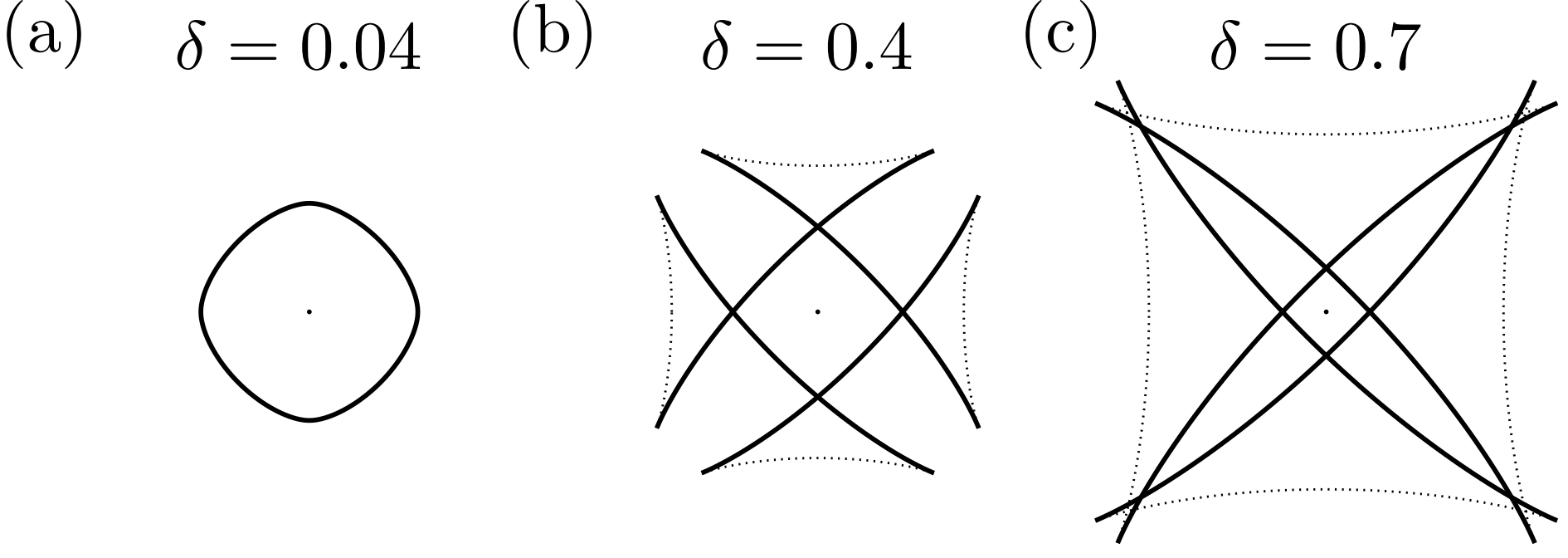
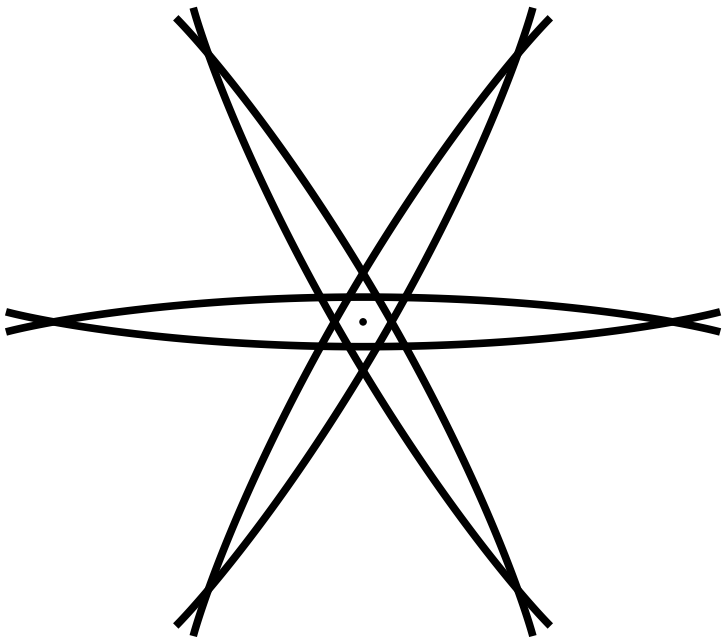
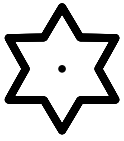

(a)
$\delta = 0.04$
(b)
$\delta = 0.4$
(c)
$\delta = 0.7$

(a)

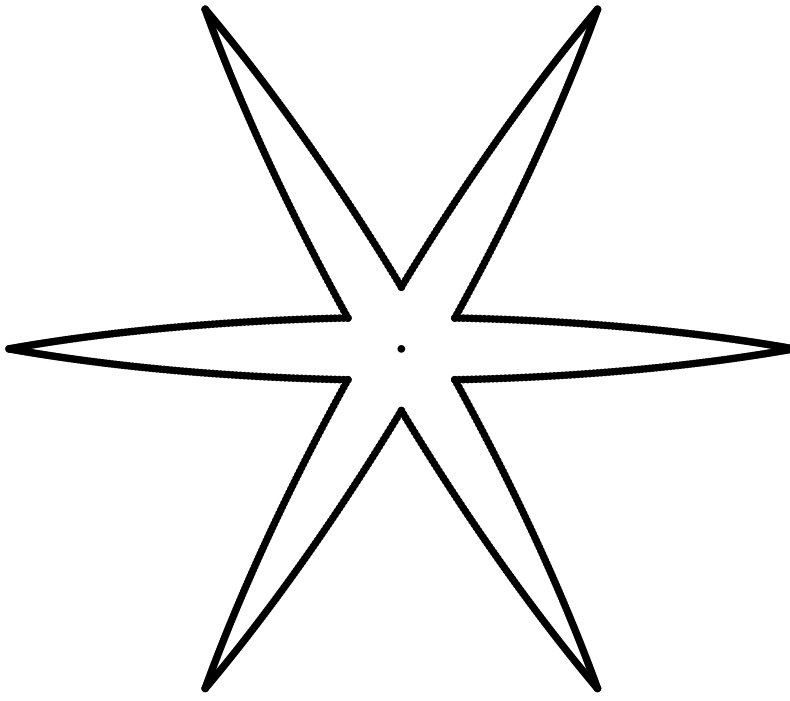


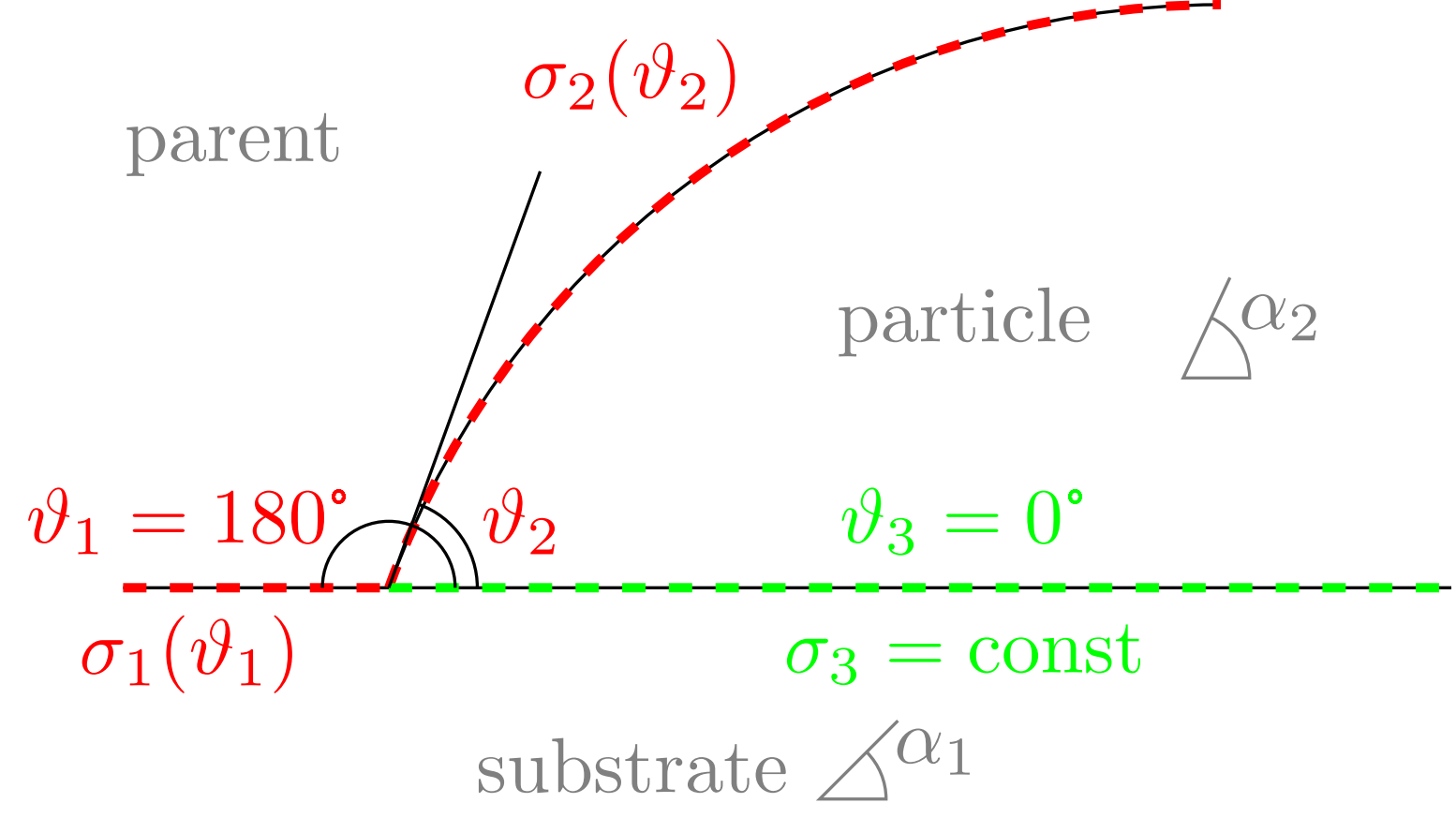
(b) cross order 1

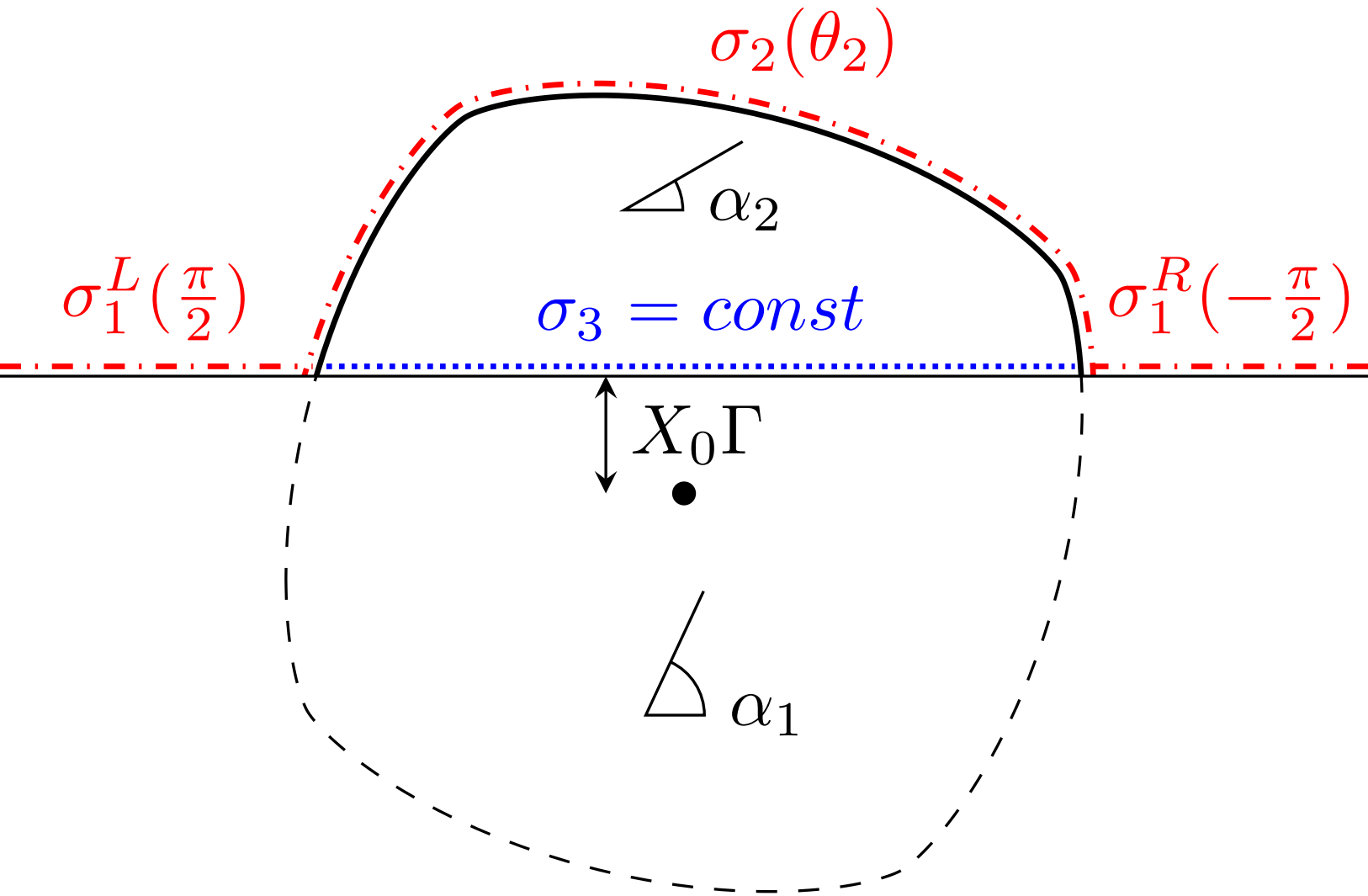
(c) cross order 2

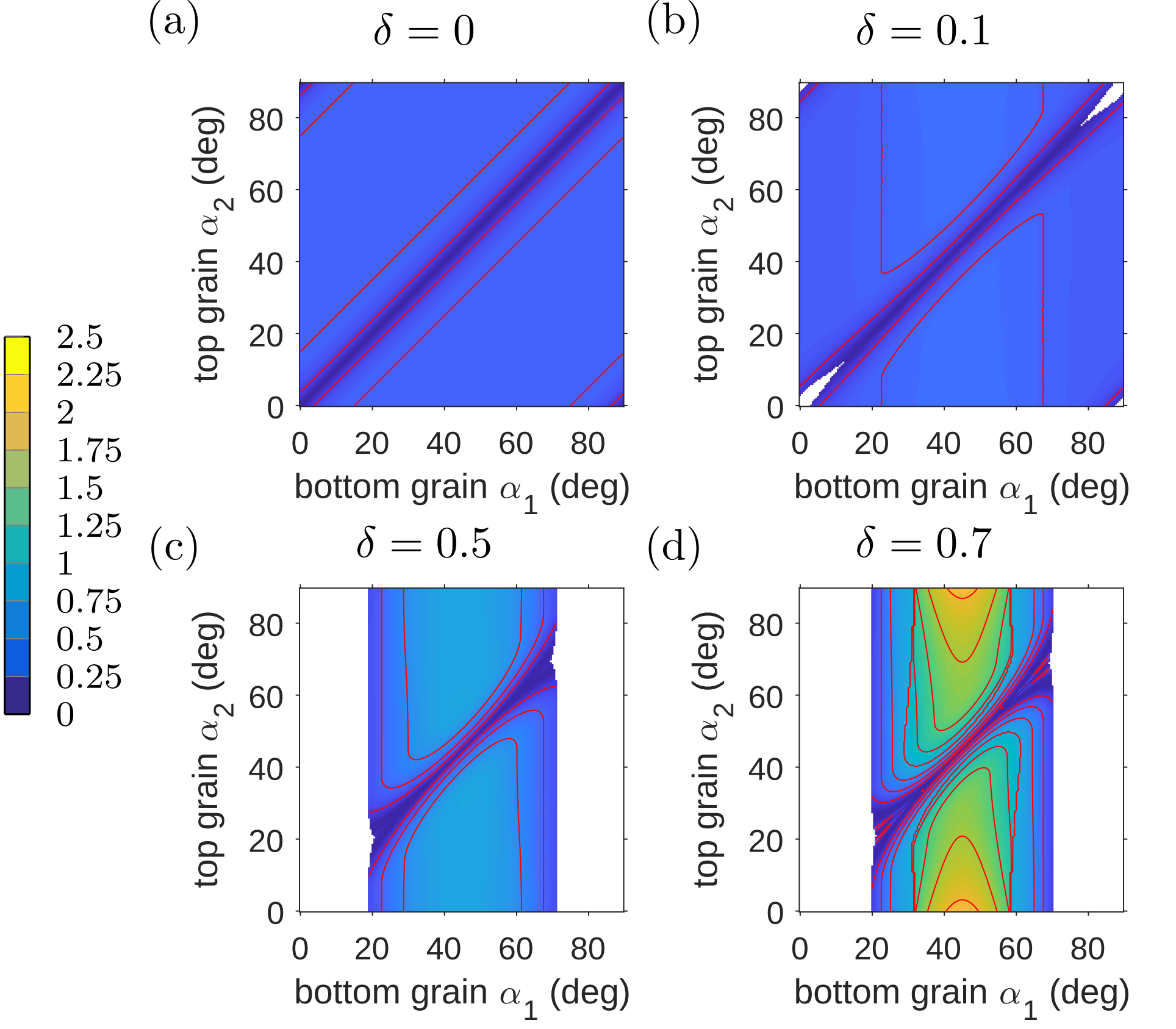


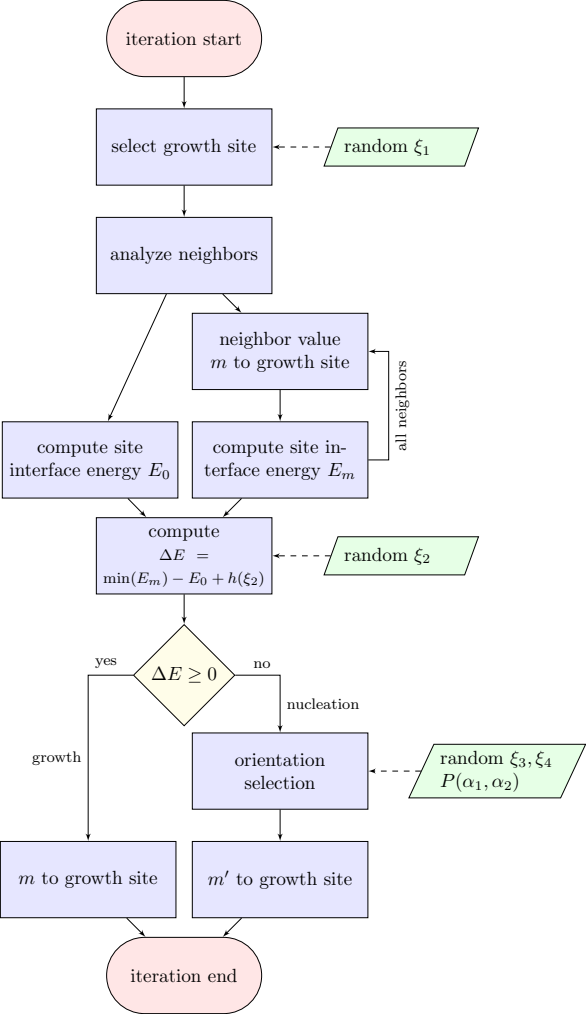
(d) cross order 3

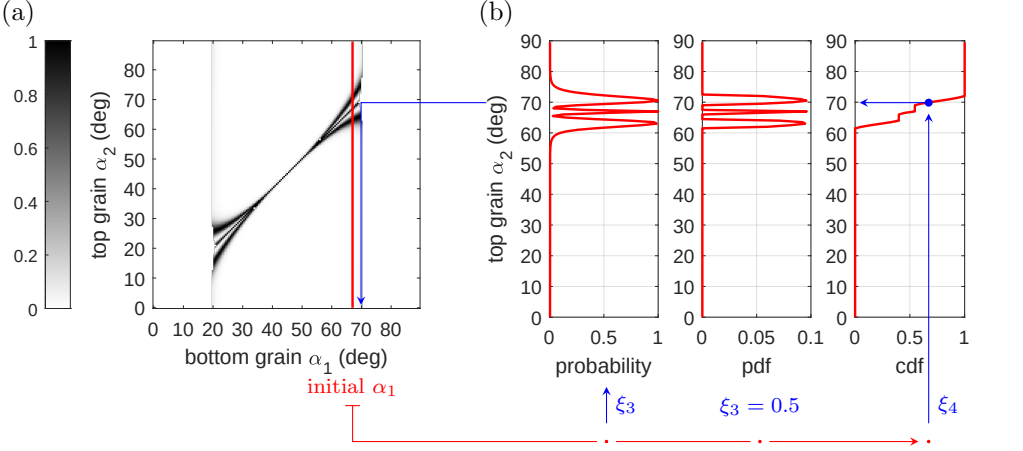


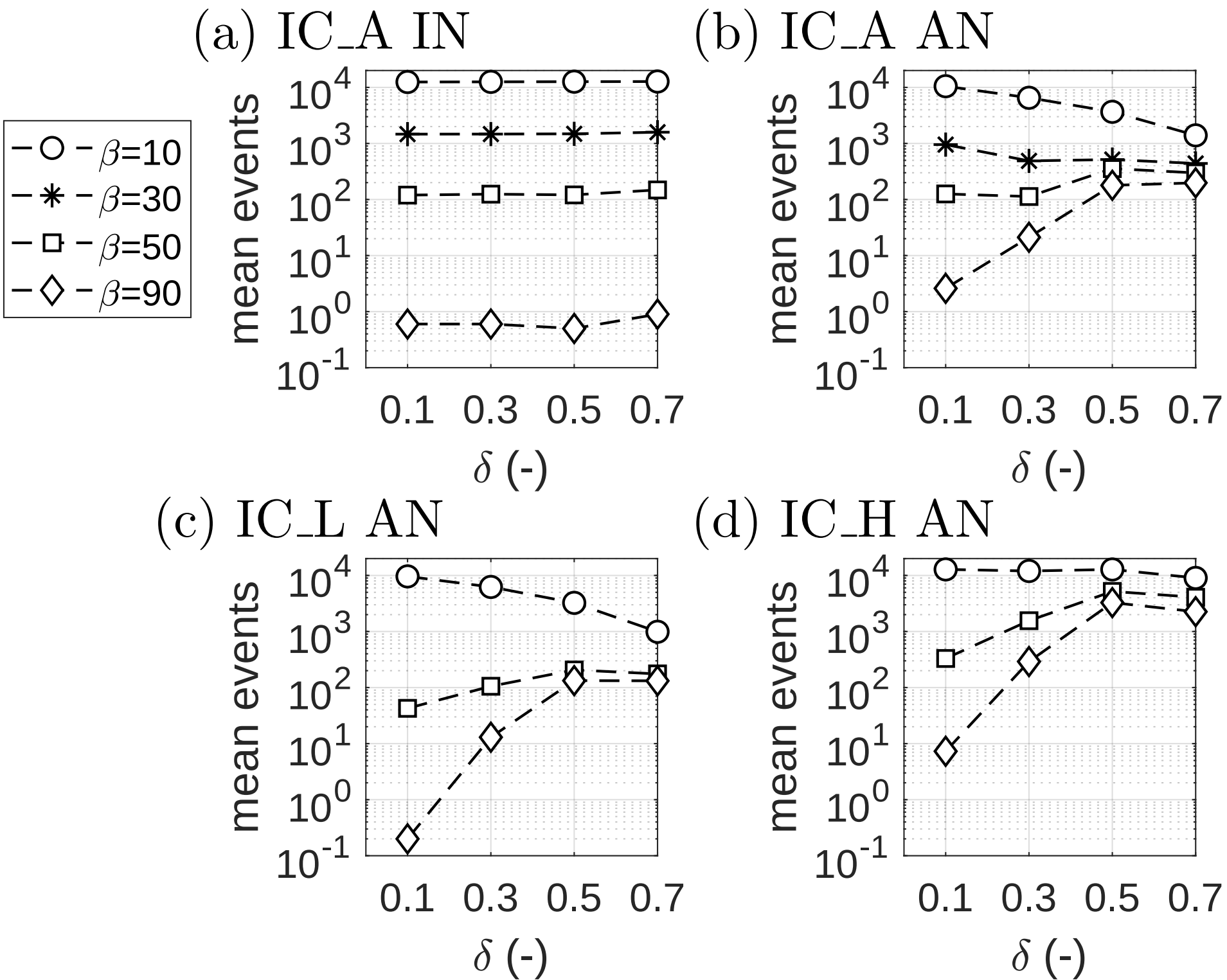

$\sigma_2(\vartheta_2)$
parent
particle
α_2
$\vartheta_1 = 180^\circ$
ϑ_2
$\vartheta_3 = 0^\circ$
$\sigma_1(\vartheta_1)$
$\sigma_3 = \text{const}$
substrate
α_1

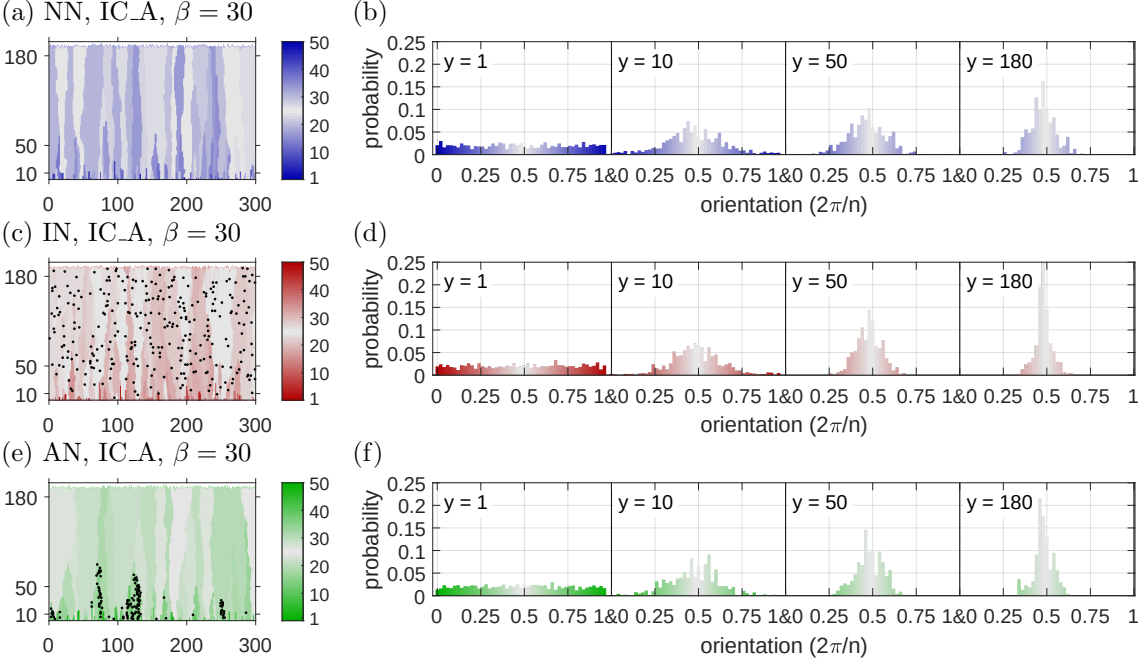

$\sigma_2(\theta_2)$
α_2
$\sigma_1^L(\frac{\pi}{2})$
$\sigma_3 = const$
$\sigma_1^R(-\frac{\pi}{2})$
$X_0\Gamma$
α_1


(a)
$\delta = 0$
(b)
$\delta = 0.1$
(c)
$\delta = 0.5$
(d)
$\delta = 0.7$
top grain α_2 (deg)
bottom grain α_1 (deg)
0
20
40
60
80
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0

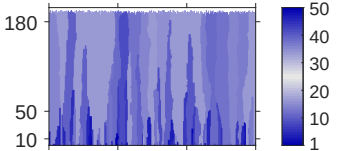

iteration start
select growth site
random ξ_1
analyze neighbors
neighbor value m to growth site
all neighbors
compute site interface energy E_0
compute site interface energy E_m
compute $\Delta E = \min(E_m) - E_0 + h(\xi_2)$
random ξ_2
yes
$\Delta E \geq 0$
no
nucleation
growth
orientation selection
random ξ_3, ξ_4 $P(\alpha_1, \alpha_2)$
m to growth site
m' to growth site
iteration end


(a)
(b)
top grain α_2 (deg)
bottom grain α_1 (deg)
initial α_1
probability
pdf
cdf
ξ_3
$\xi_3 = 0.5$
ξ_4

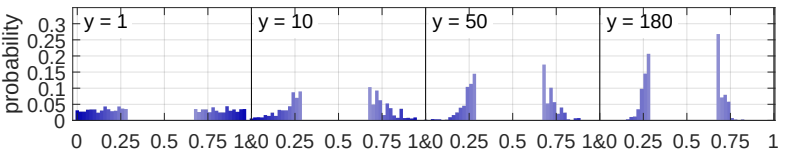

(a) IC_A IN
(b) IC_A AN
(c) IC_L AN
(d) IC_H AN
β=10
β=30
β=50
β=90
mean events
δ (-)
0.1
0.3
0.5
0.7


(a) NN, IC_A, $\beta = 30$
(b)
(c) IN, IC_A, $\beta = 30$
(d)
(e) AN, IC_A, $\beta = 30$
(f)
180
50
10
0
100
200
300
50
40
30
20
10
1
probability
y = 1
y = 10
y = 50
y = 180
0.25
0.2
0.15
0.1
0.05
0
0.25
0.5
0.75
1&0
orientation (2π/n)

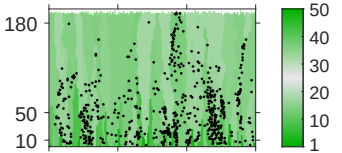
(a) NN, IC_H, $\beta = 90$



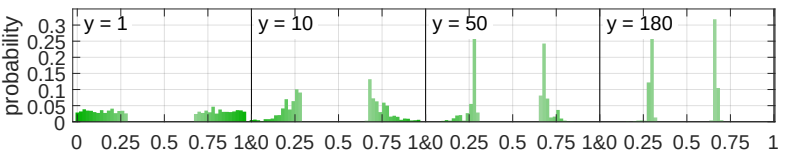
(b)

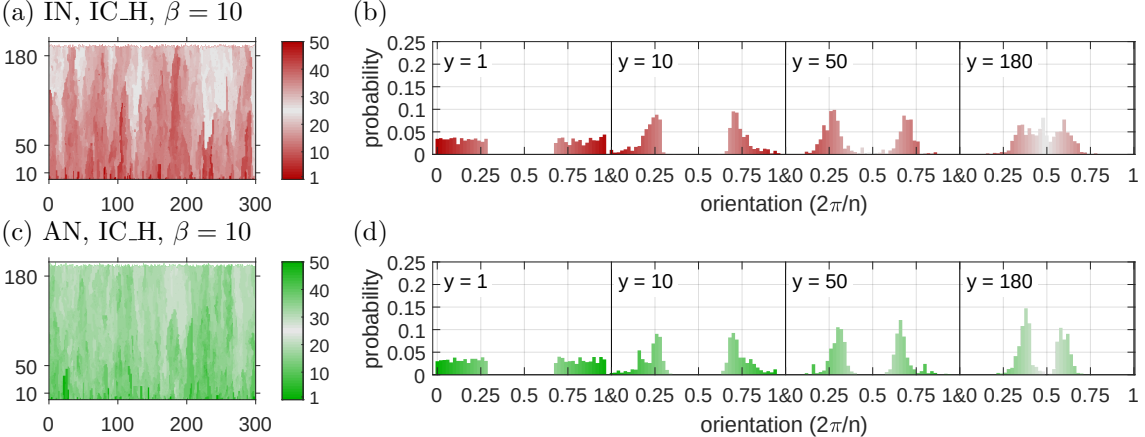


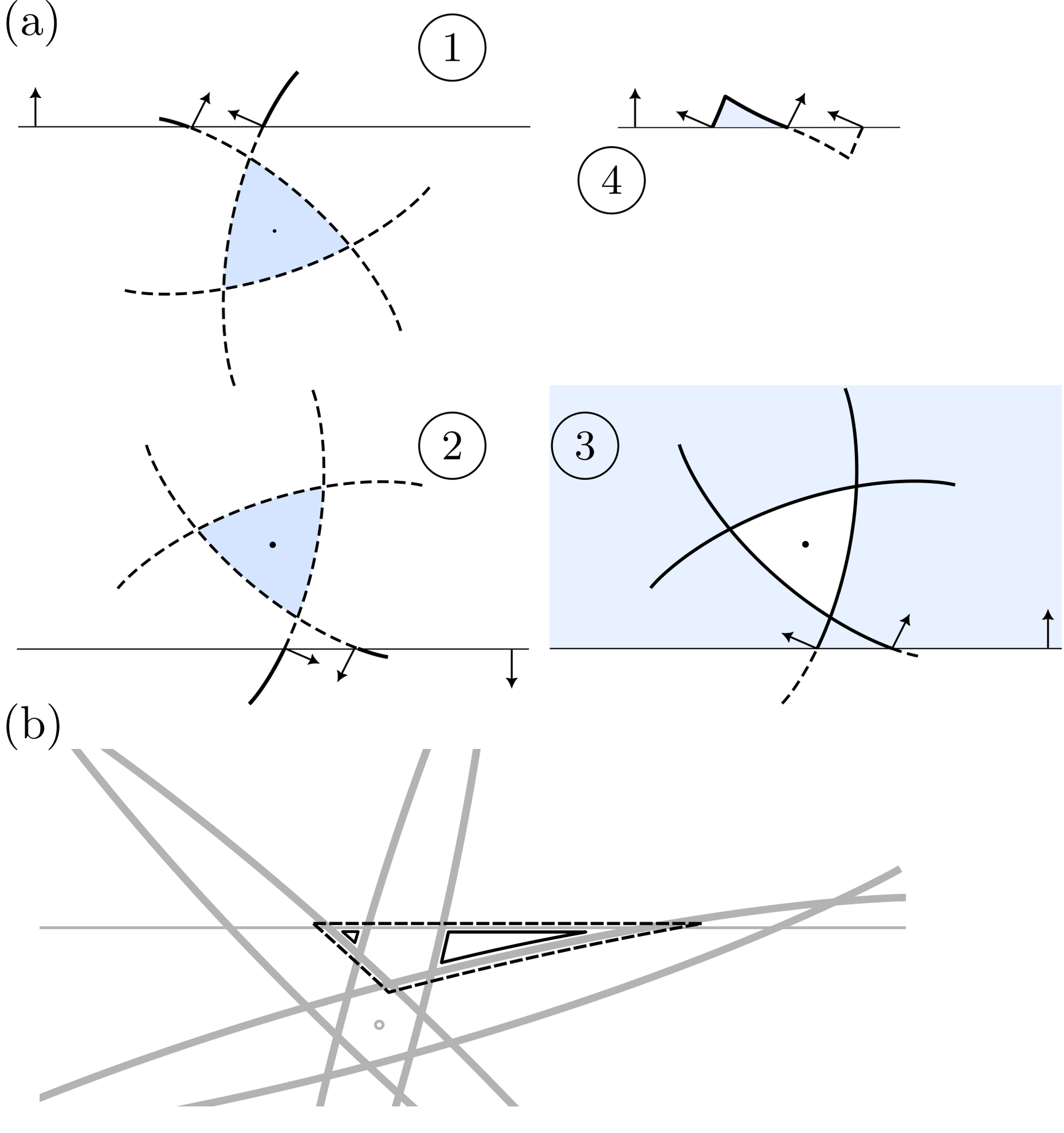
(c) AN, IC_H, $\beta = 90$



(d)




(a) IN, IC_H, $\beta = 10$
(b)
(c) AN, IC_H, $\beta = 10$
(d)
180
50
10
0
100
200
300
50
40
30
20
10
1
probability
0.25
0.2
0.15
0.1
0.05
0
y = 1
y = 10
y = 50
y = 180
0.25
0.5
0.75
1&0
orientation (2π/n)


(a)
1
2
3
4
(b)