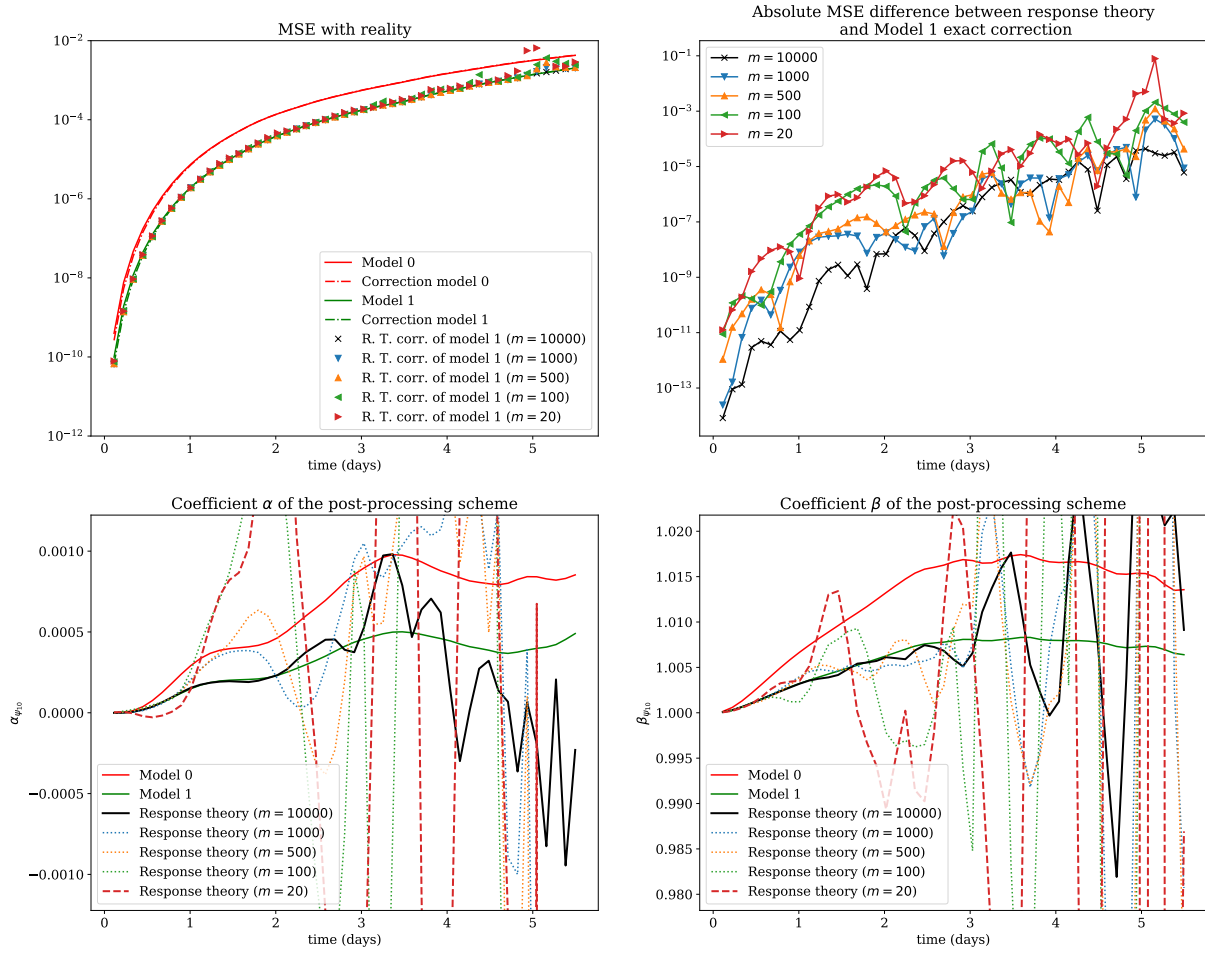
2.10.2 Corrections of the parameters α and β



2.10.3 Performance of the correction

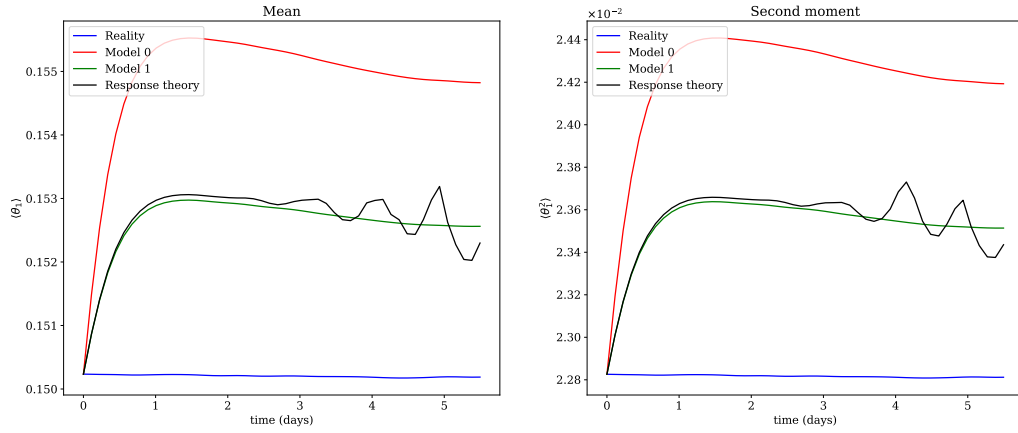


2.10.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

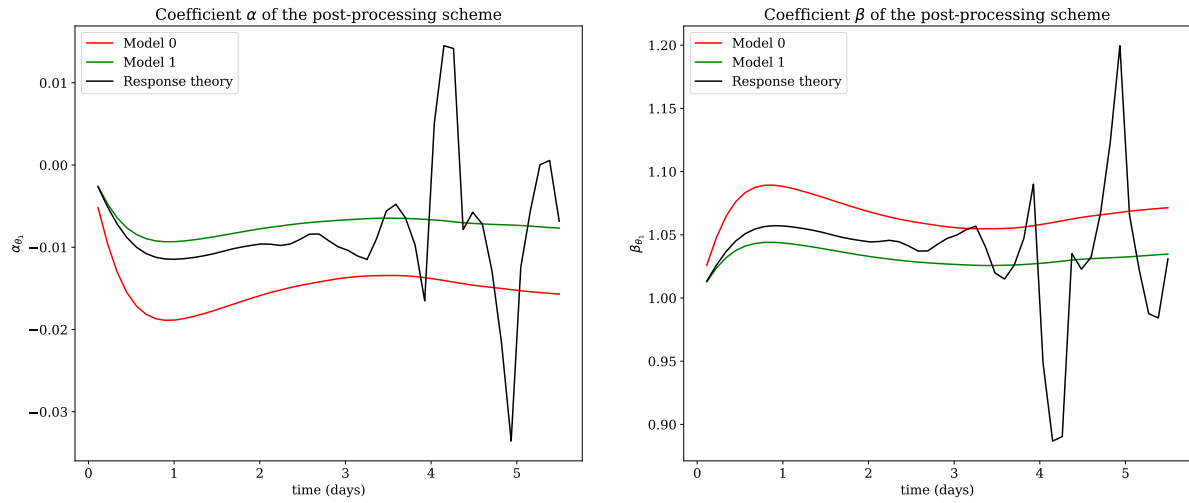


2.11 Variable θ_1

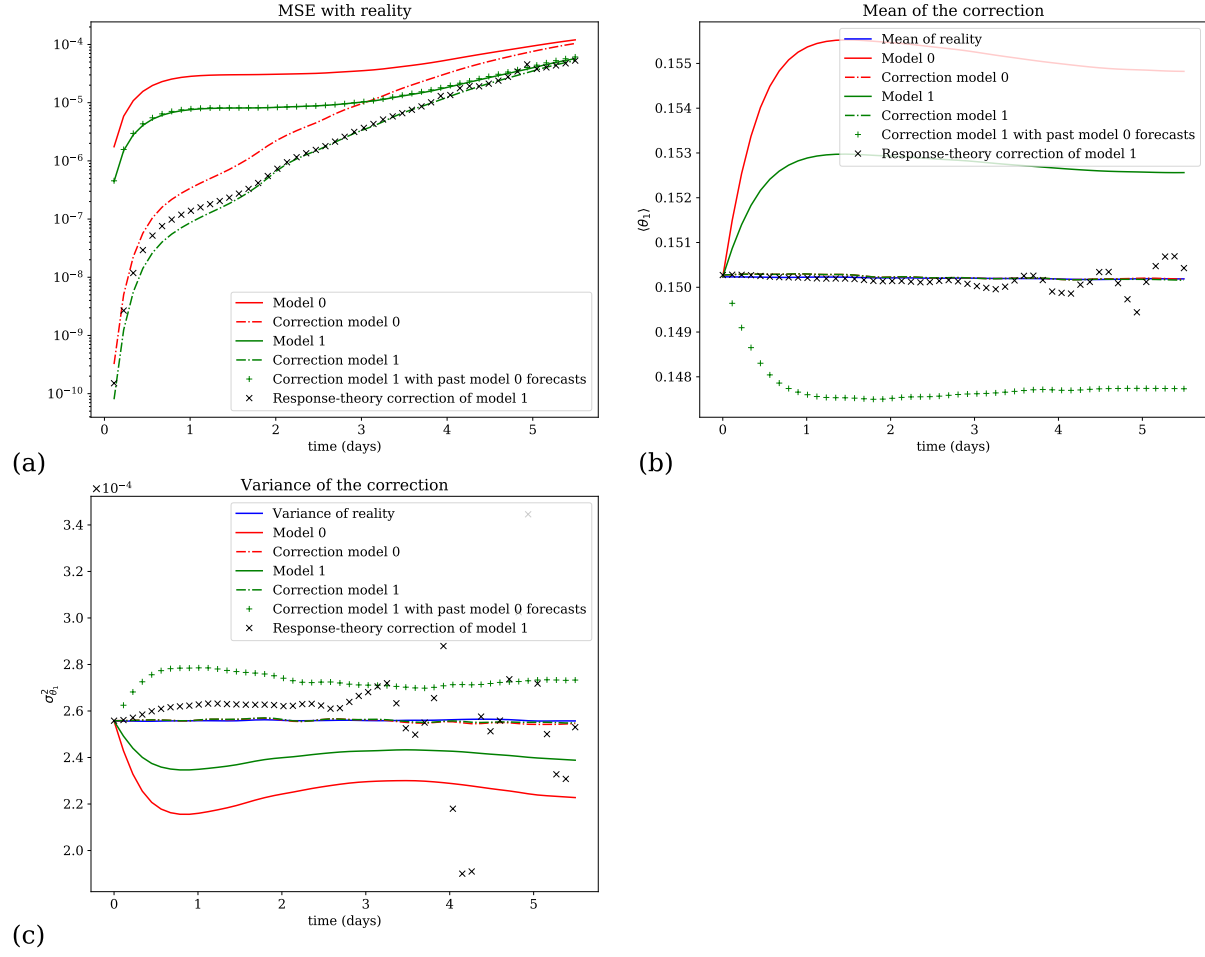
2.11.1 Corrections of the moments of the variable



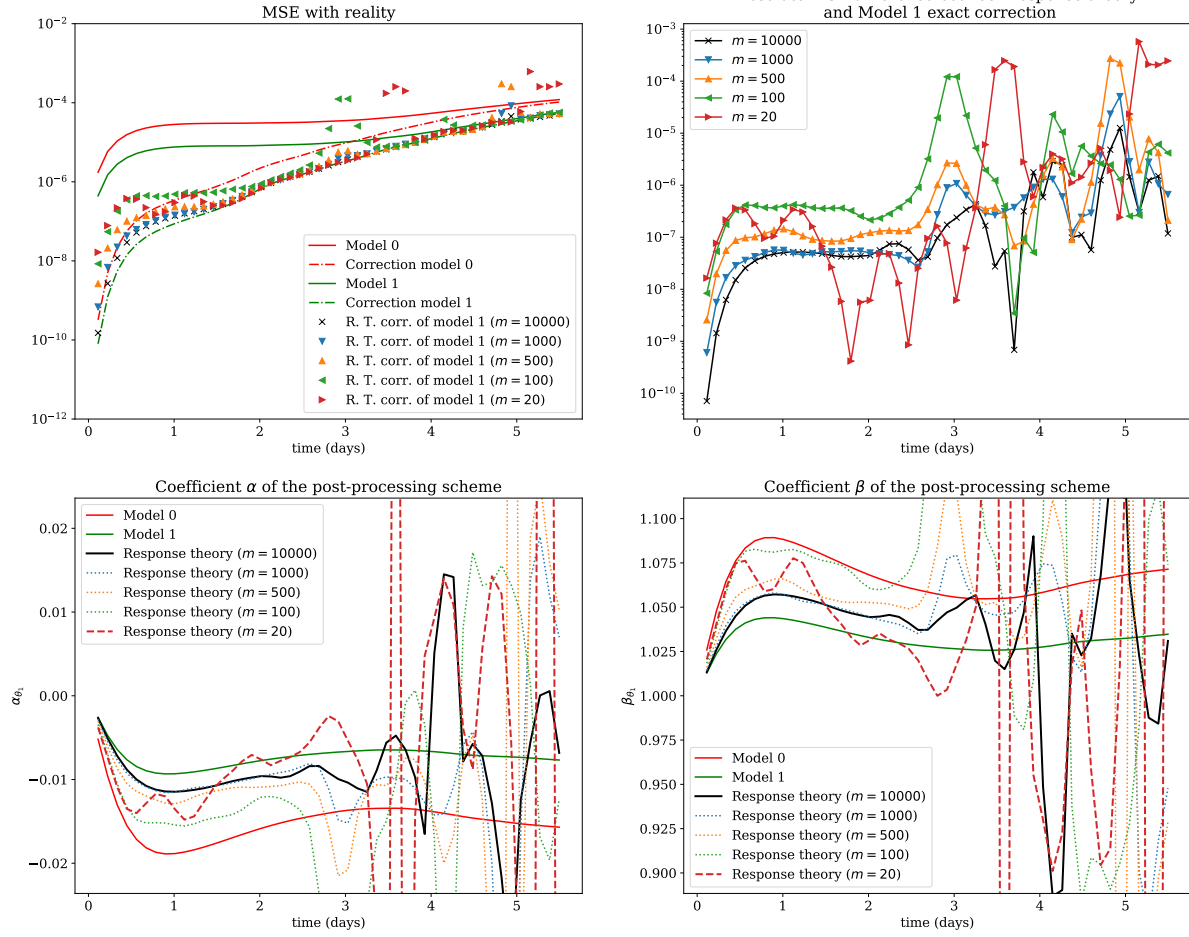
2.11.2 Corrections of the parameters α and β



2.11.3 Performance of the correction

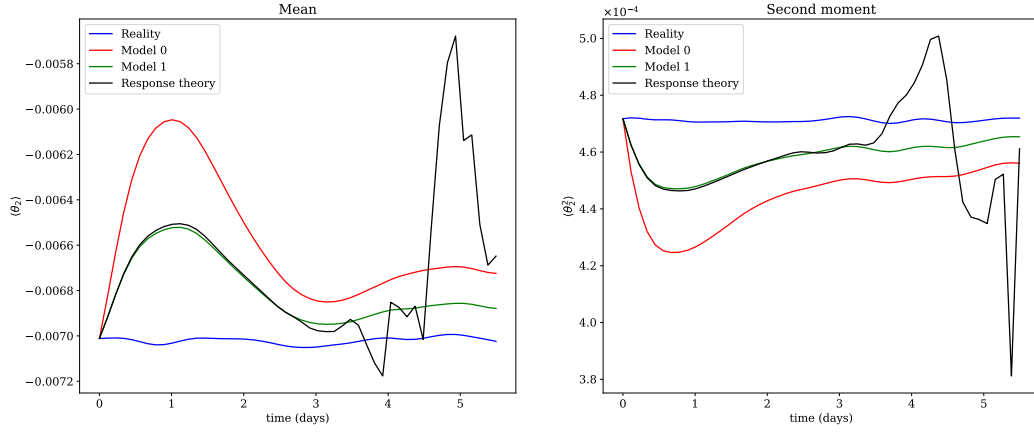


2.11.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

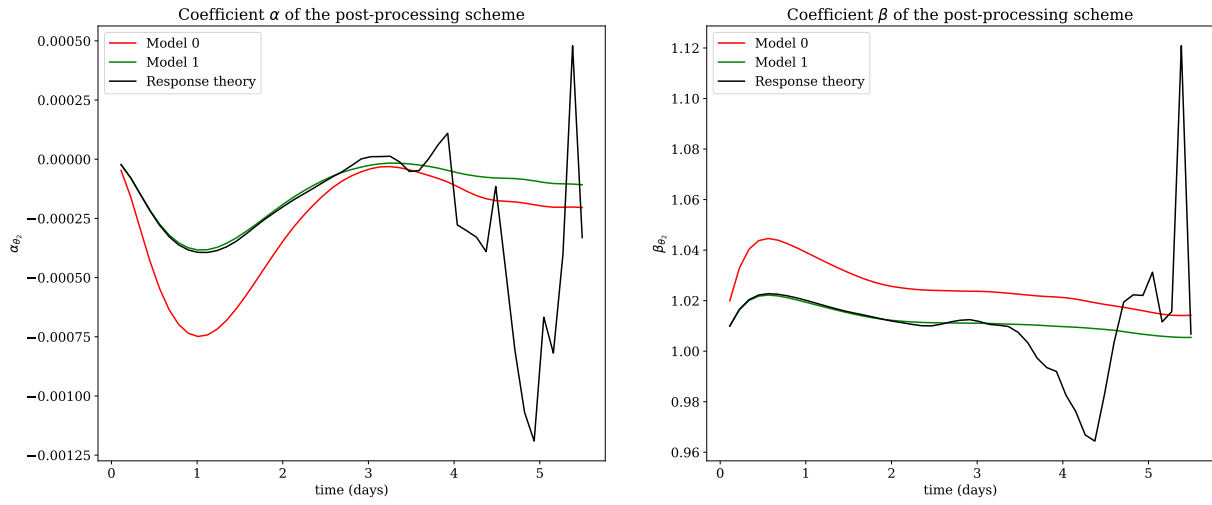


2.12 Variable θ_2

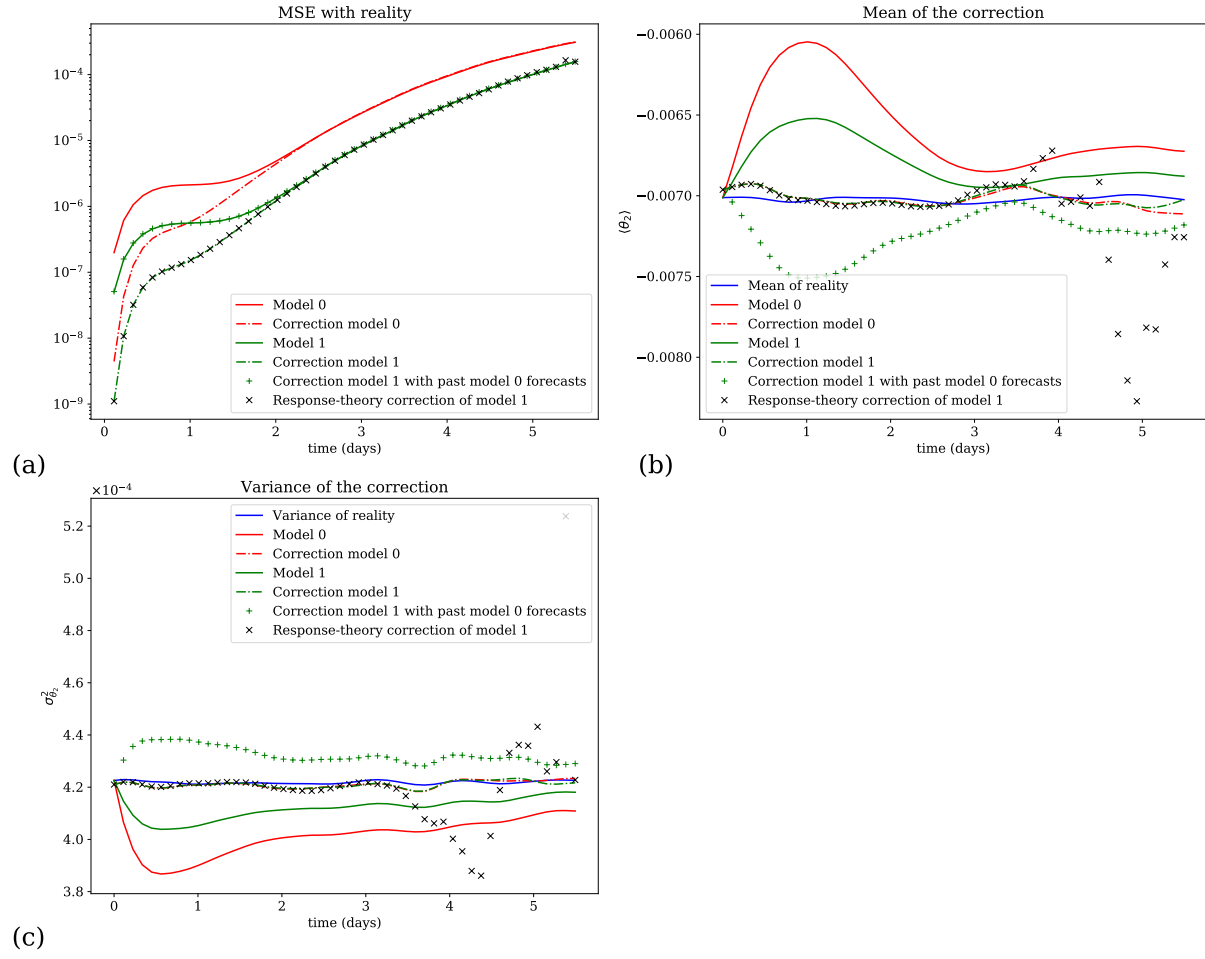
2.12.1 Corrections of the moments of the variable



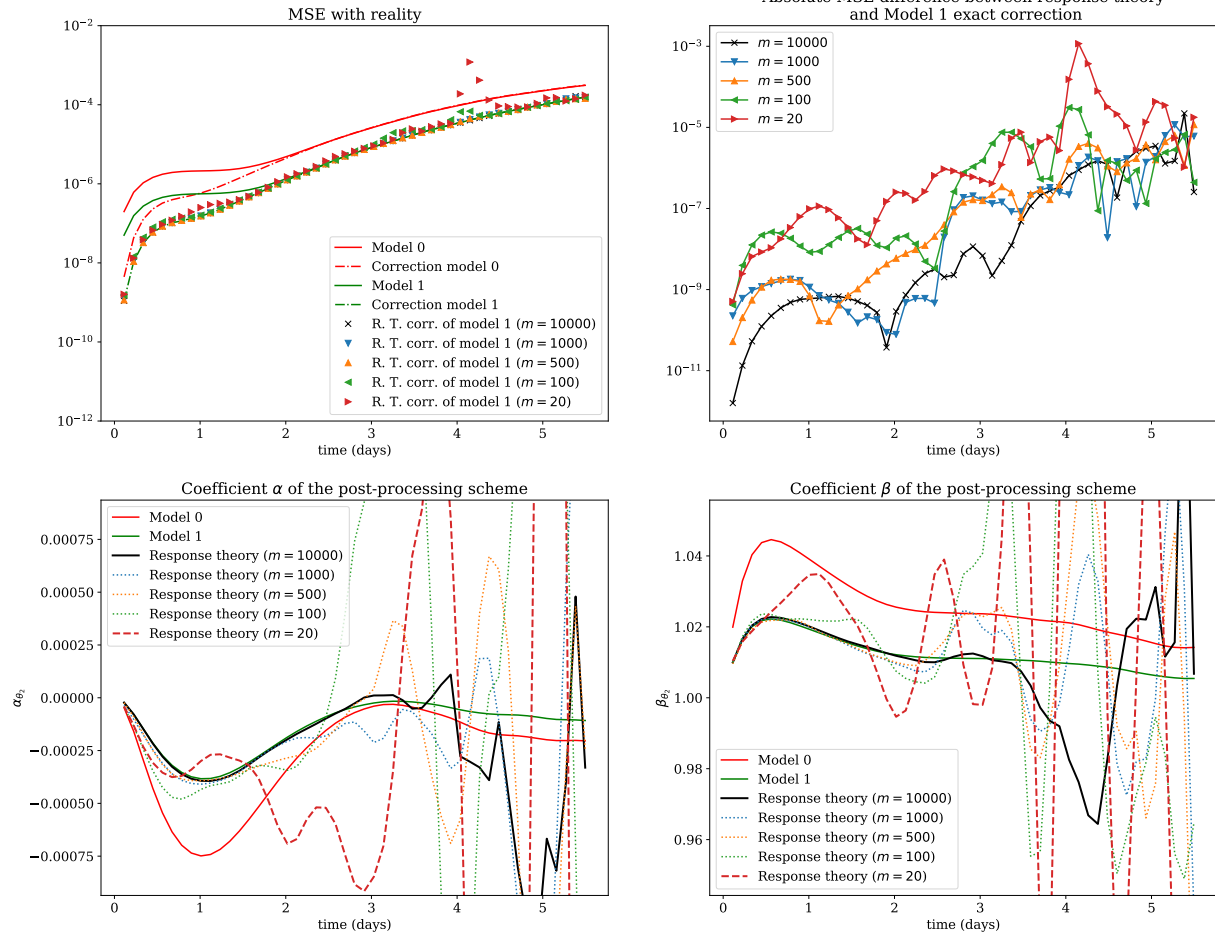
2.12.2 Corrections of the parameters α and β



2.12.3 Performance of the correction

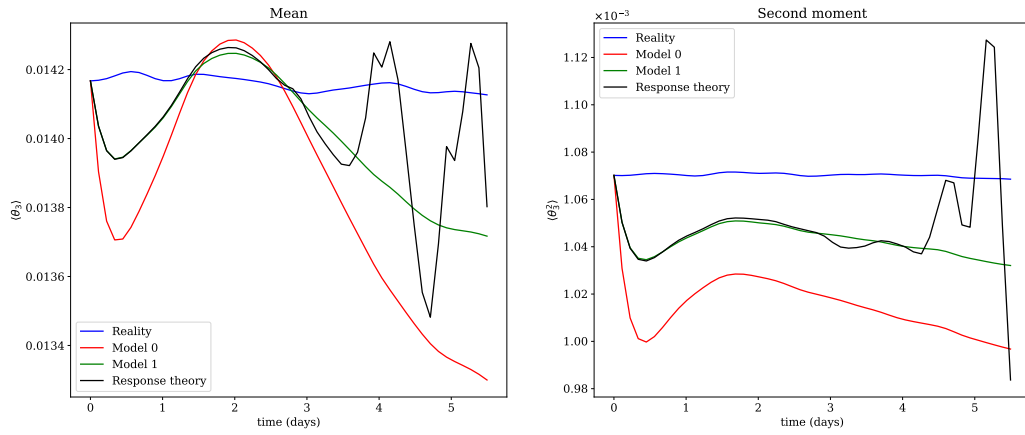


2.12.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

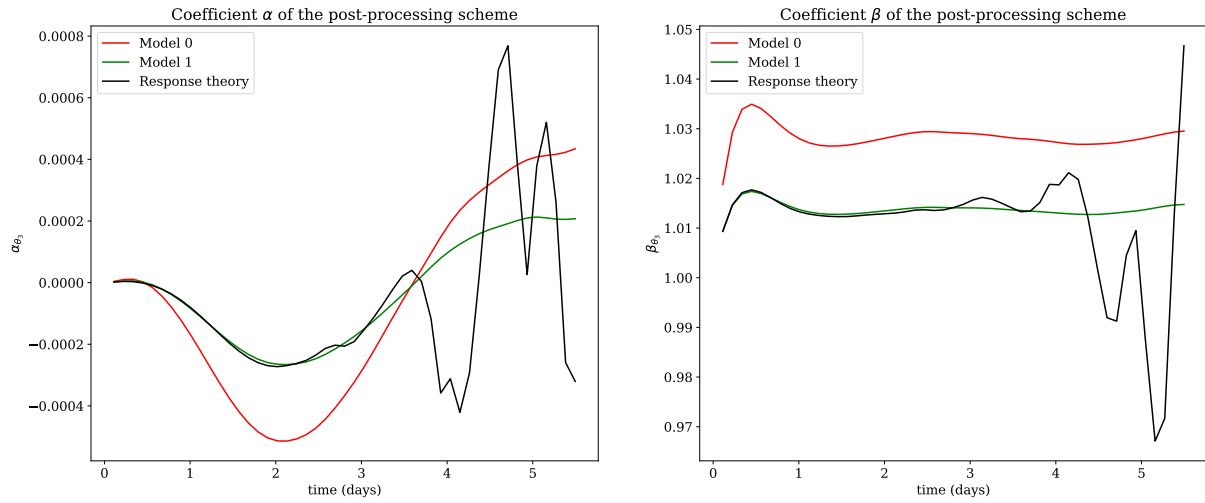


2.13 Variable θ_3

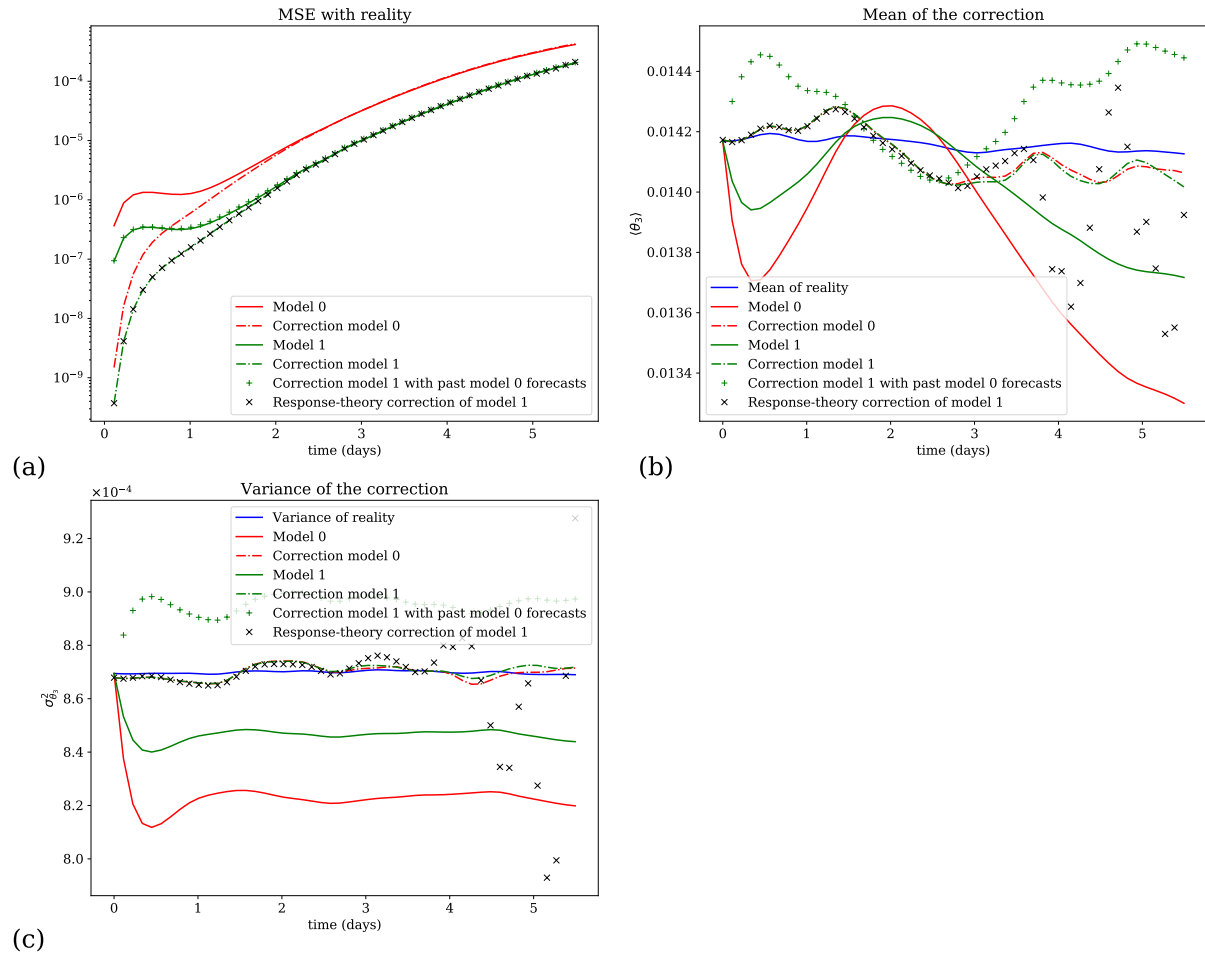
2.13.1 Corrections of the moments of the variable



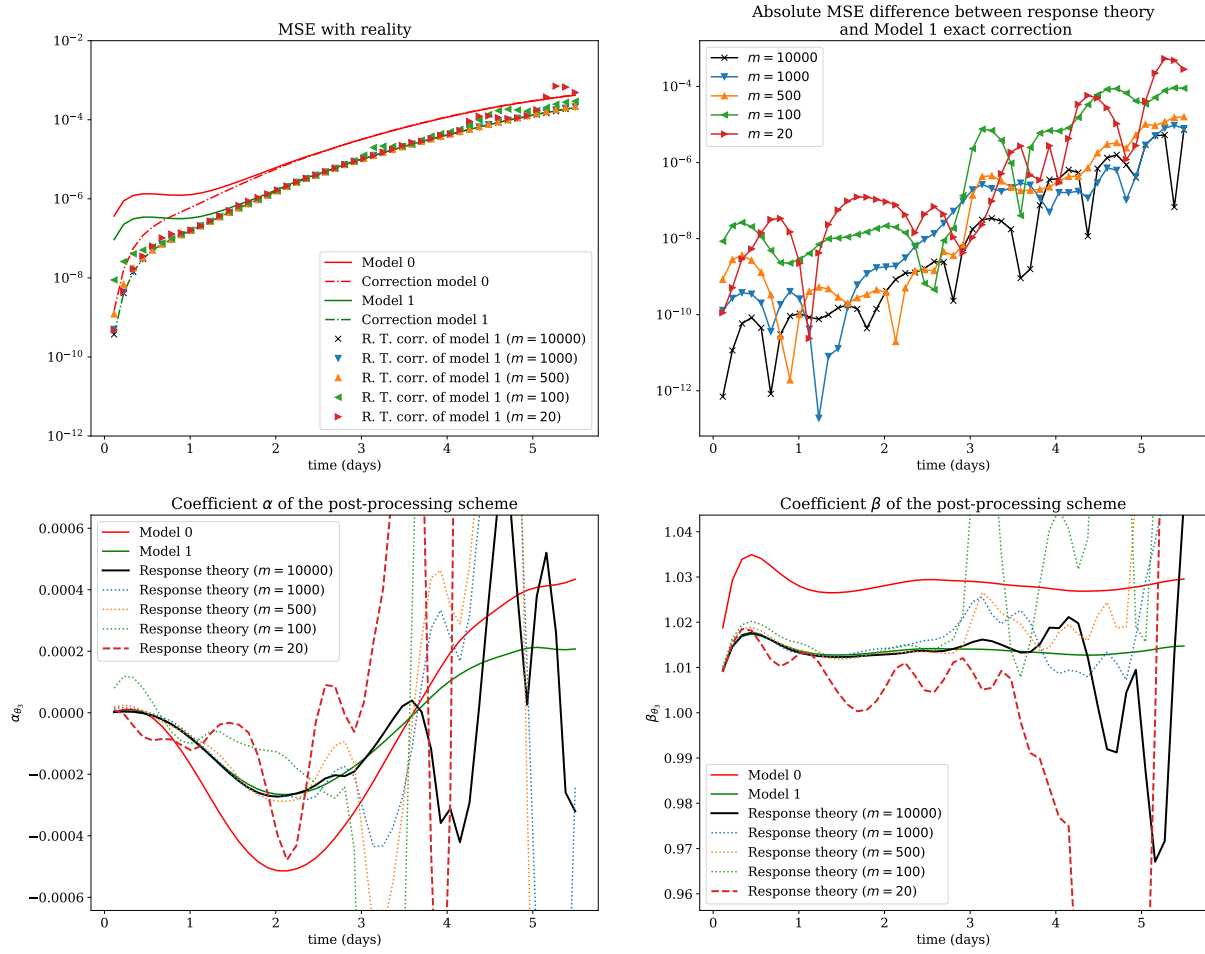
2.13.2 Corrections of the parameters α and β



2.13.3 Performance of the correction

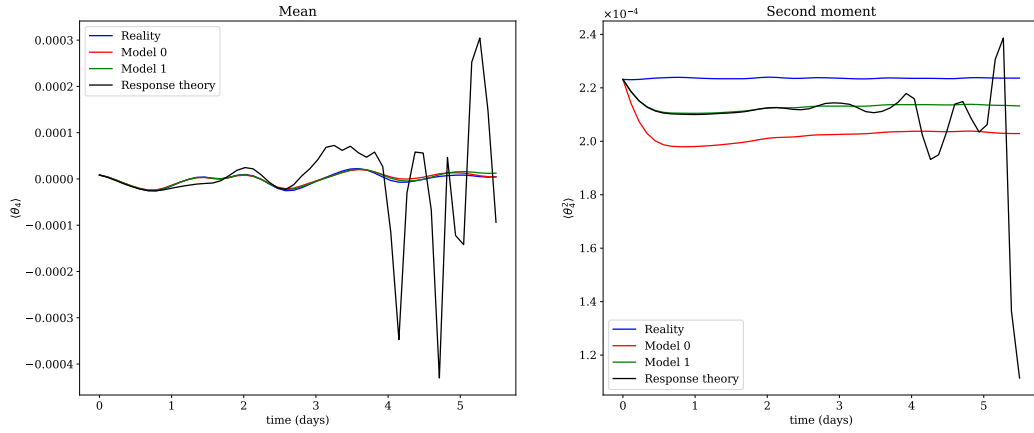


2.13.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

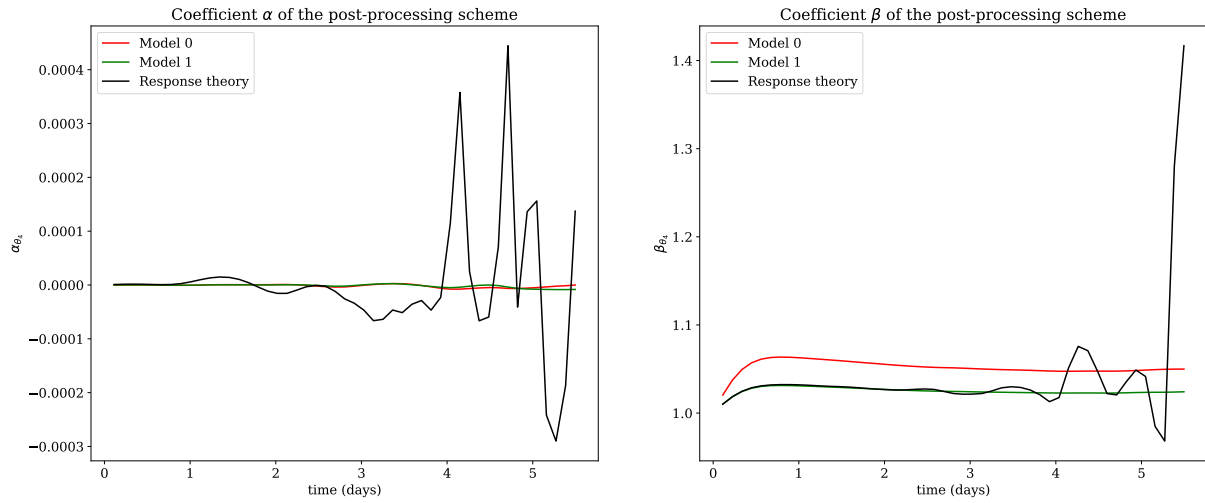


2.14 Variable θ_4

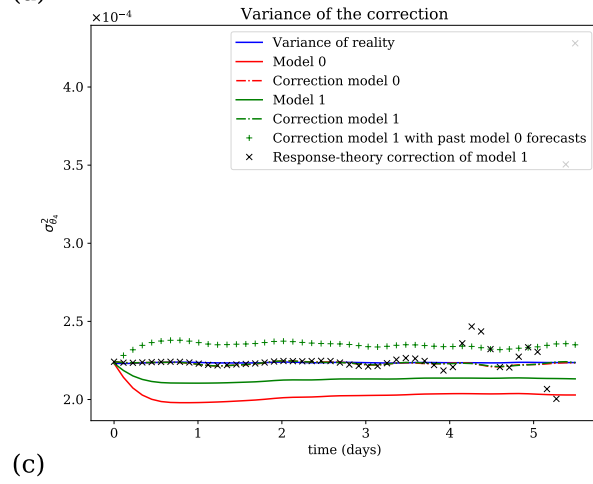
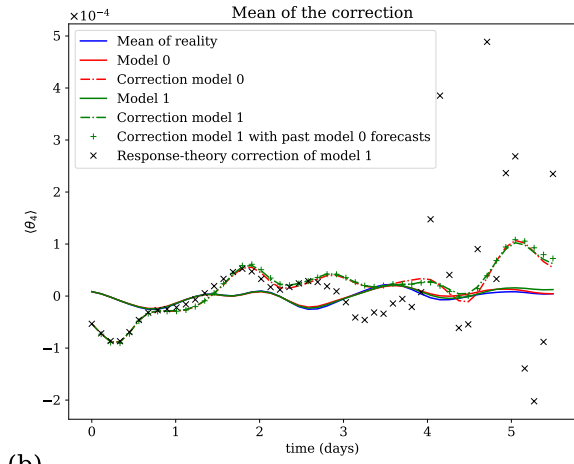
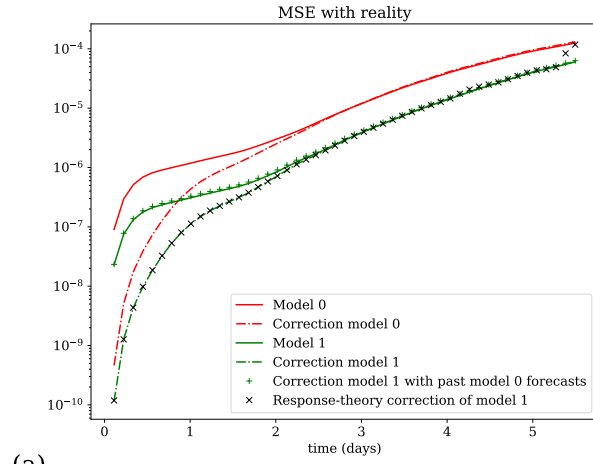
2.14.1 Corrections of the moments of the variable



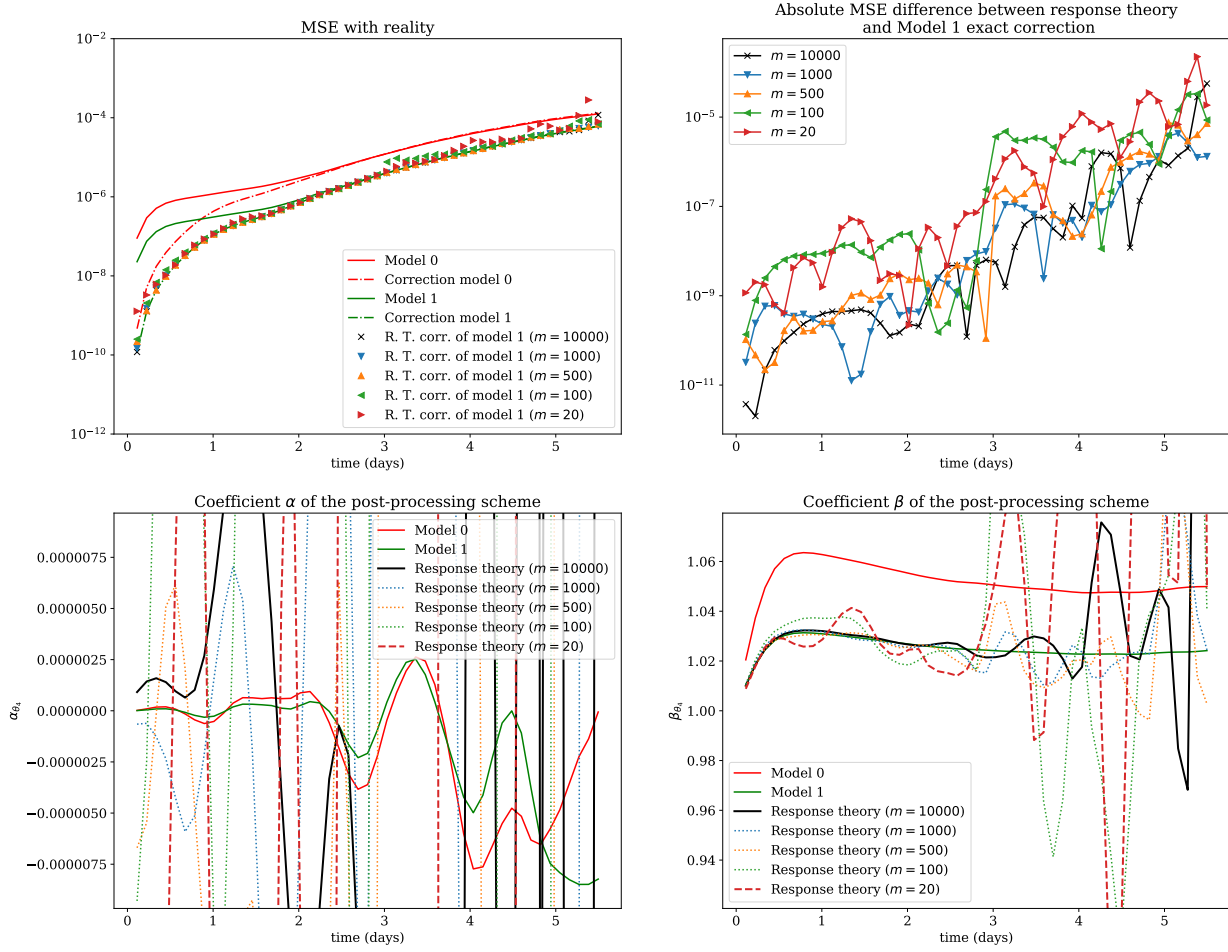
2.14.2 Corrections of the parameters α and β



2.14.3 Performance of the correction

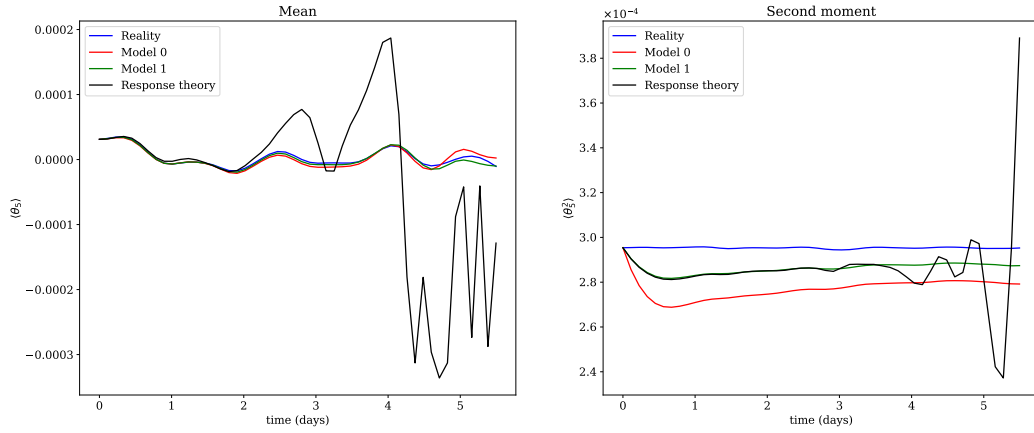


2.14.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

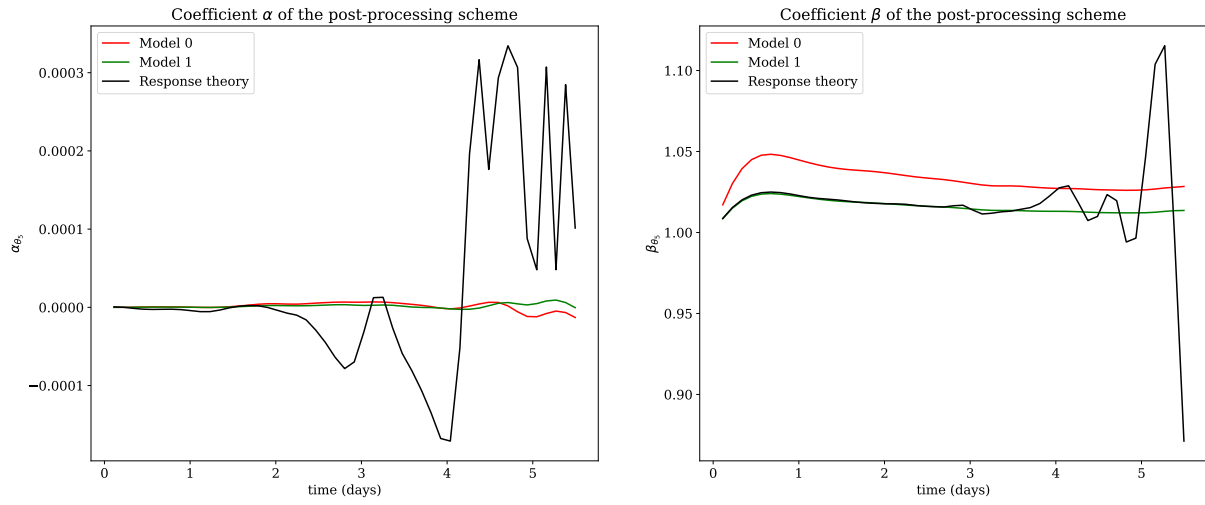


2.15 Variable θ_5

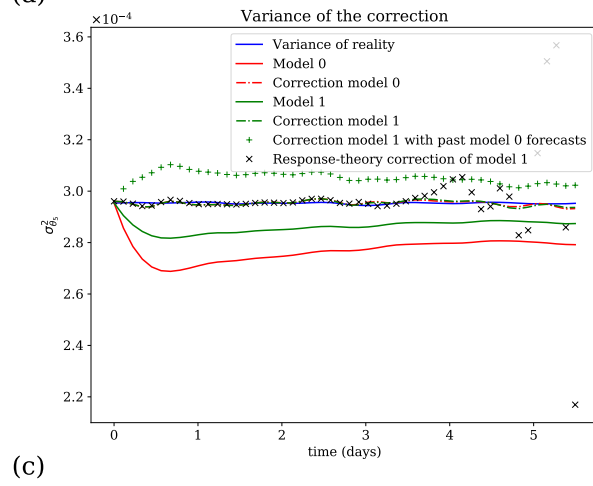
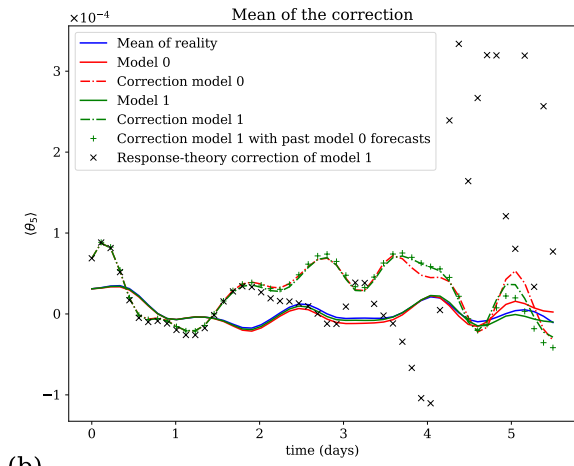
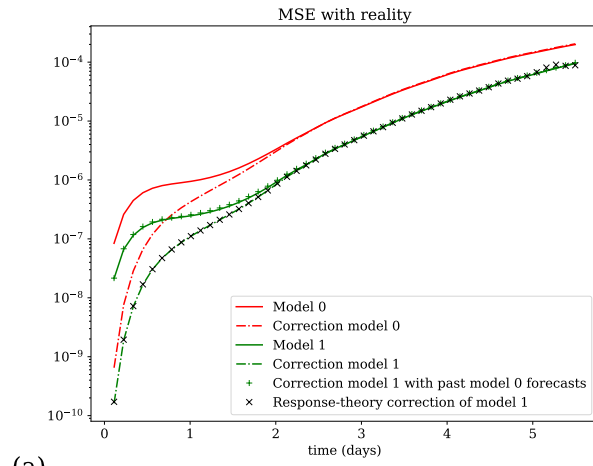
2.15.1 Corrections of the moments of the variable



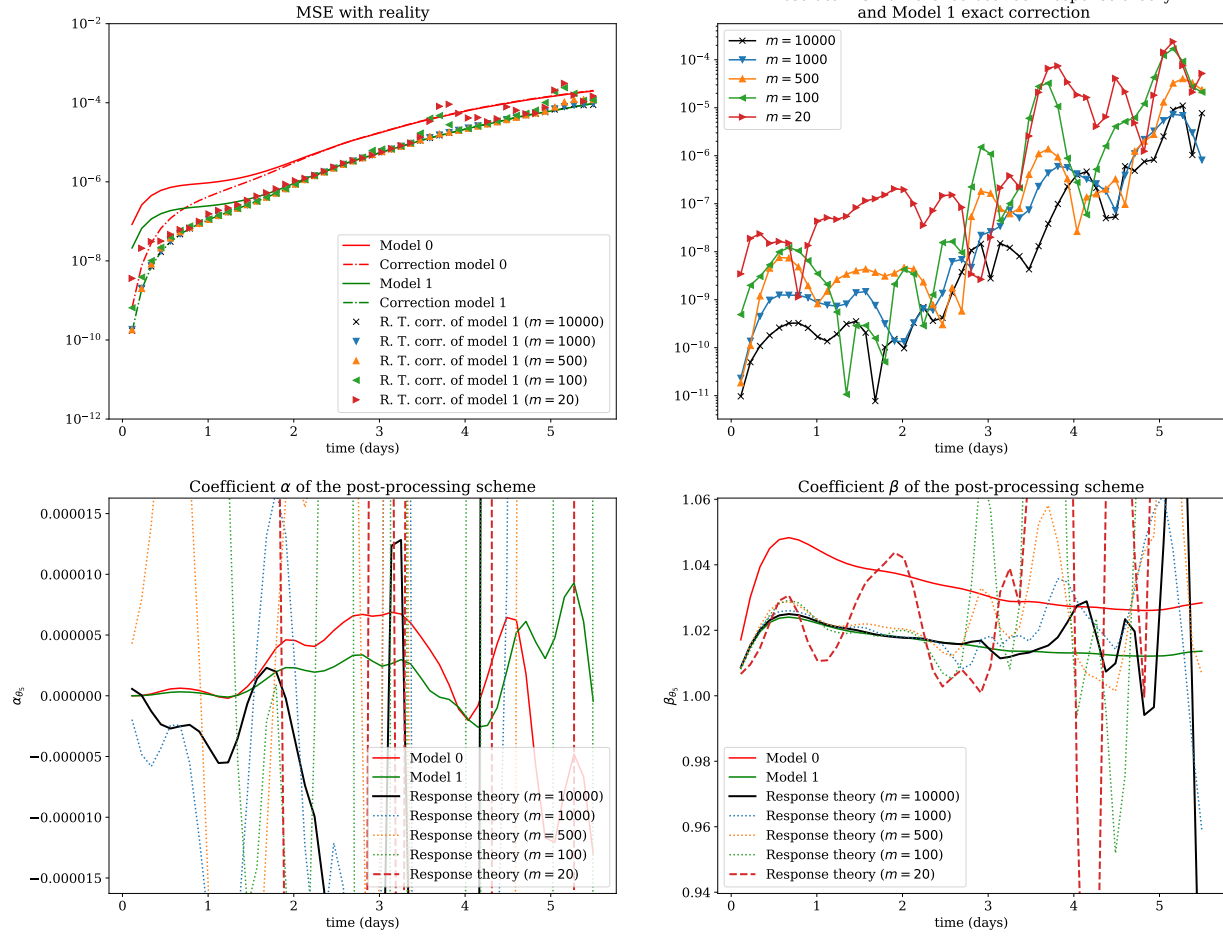
2.15.2 Corrections of the parameters α and β



2.15.3 Performance of the correction

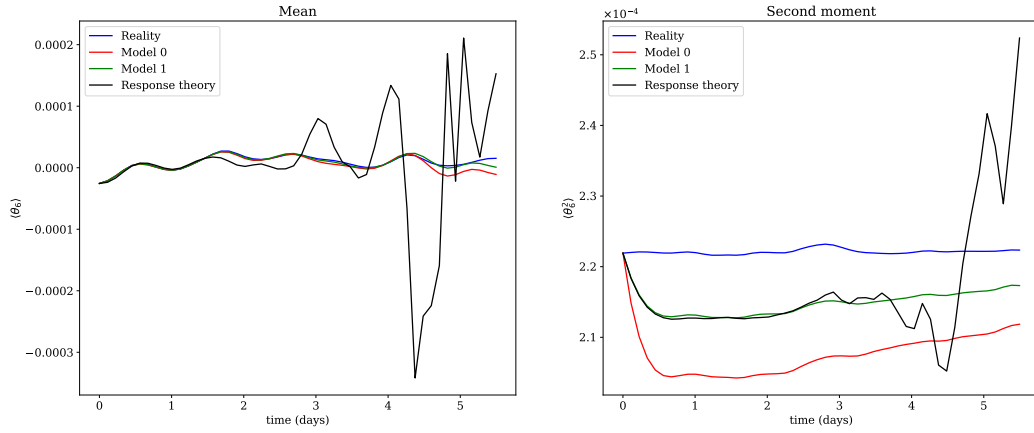


2.15.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

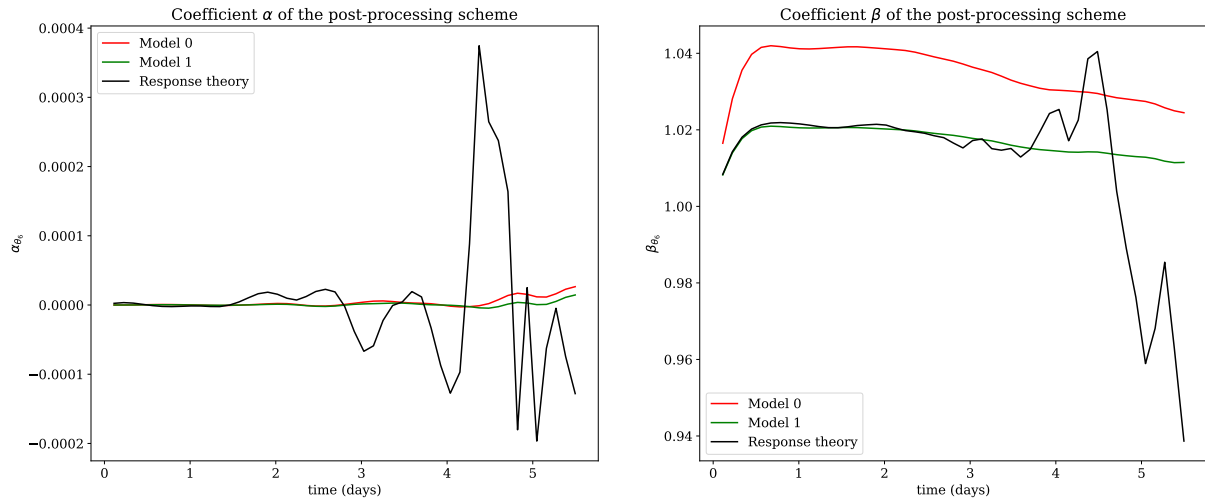


2.16 Variable θ_6

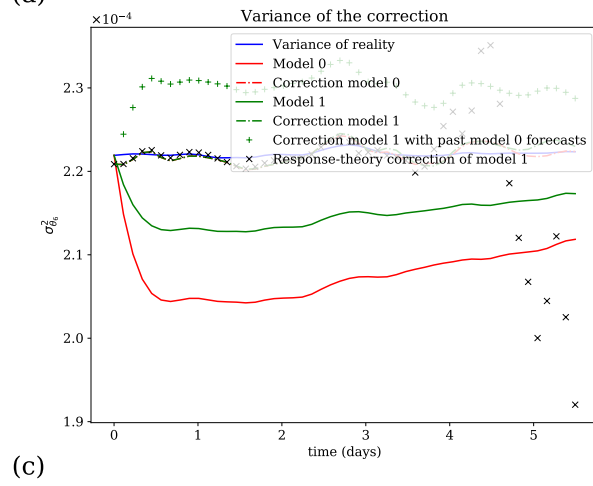
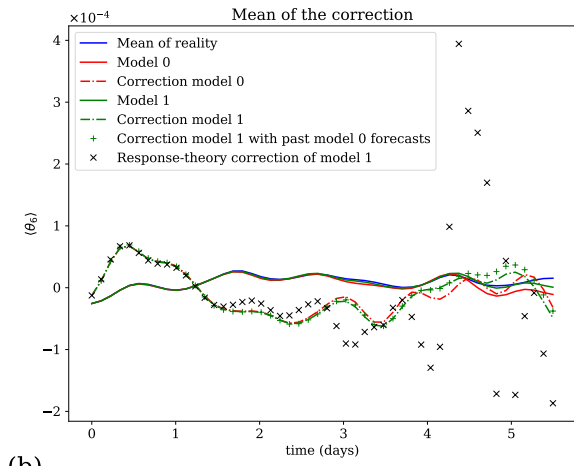
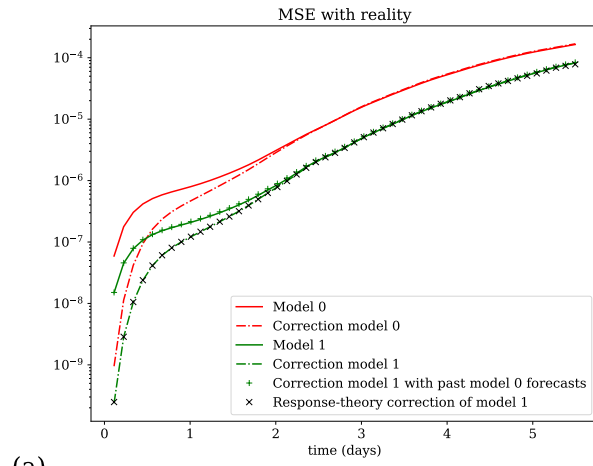
2.16.1 Corrections of the moments of the variable



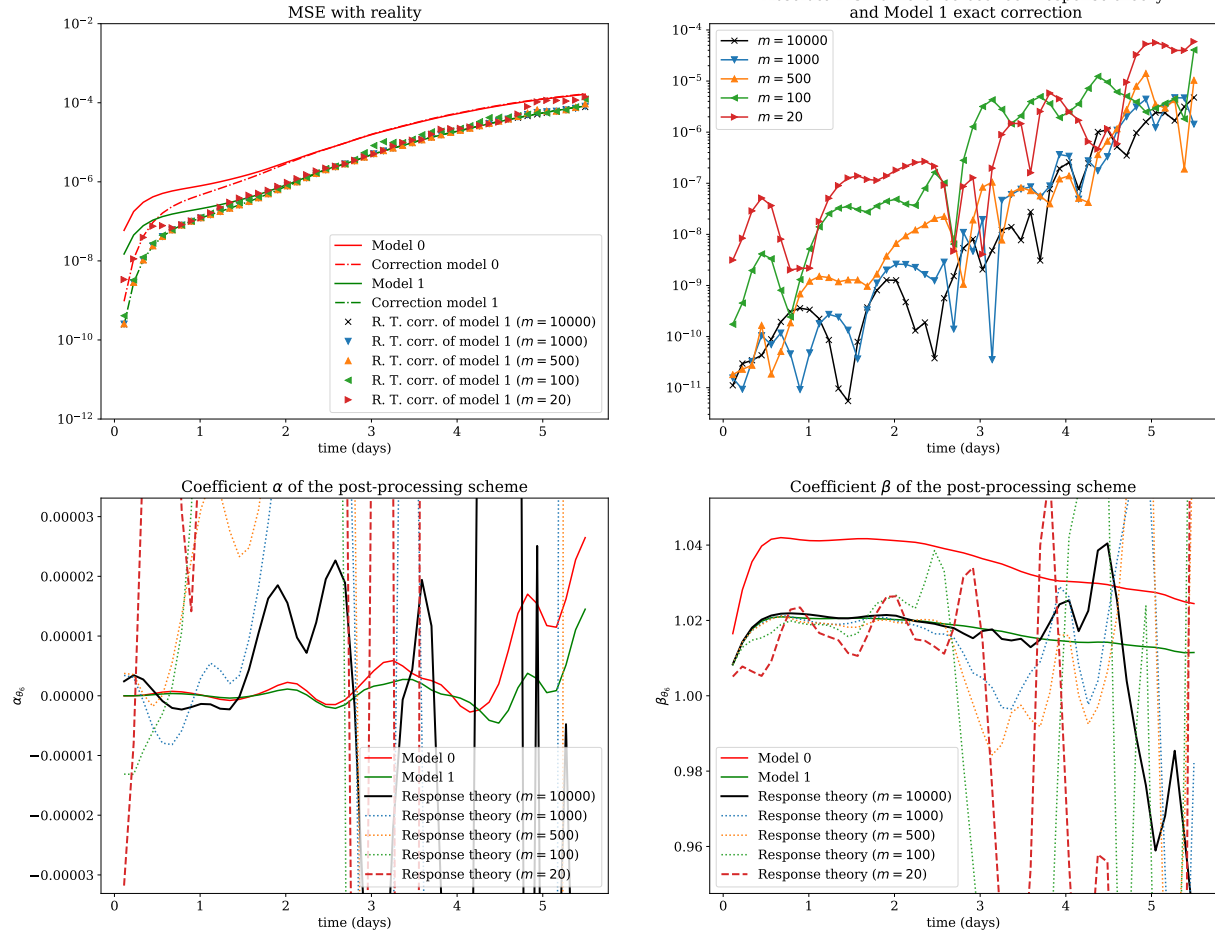
2.16.2 Corrections of the parameters α and β



2.16.3 Performance of the correction

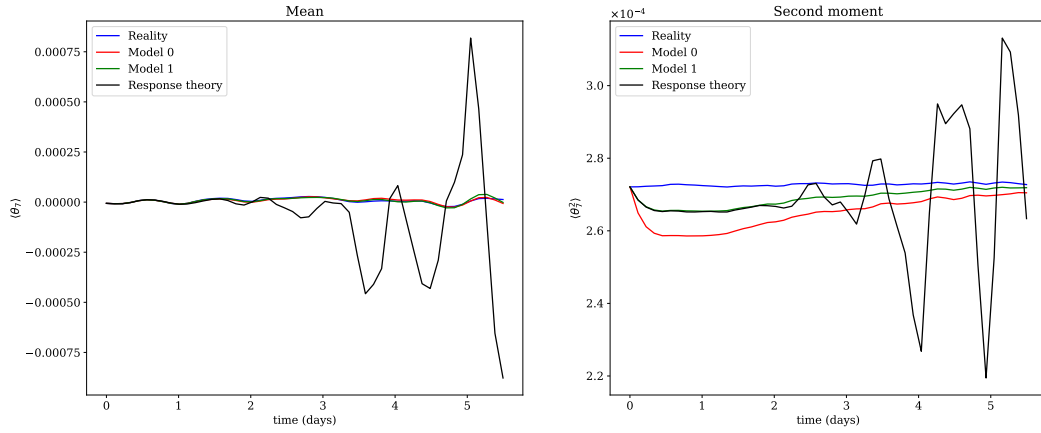


2.16.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

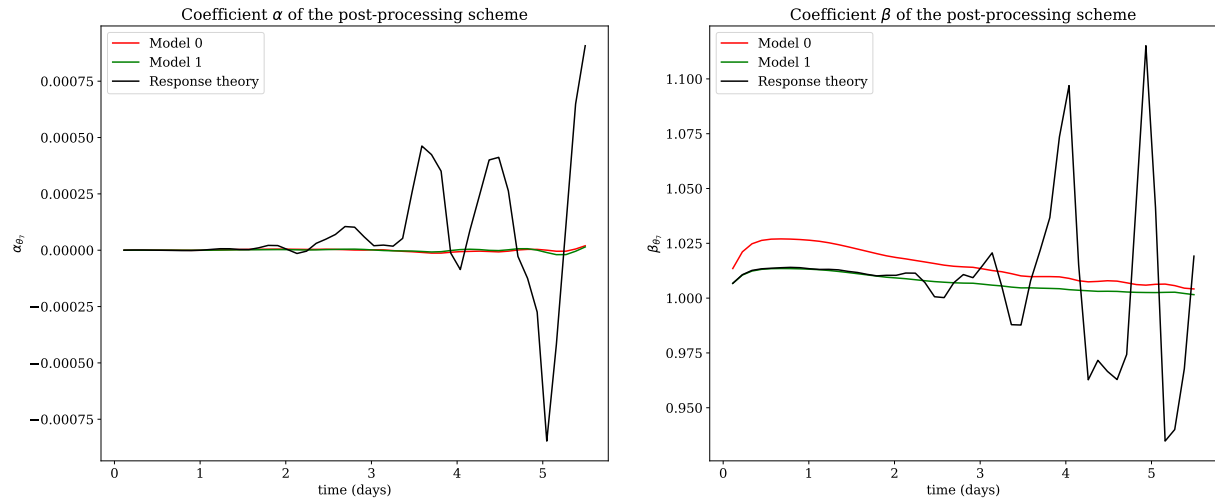


2.17 Variable θ_7

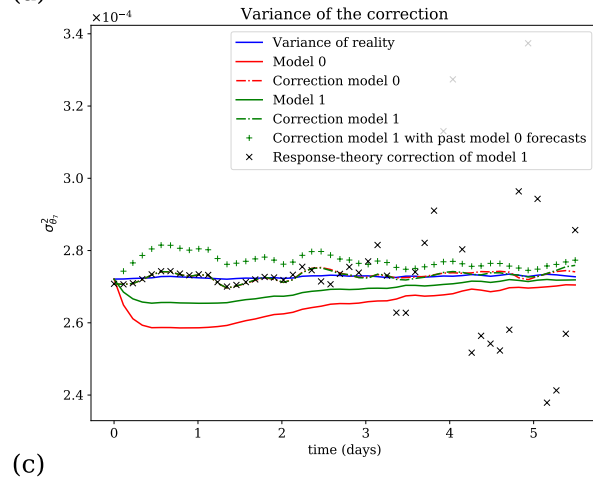
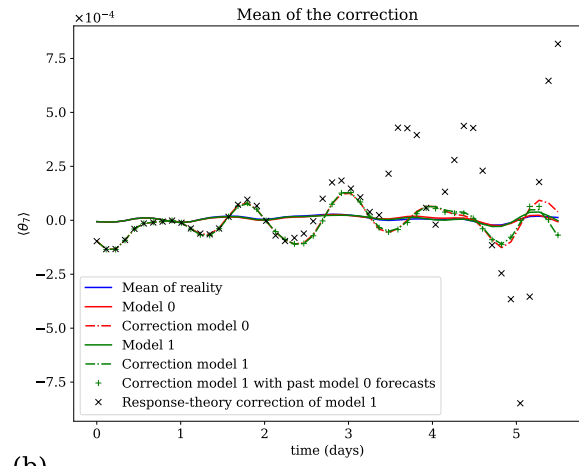
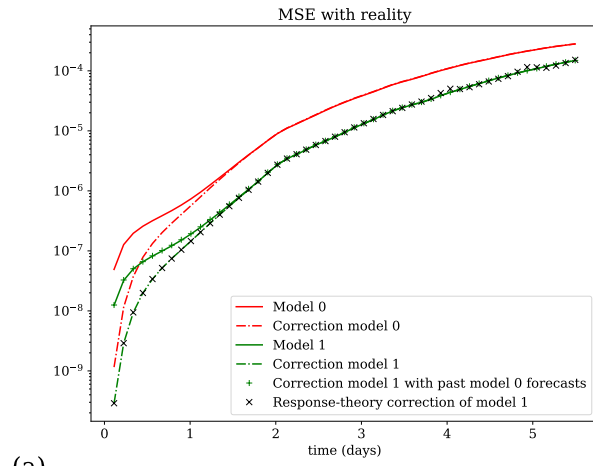
2.17.1 Corrections of the moments of the variable



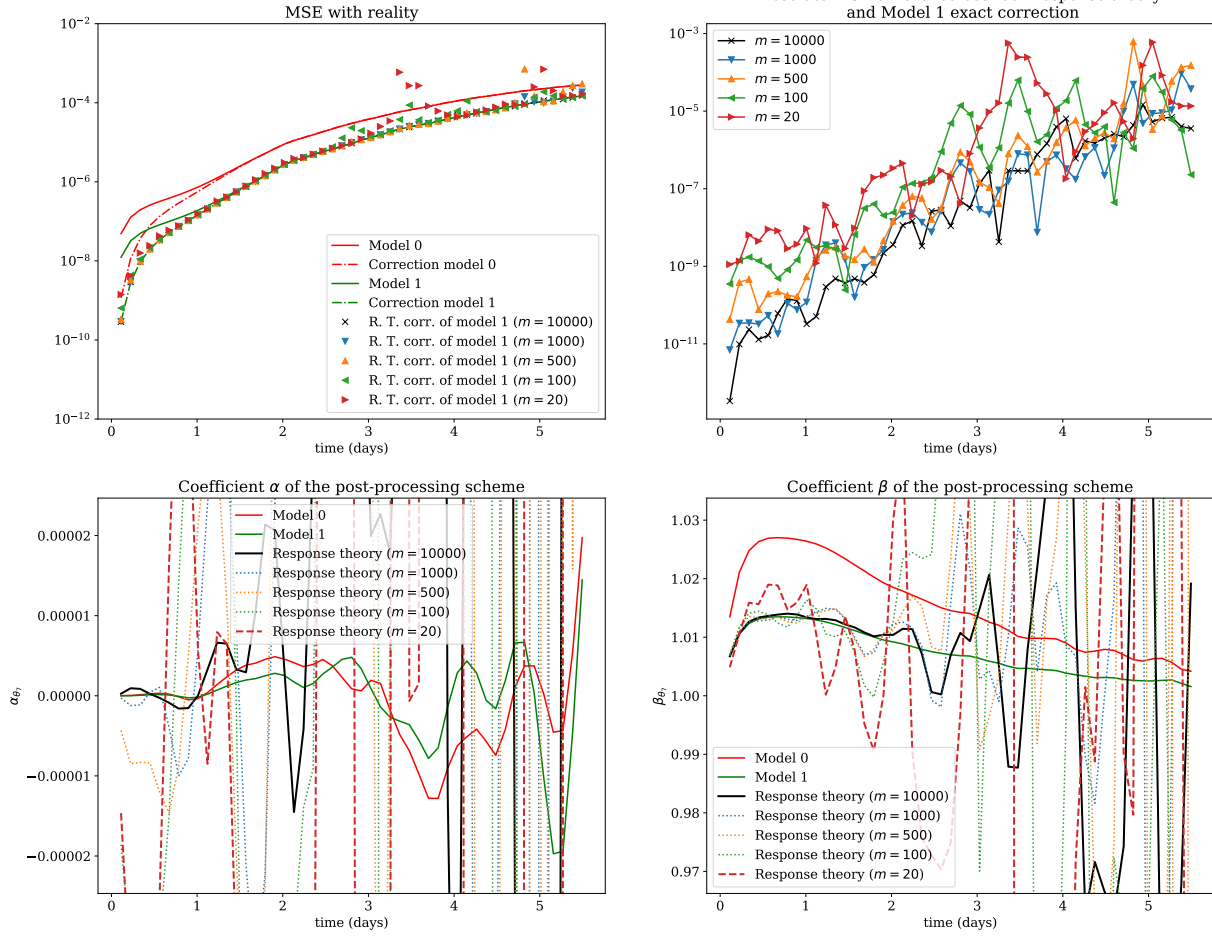
2.17.2 Corrections of the parameters α and β



2.17.3 Performance of the correction

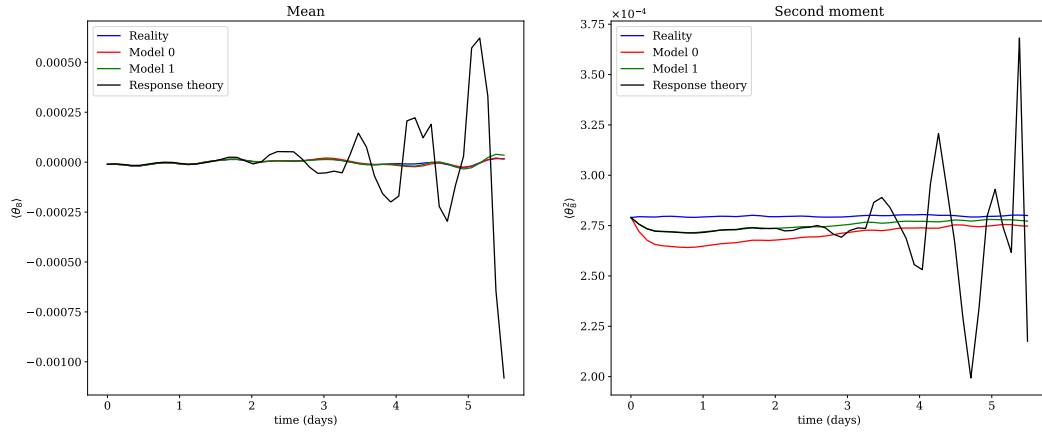


2.17.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

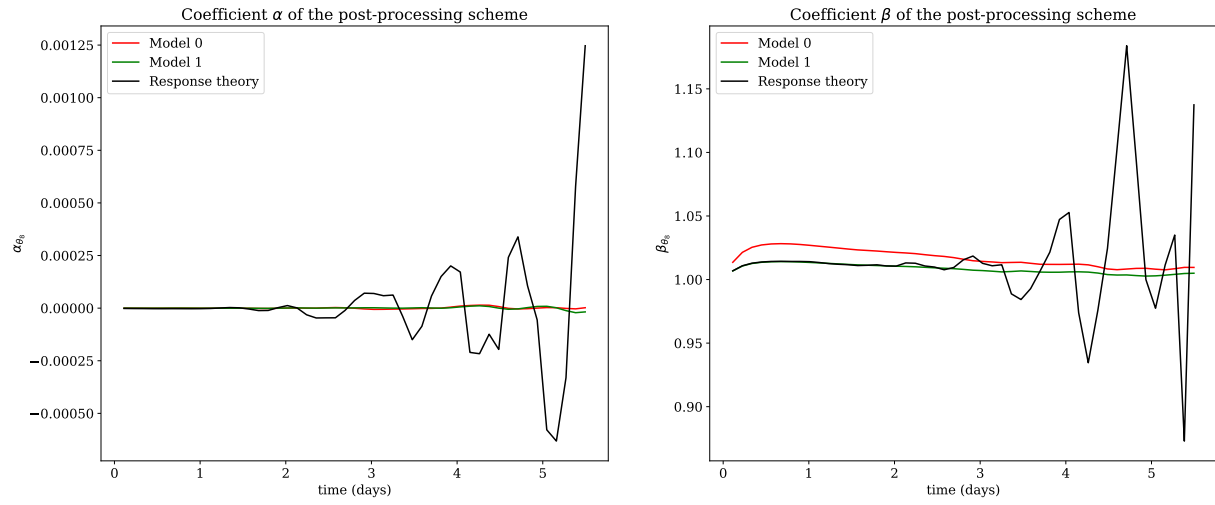


2.18 Variable θ_8

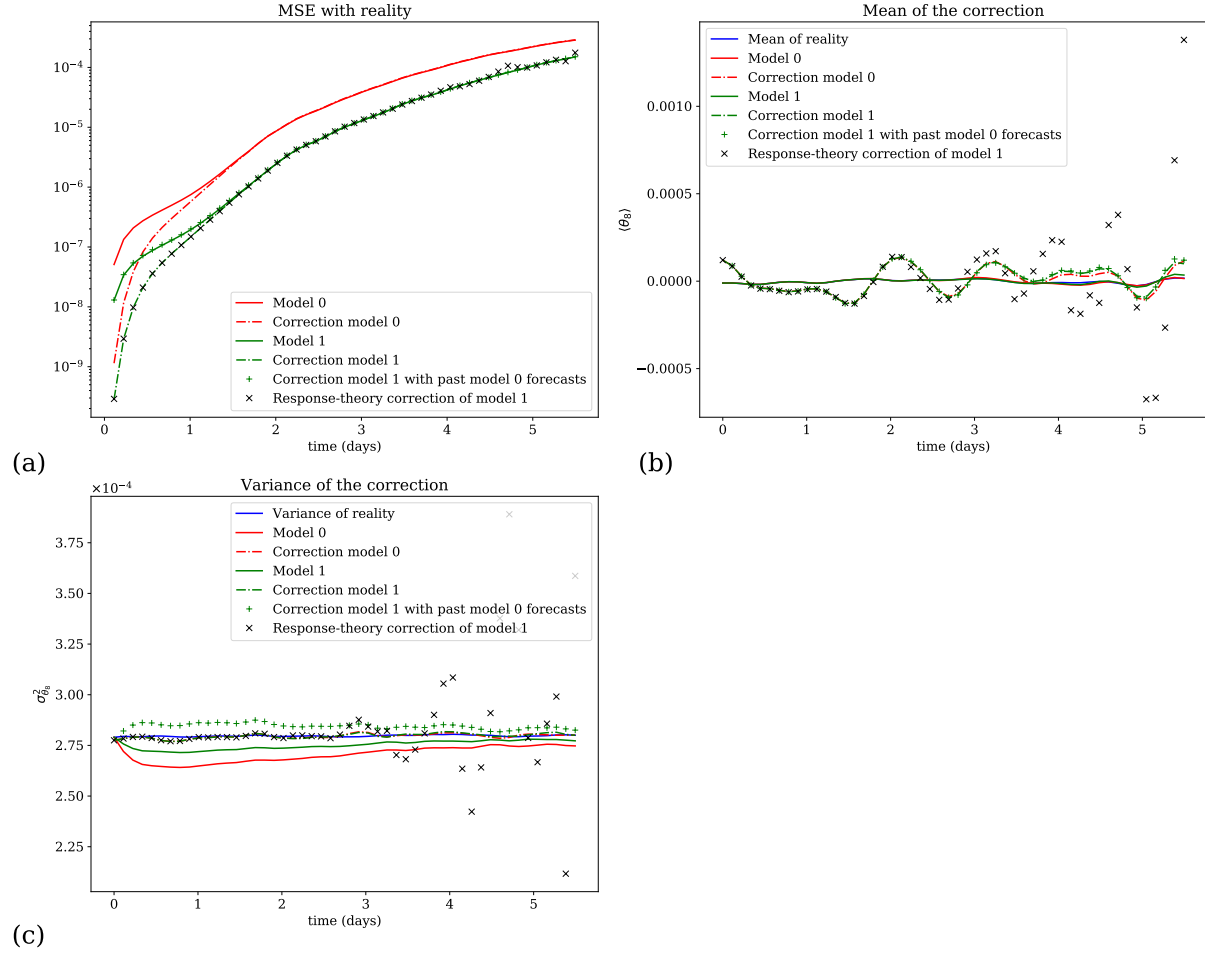
2.18.1 Corrections of the moments of the variable



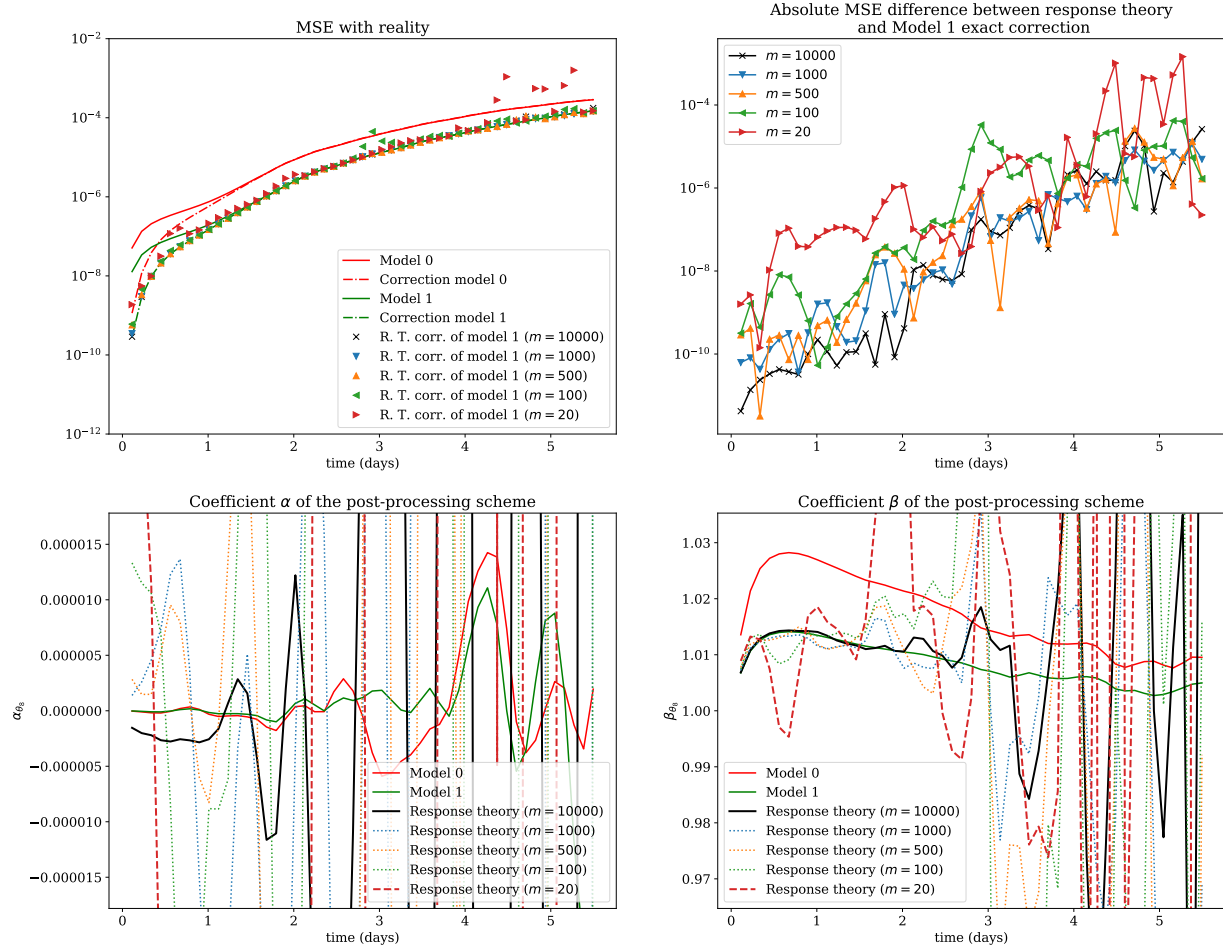
2.18.2 Corrections of the parameters α and β



2.18.3 Performance of the correction

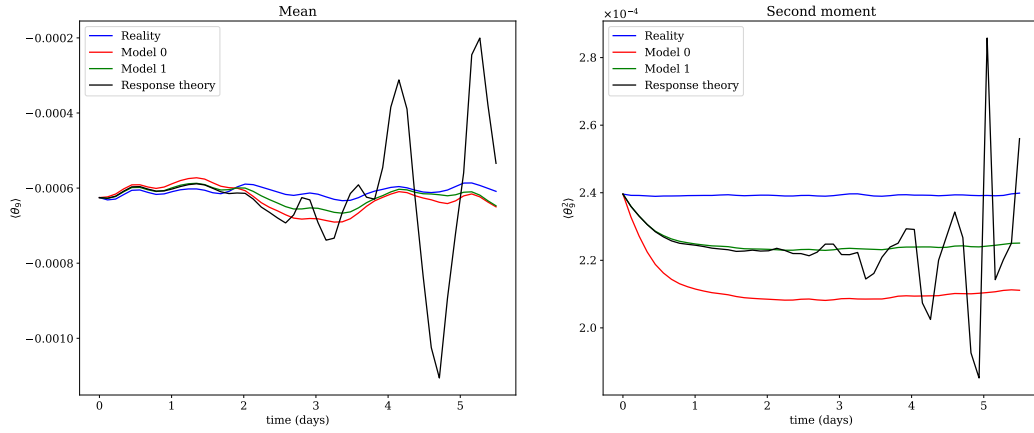


2.18.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

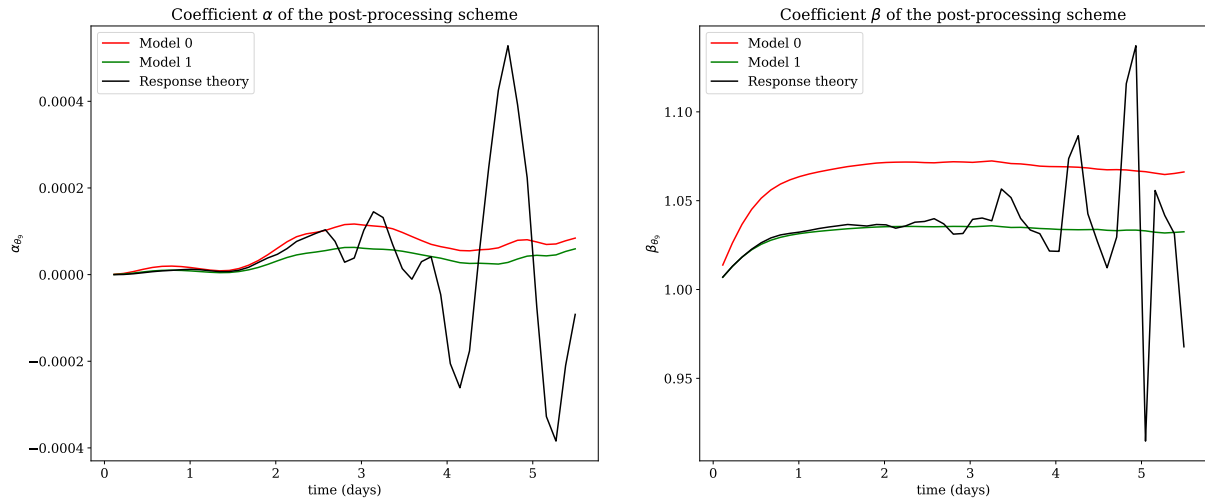


2.19 Variable θ_9

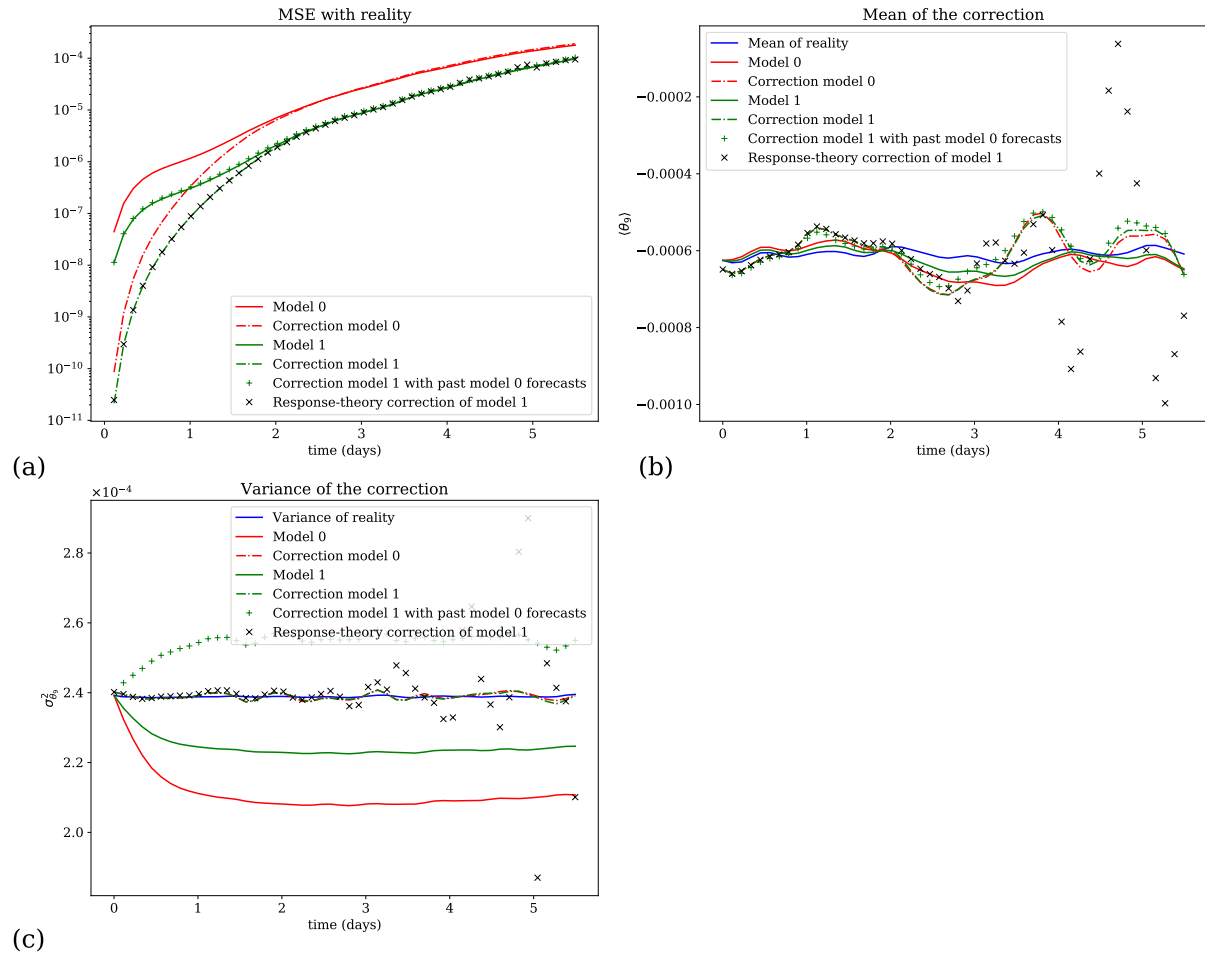
2.19.1 Corrections of the moments of the variable



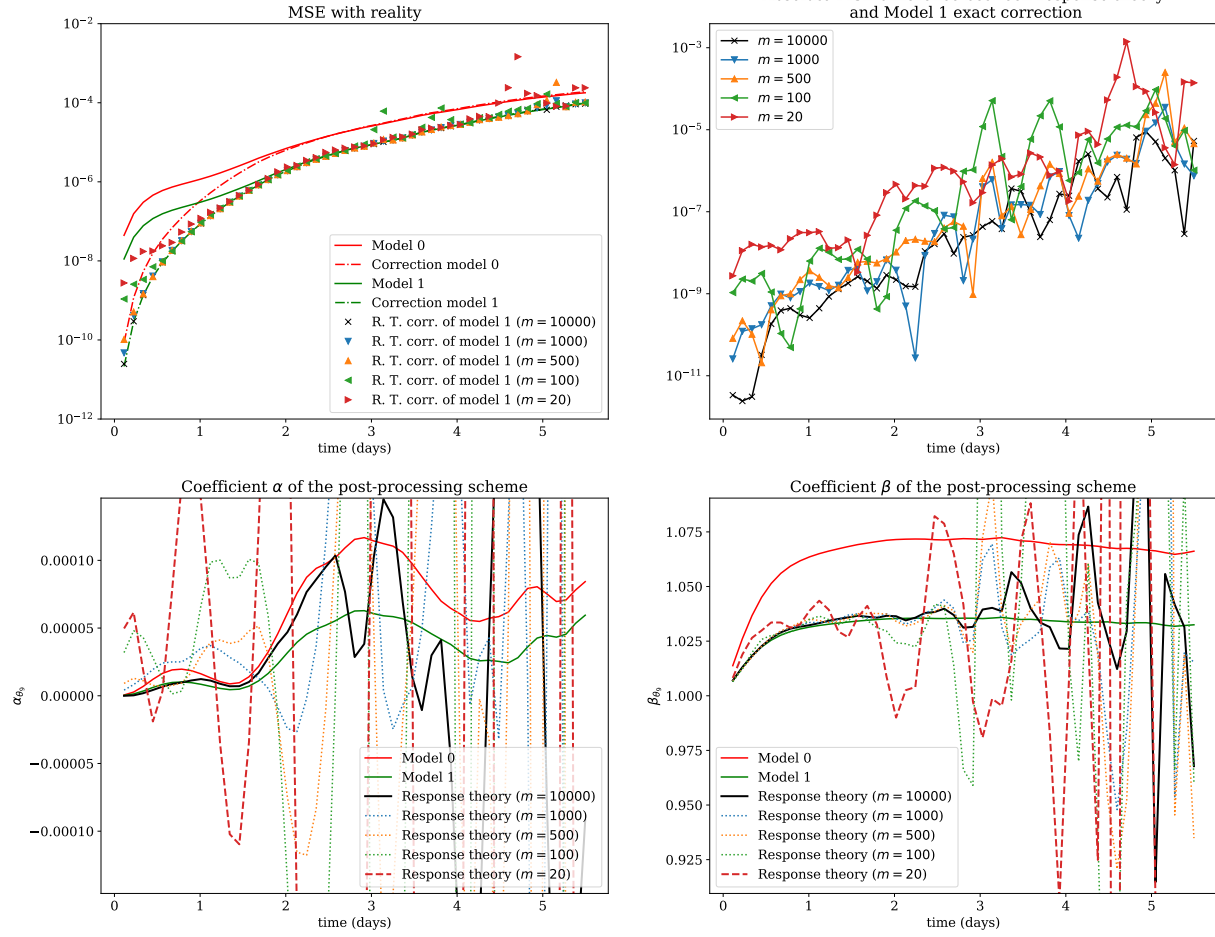
2.19.2 Corrections of the parameters α and β



2.19.3 Performance of the correction

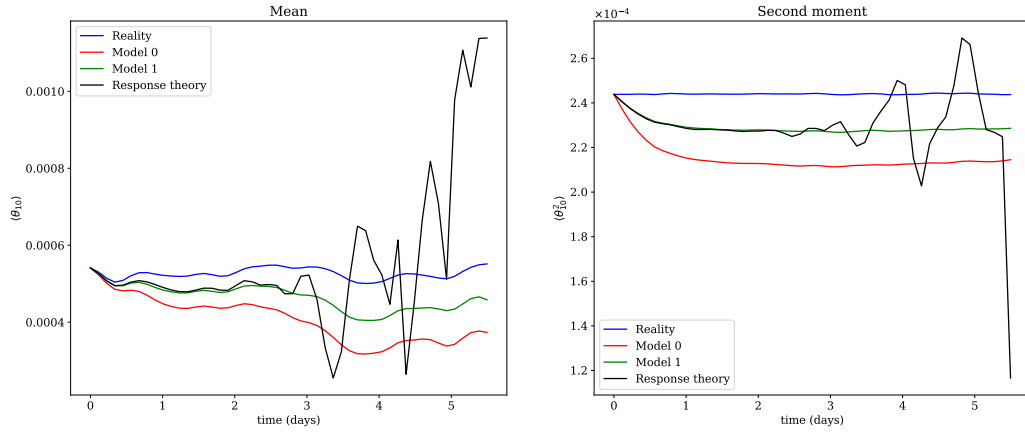


2.19.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

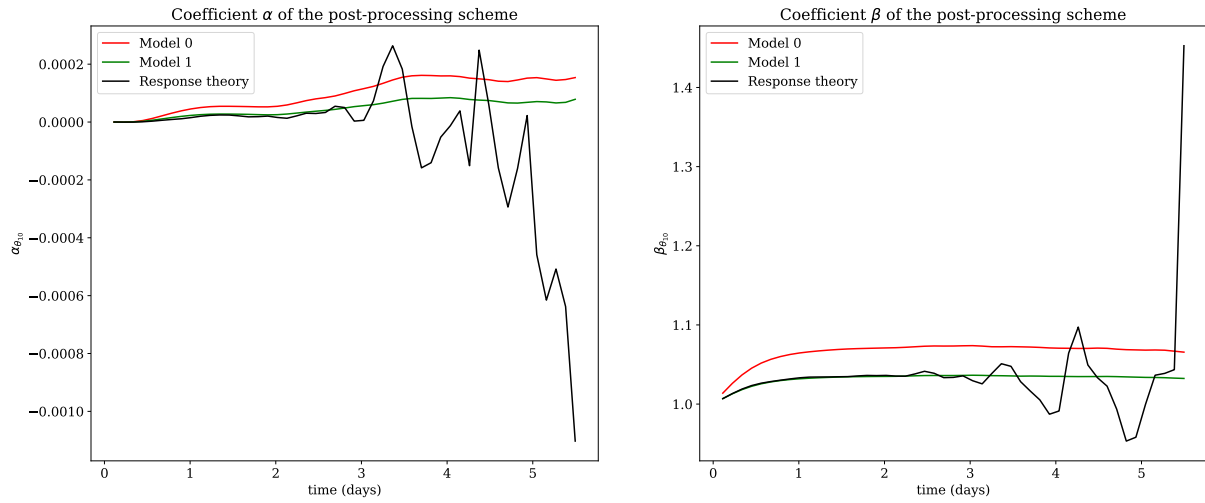


2.20 Variable θ_{10}

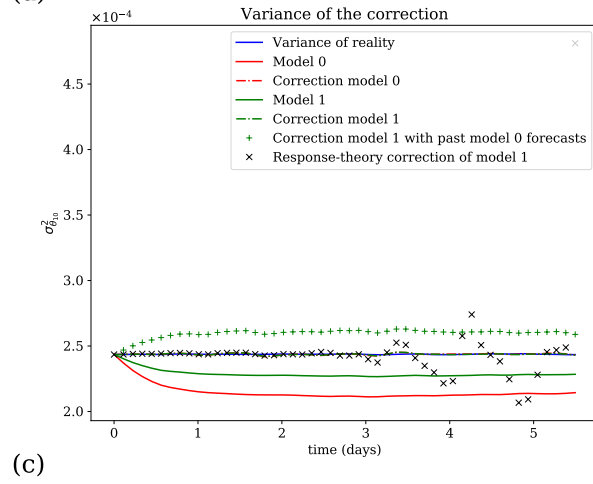
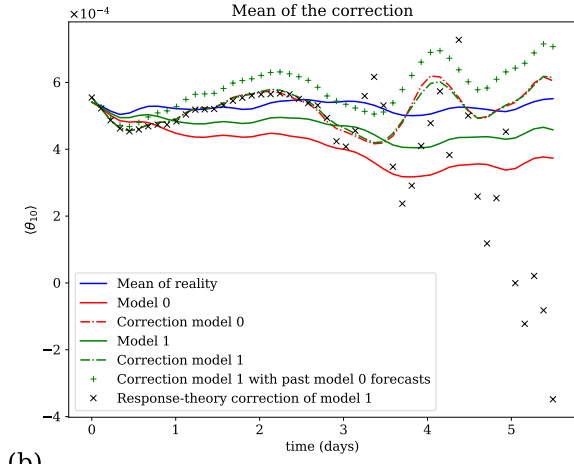
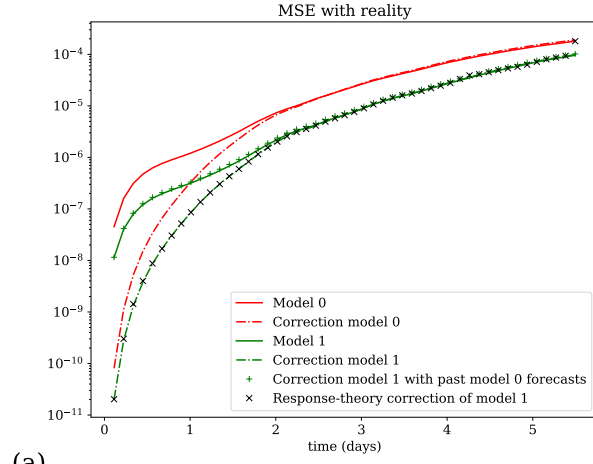
2.20.1 Corrections of the moments of the variable



2.20.2 Corrections of the parameters α and β



2.20.3 Performance of the correction



2.20.4 Comparison of the efficiency of the response theory correction for different numbers m of trajectories

