A model of infection and immune response to low dose radiation: supplementary material—sensitivity analysis

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The model built in this work consist of 11 adjustable parameters, plus initial condition assumptions. As stated in the manuscript, values in the literature, where available, were taken in deriving the specific values of the parameters used in this work, while others were found through iterative reduction of root mean square cost functions, against available data. To explore the sensitivity of the model, the parameters outlined in Section 2.4 of the manuscript were each increased by a factor of two in sequence. The results are summarized in table S.1, and in the figures that follow.

Parameter	Sim Value	Effect of increase by 2×
$T(0)$	6.0×10^4	Initial target cell concentration [cells/ml] - increase in peak inflammation by a factor of 4.1 - increases peak viral load by 131% - reduces time from initial infection to symptom onset from 218 hrs (9.1 d) to 150 hrs (6.3 d)
β	1.1×10^{-8}	Viral infection rate [ml/(virus hr)] - increases initial slope on viral load curve - reduces time from initial infection to symptom onset from 218 hrs (9.1 d) to 152 hrs (6.3 d) - increase in peak inflammation by 2.9 %
k	0.13	I_1 to I_2 transition rate constant - reduces time from initial infection to symptom onset from 218 hrs (9.1 d) to 186 hrs (7.8 d) - increase in peak inflammation by 2.2 %
δ	0.039	I_2 cell clearance rate - peak inflammation reduced by 72.7 % - peaks of both C_p and C_a curves occur sooner - viral load, initial slope decreased, but final slope increased - time from initial infection to symptom onset increases to 264 hours (11.0 d)
p	90	Virus production rate - peak viral load increases by 128% - time from initial infection to symptom onset decreases to 152 hours (6.3 d) - increase in peak inflammation by 1.5 %
c	0.15	Rate of virus clearance - peak viral load decreases by 60% - time from initial infection to symptom onset increases to 302 hours (12.6 d) - reduces in peak inflammation by 7.8 %
k_{Cp}	0.0079	Collective production rate of pro-inflammatory factors - increases peak inflammation by 100% (doubles)
μ_{Cp}	0.010	Clearance rate of pro-inflammatory factors - reduces peak inflammation by 20%, peak occurs 7 hours earlier - C_p curve peaks occurs 10 hours earlier
k_{Ca}	0.30	Collective production rate of anti-inflammatory factors - reduces peak inflammation by 11%, peaks 13 hours earlier - C_a curve peaks 12 hours earlier
μ_{Ca}	0.35	Clearance rate of anti-inflammatory factors - increases peak inflammation by 7%, peaks 14 hours later - behavior may seem counter-intuitive, but C_a is produced in proportion to F, if C_a is cleared faster, more F results and therefore C_a tail increases
k_F	3.3×10^{-8}	Collective inflammation rate - increases peak inflammation by 100% (peaks 6 hours earlier)
μ_F	0.0030	Inflammation reduction rate - decreases peak inflammation by 11%, peaks 13 hours earlier - C_a falls off faster

Table S1. Sensitivity analysis. Parameter values are in hr^{-1} unless otherwise stated.
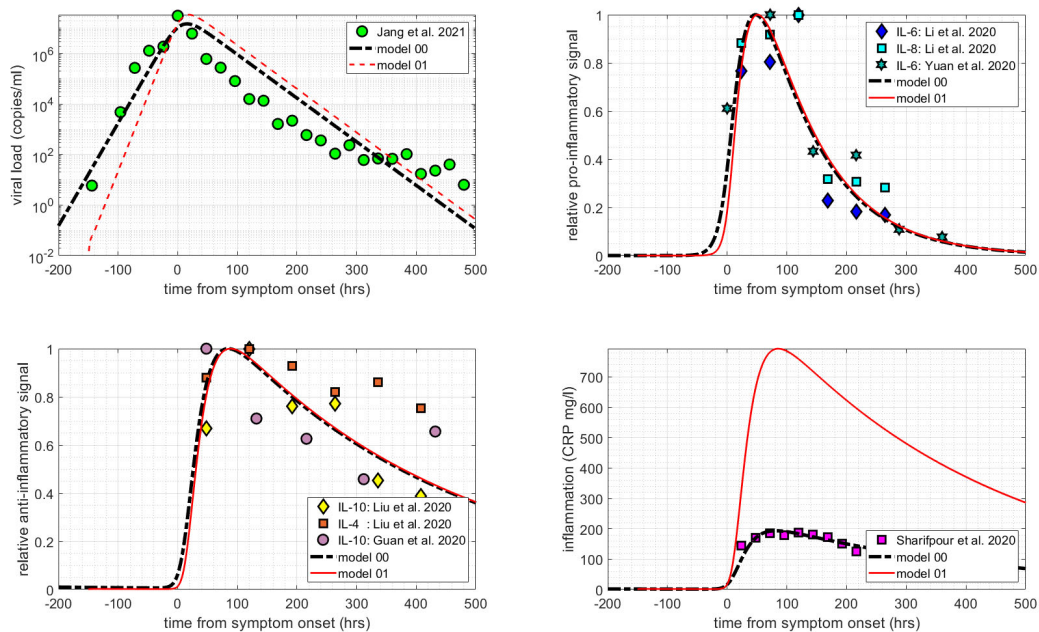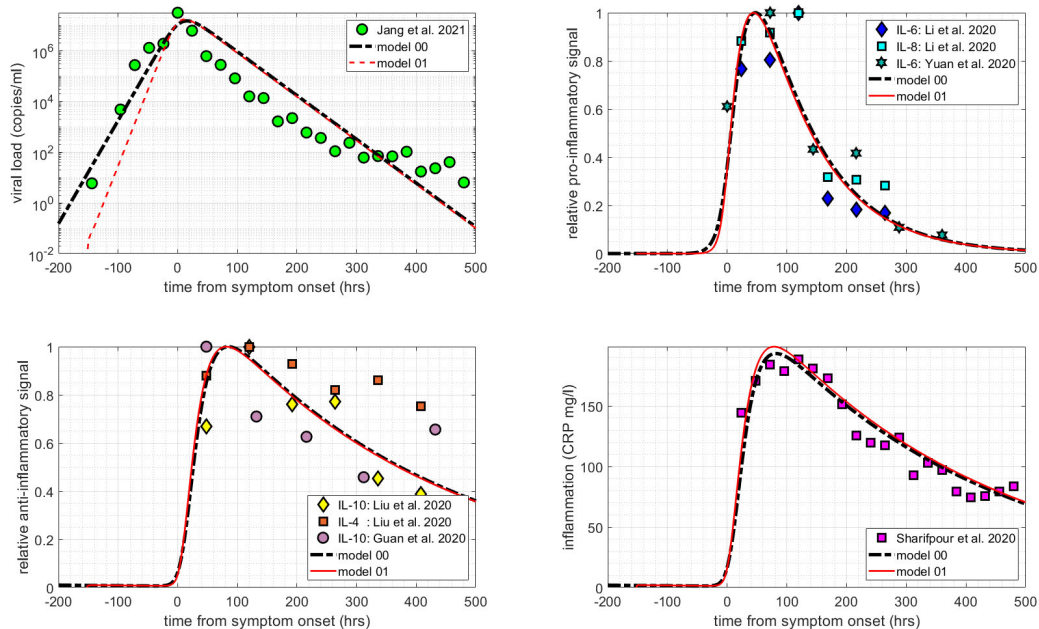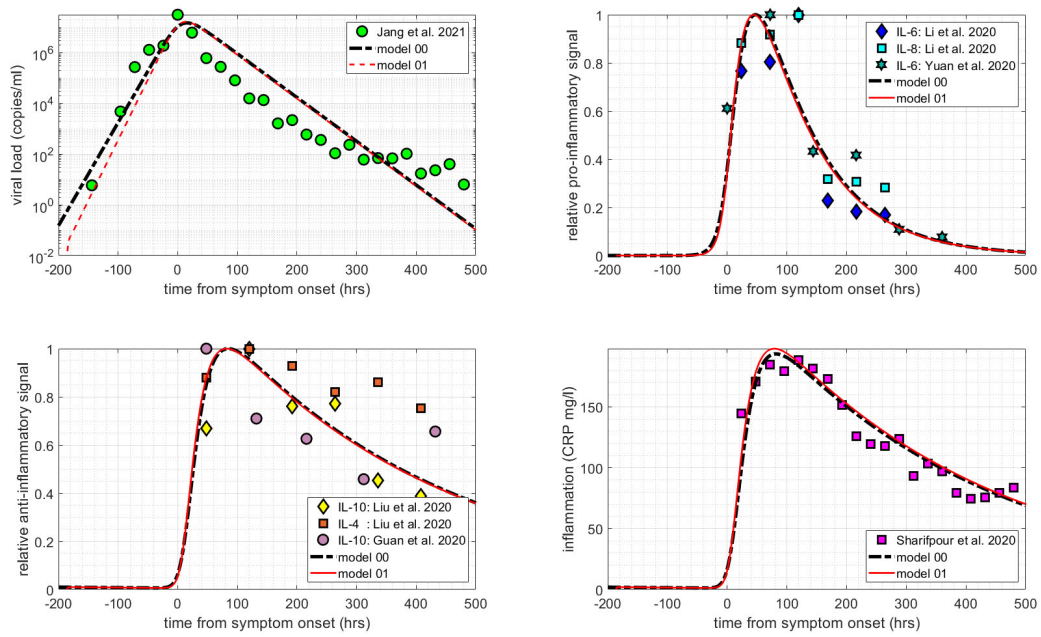
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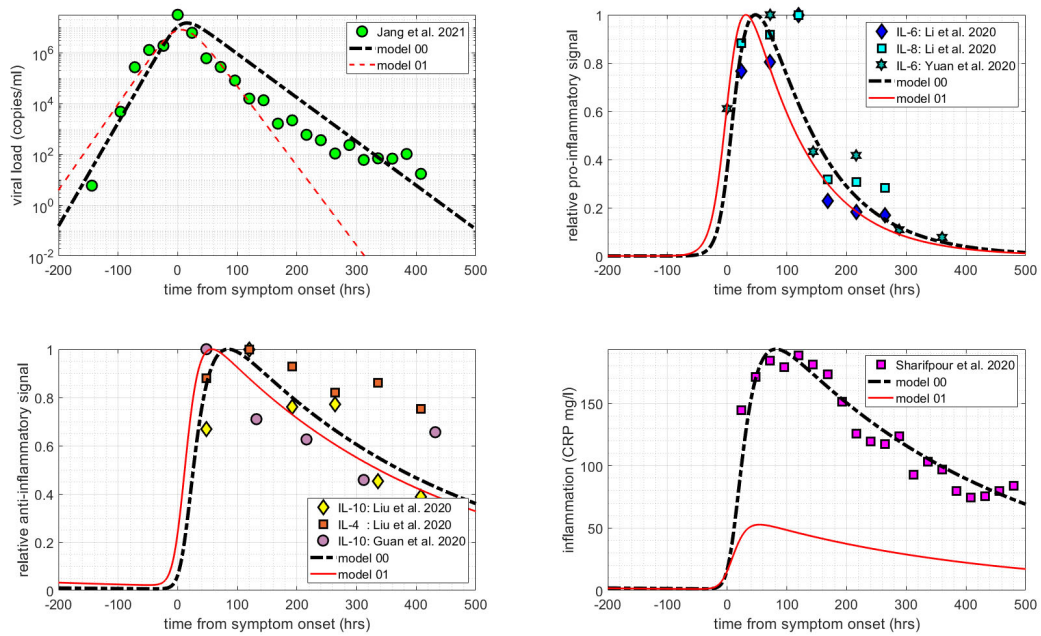23   Figure S1. The results of increasing T(0) by a factor of 2.

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26   Figure S2. The results of increasing β by a factor of 2.
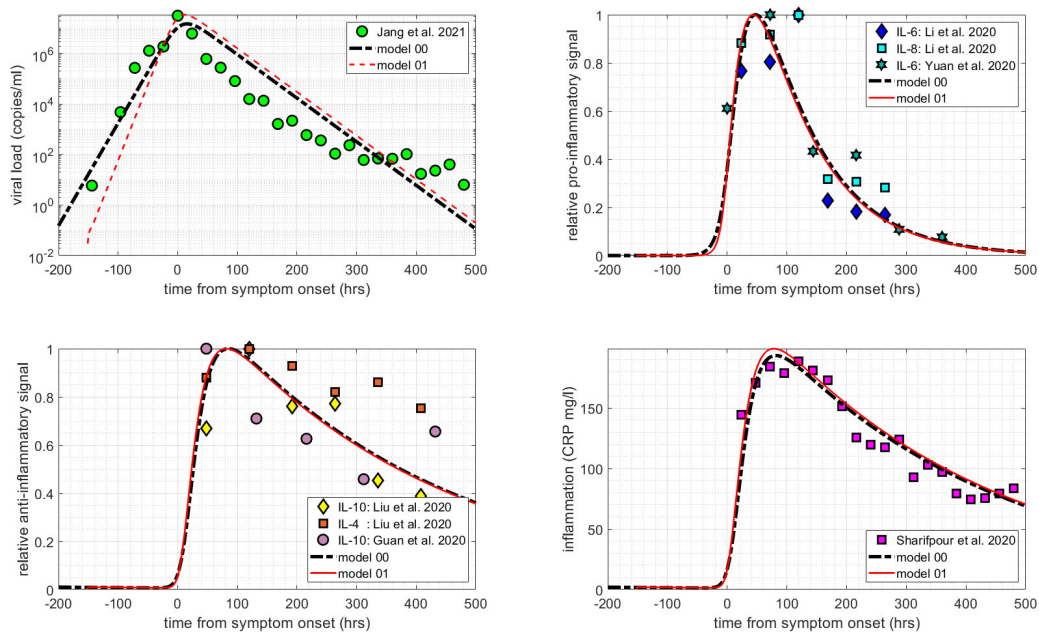
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29   Figure S3. The results of increasing k by a factor of 2.
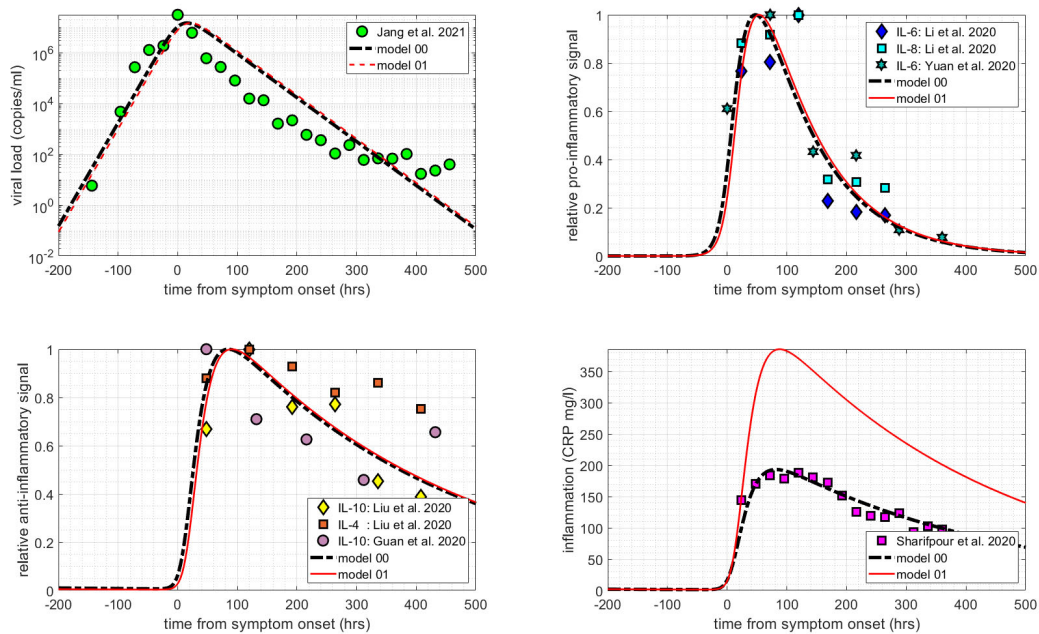
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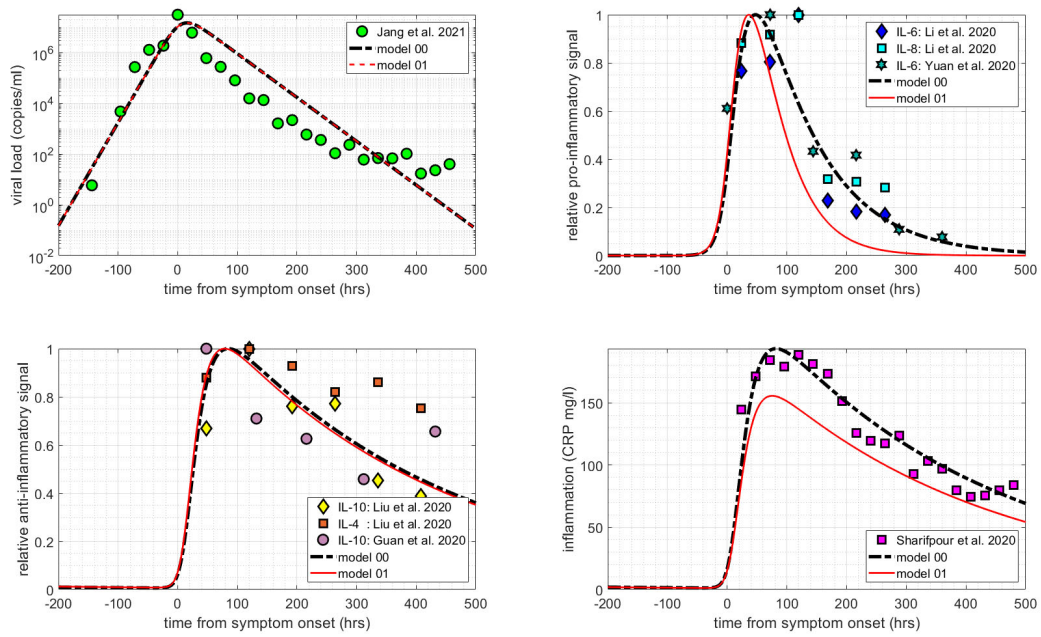32   Figure S4. The results of increasing δ by a factor of 2.

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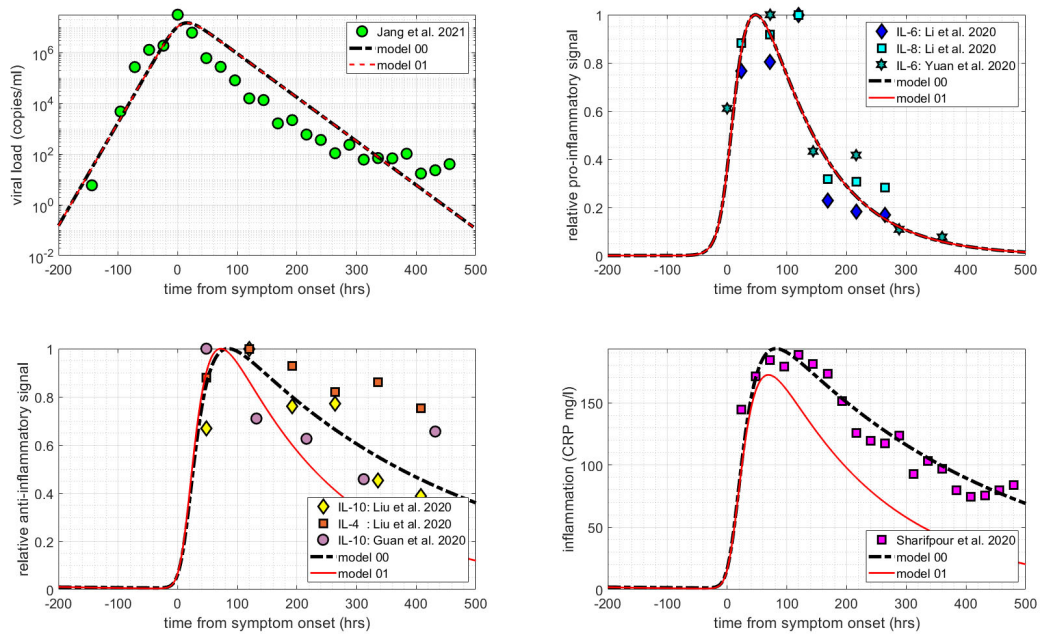35   Figure S5. The results of increasing p by a factor of 2.

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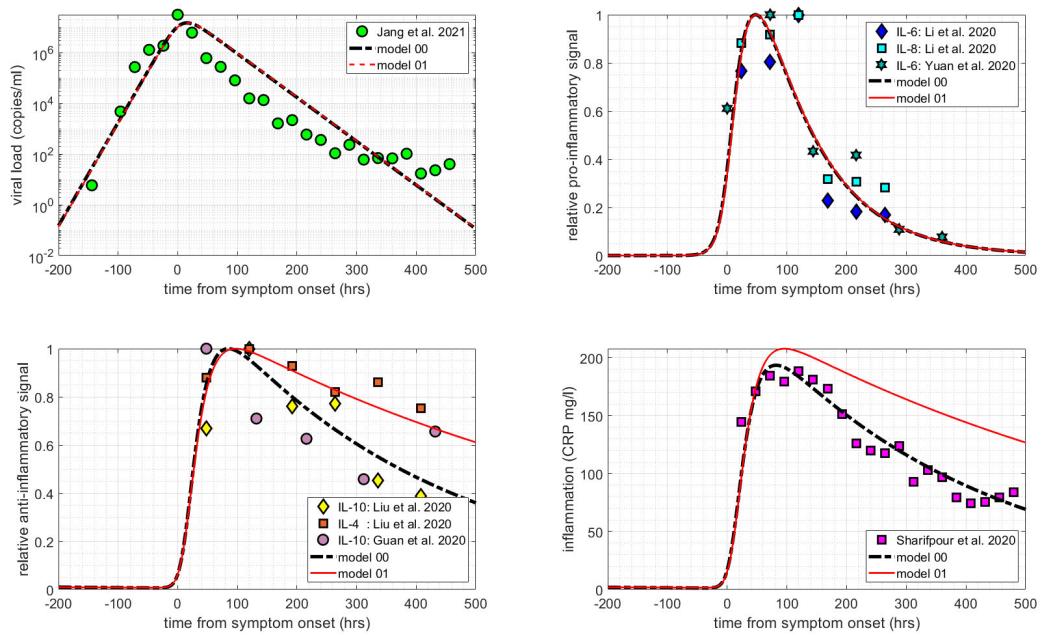38   Figure S6. The results of increasing k_{Cp} by a factor of 2.

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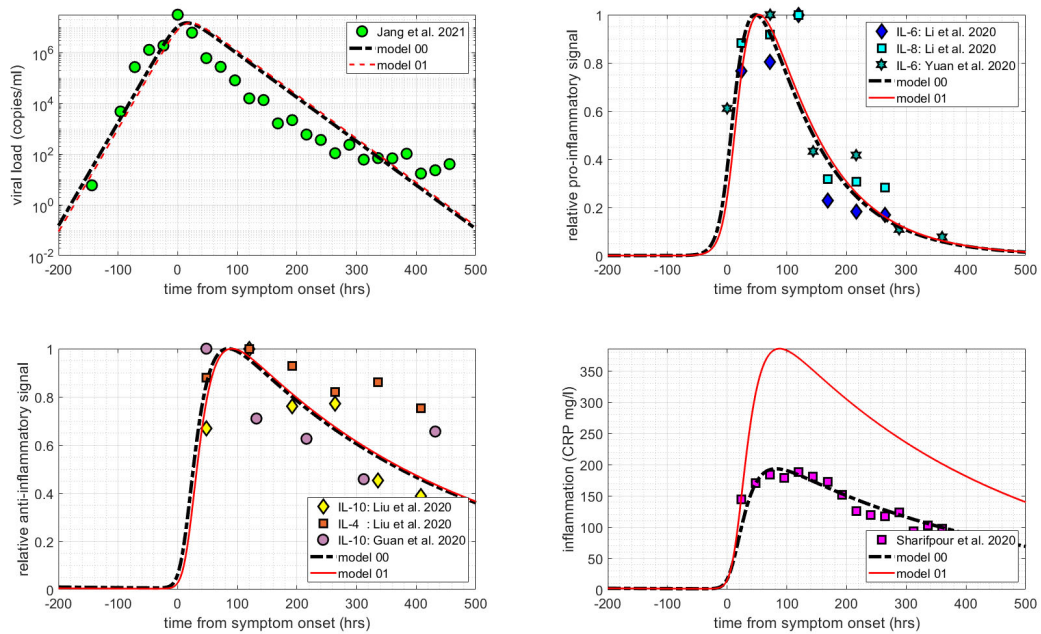Figure S7. The results of increasing μ_{Cp} by a factor of 2.

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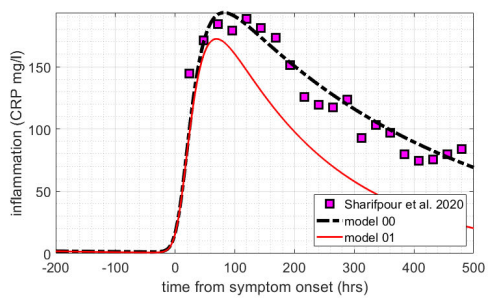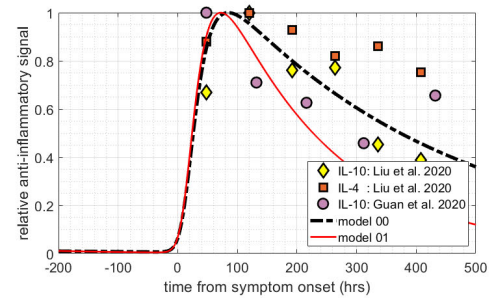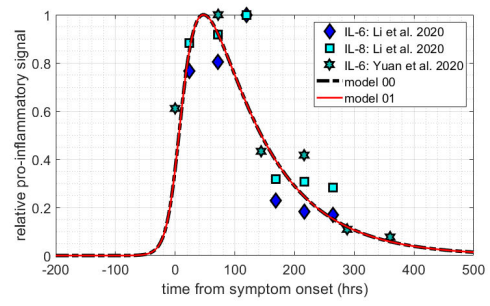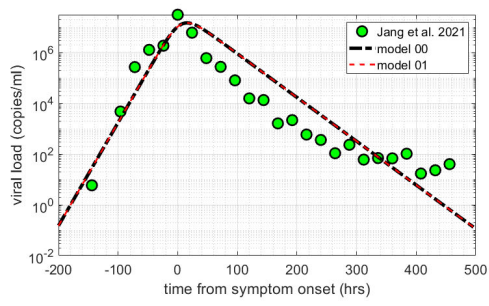Figure S8. The results of increasing k_{Ca} by a factor of 2.

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Figure S9. The results of increasing μ_{Ca} by a factor of 2.

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Figure S10. The results of increasing k_F by a factor of 2.

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Figure S11. The results of increasing μ_F by a factor of 2.

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