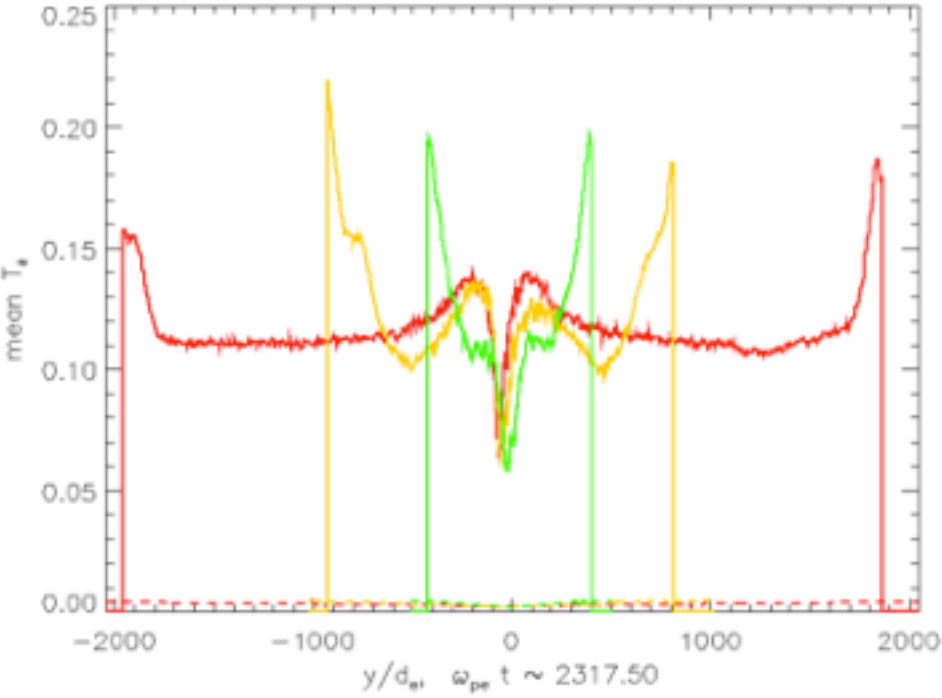
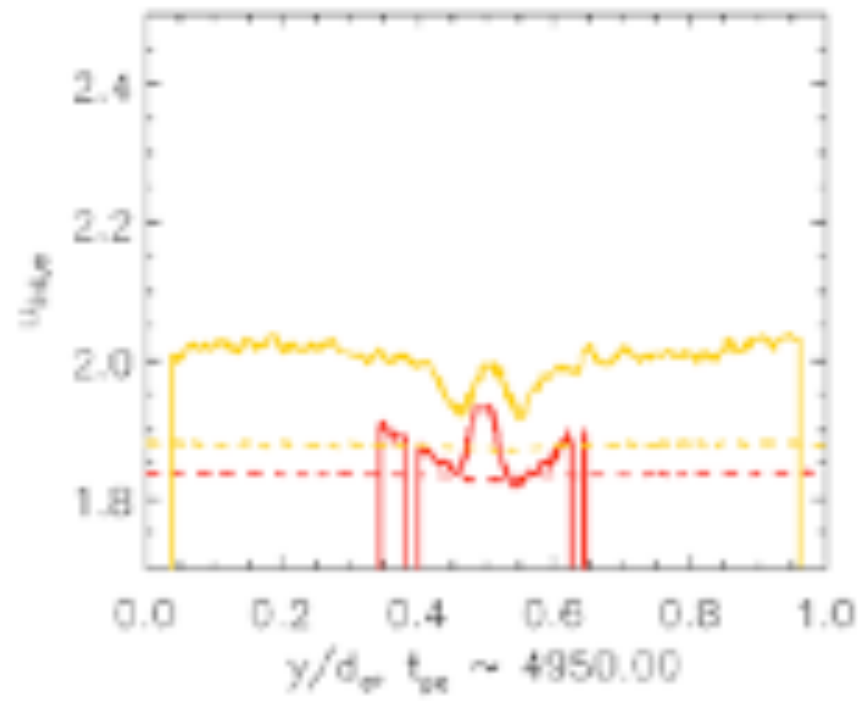
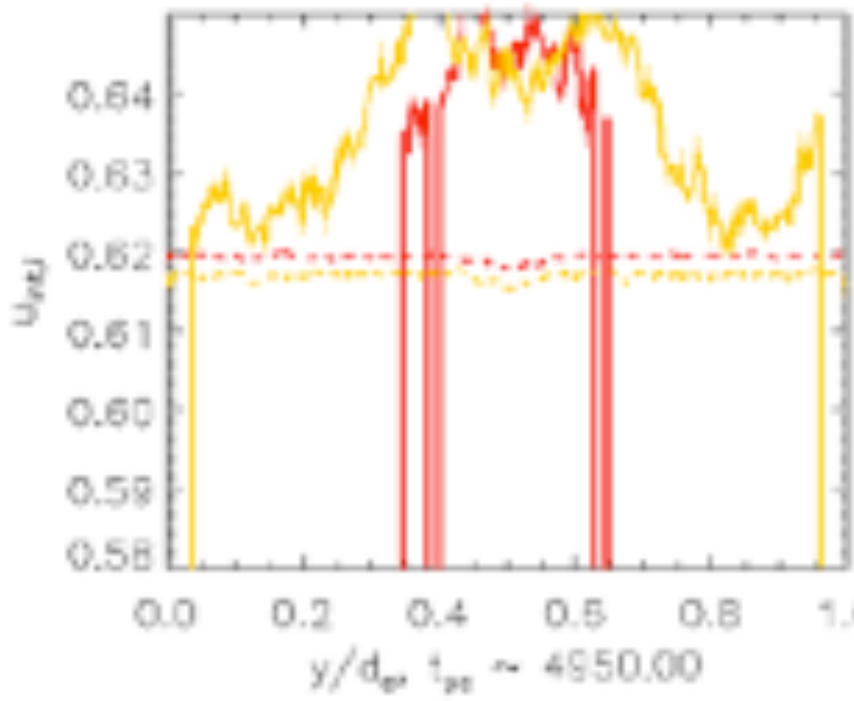
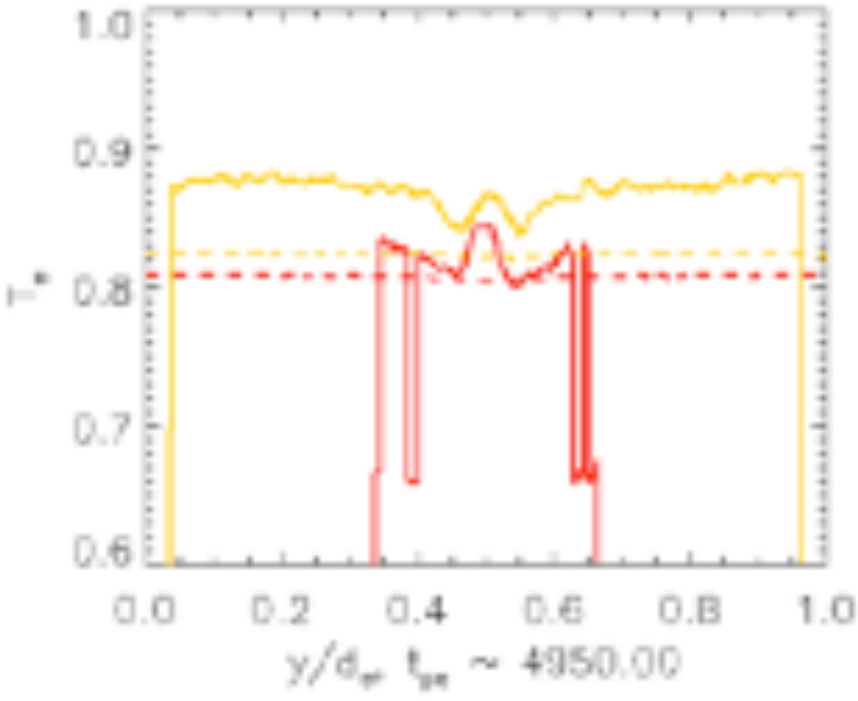
Heating should not depend on nonphysical parameters

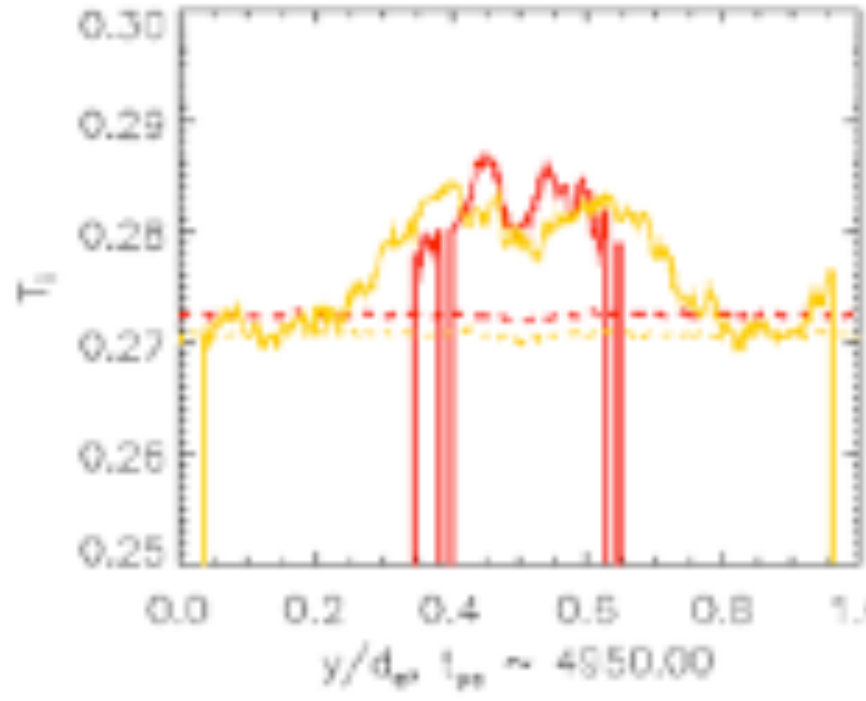

0.25
0.20
0.15
0.10
0.05
0.00
mean T_e
−2000
−1000
0
1000
2000
y/d_e, ω_{pe} t ~ 2317.50

$m_y = 4096$ (green), 8192 (yellow), 16384


2.4
2.2
2.0
1.8
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00


0.64
0.63
0.62
0.61
0.60
0.59
0.58
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00


1.0
0.9
0.8
0.7
0.6
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00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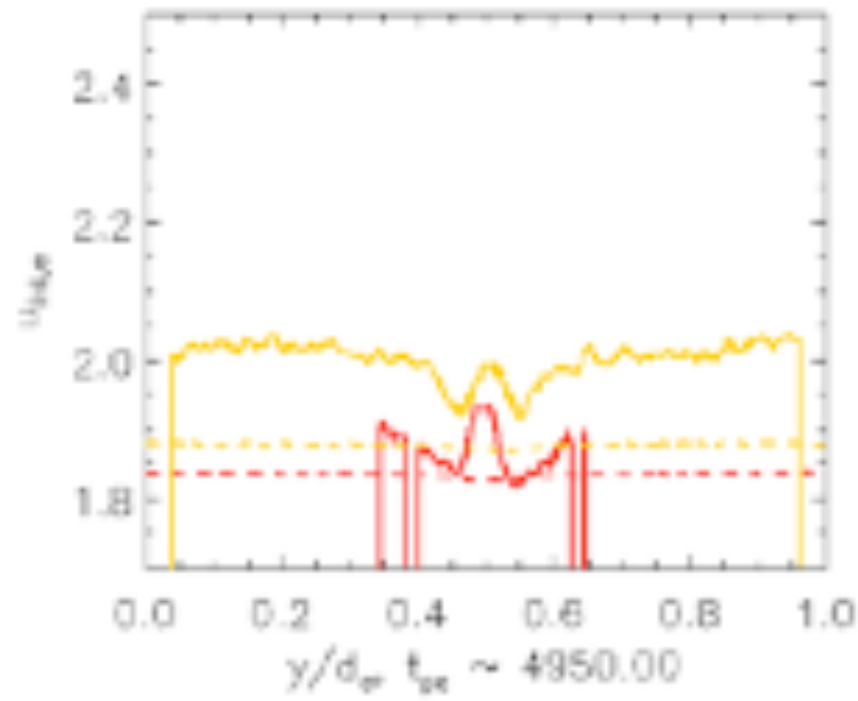
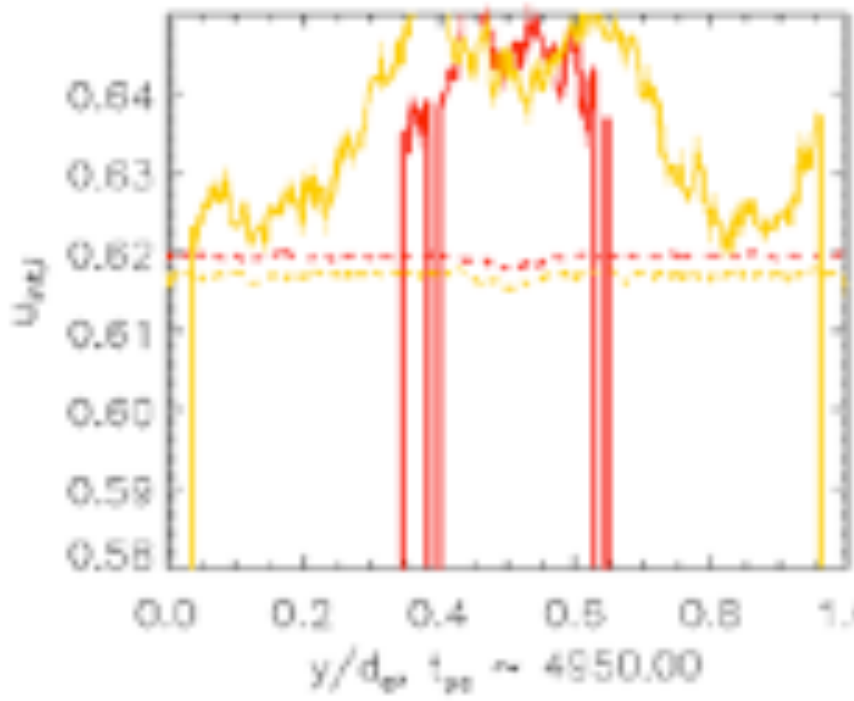
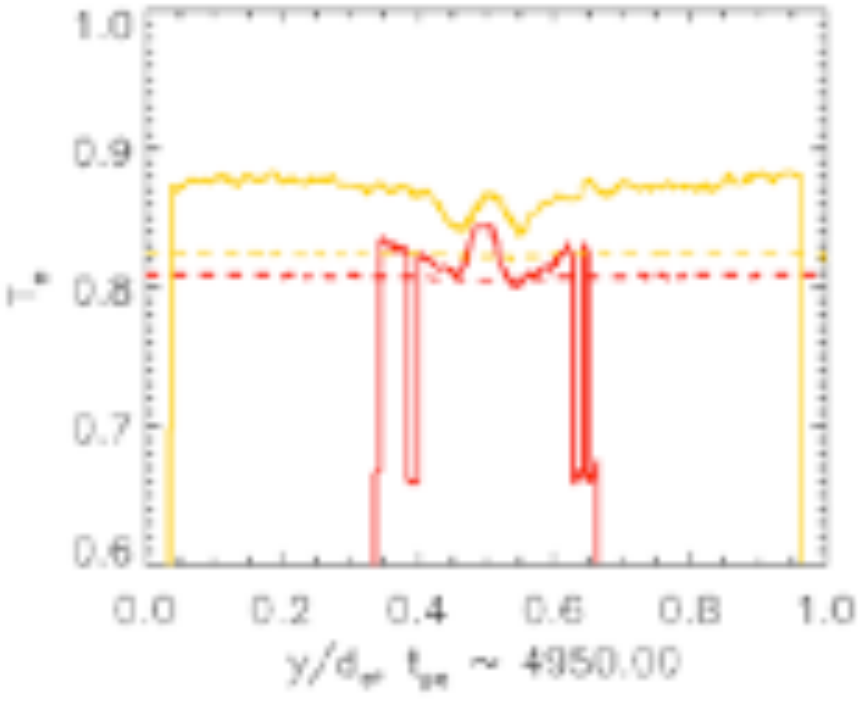
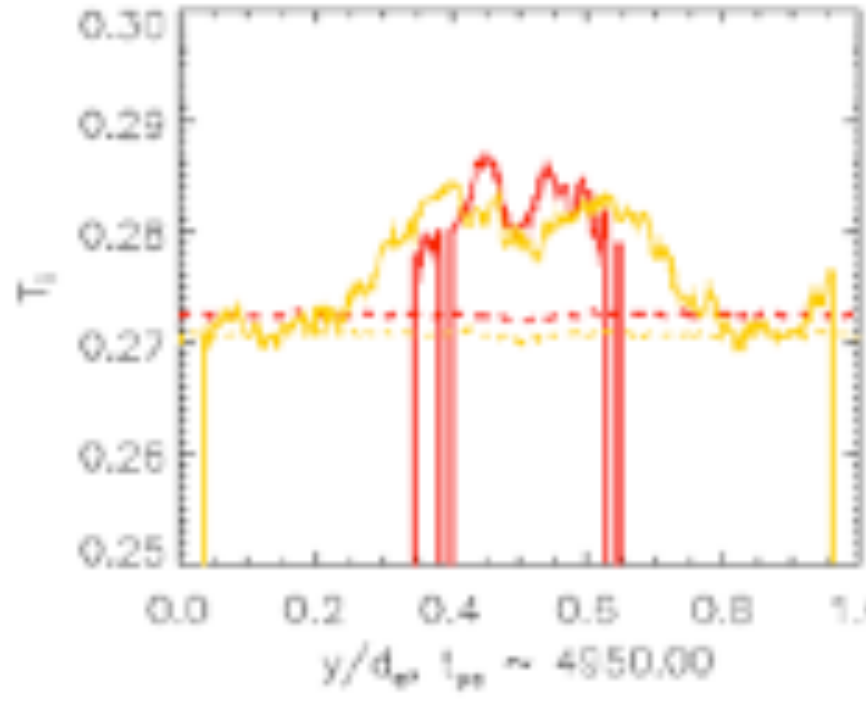
0.29
0.28
0.27
0.26
0.25
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00

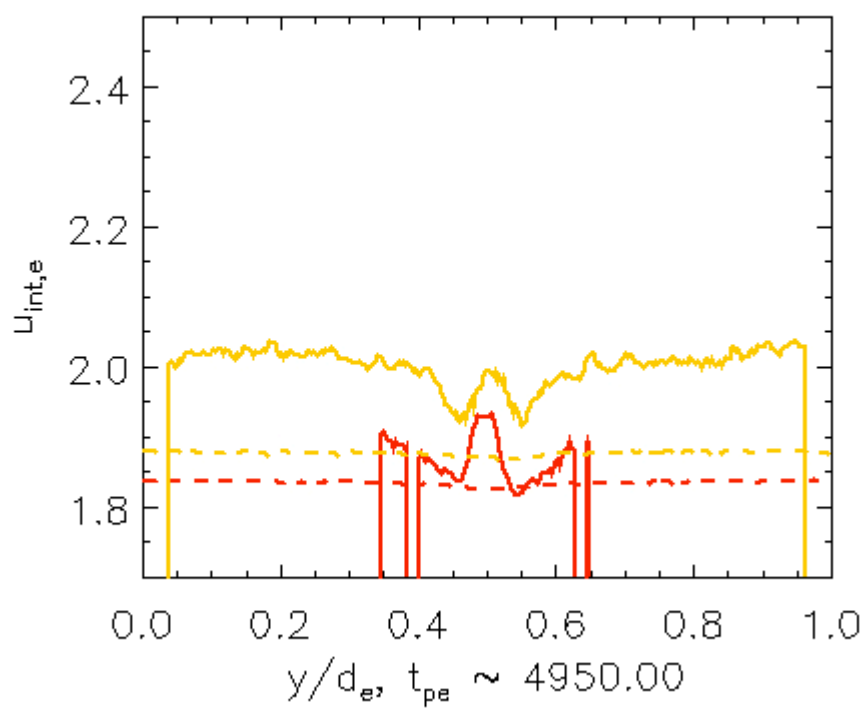
ppc = 64 (yellow), ppc = 256 (red)

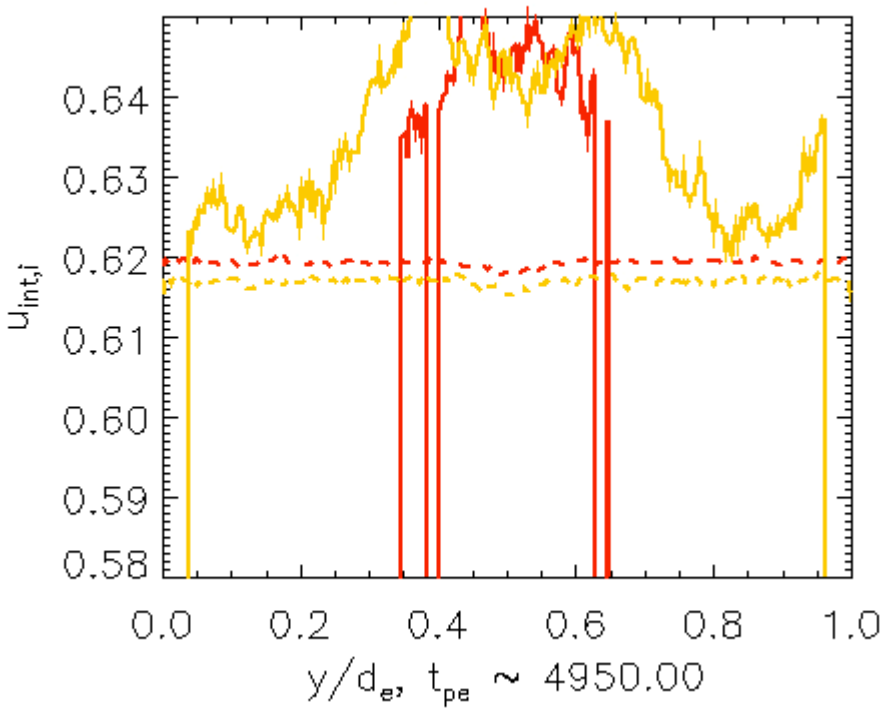

2.4
2.2
2.0
1.8
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00

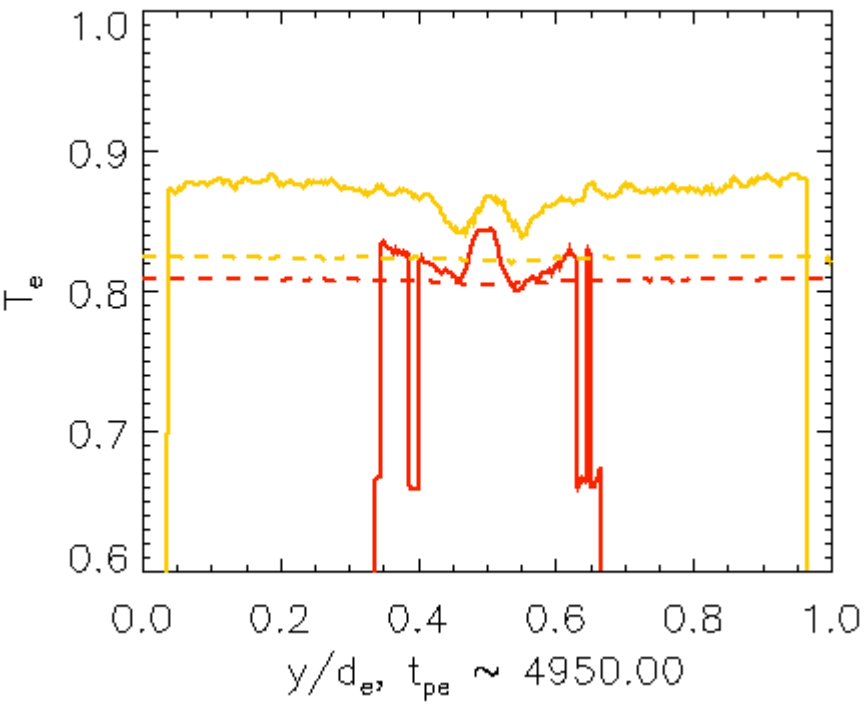

0.64
0.63
0.62
0.61
0.60
0.59
0.58
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00

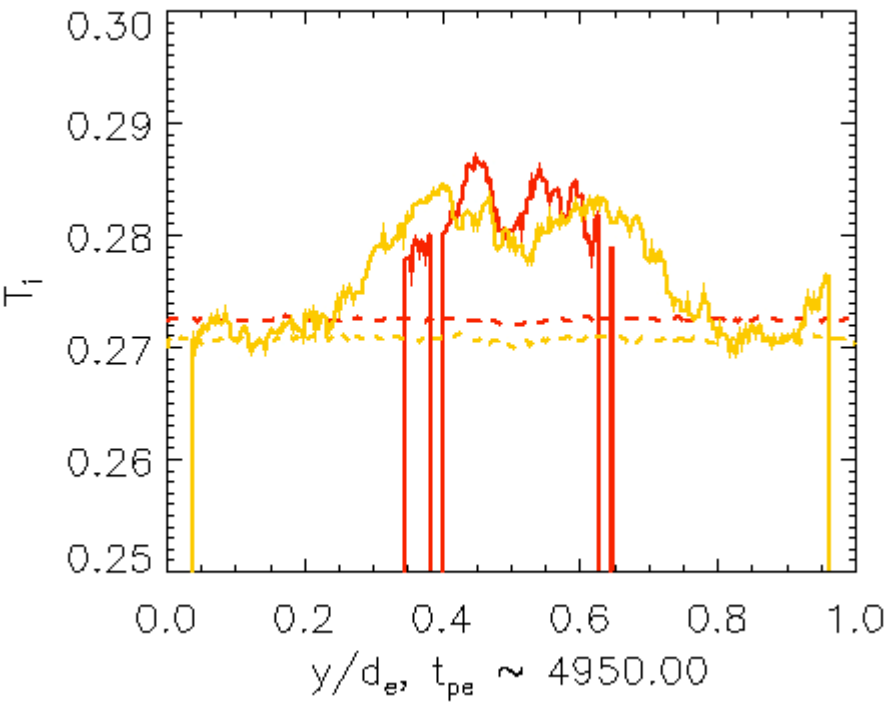

1.0
0.9
0.8
0.7
0.6
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00

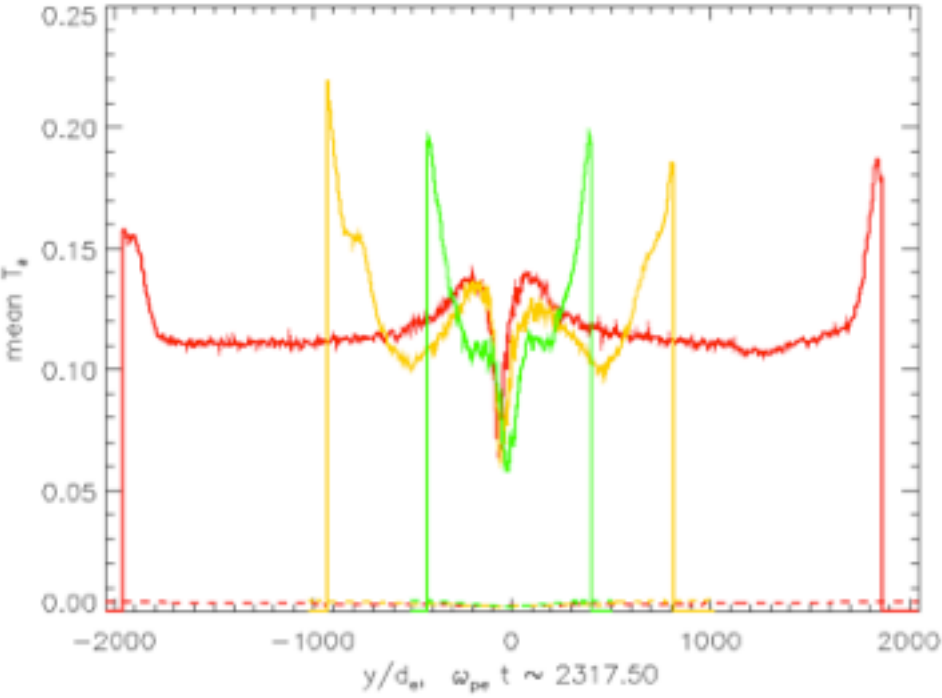

0.30
0.29
0.28
0.27
0.26
0.25
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_ce ~ 4950.00

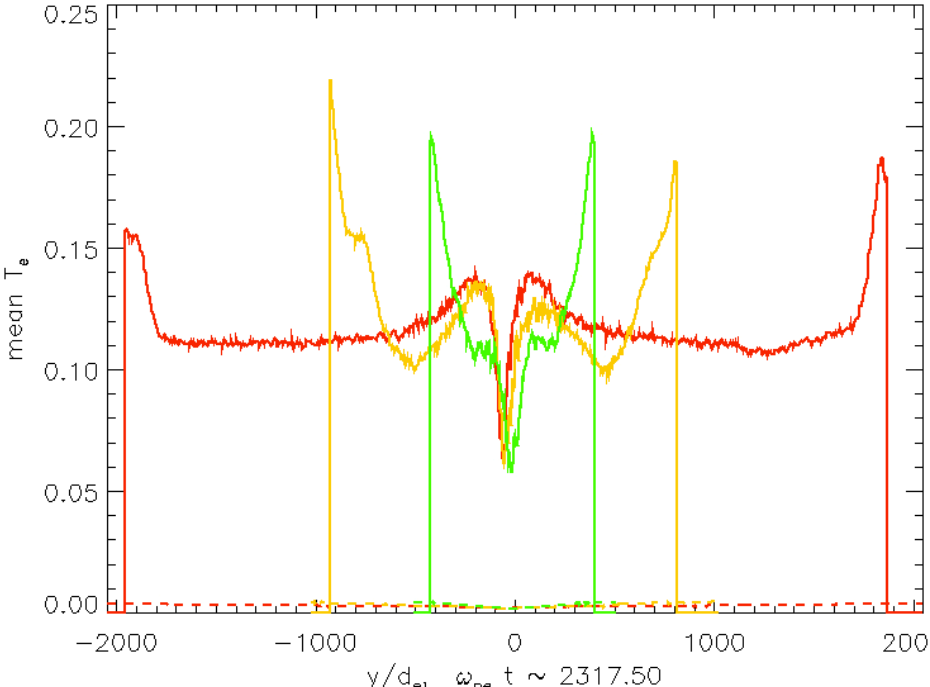

2.4
2.2
2.0
1.8
$u_{int,e}$
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_{pe} ~ 4950.00


0.64
0.63
0.62
0.61
0.60
0.59
0.58
$u_{int,i}$
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_{pe} ~ 4950.00


1.0
0.9
0.8
0.7
0.6
T_e
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_{pe} ~ 4950.00


0.30
0.29
0.28
0.27
0.26
0.25
T_i
0.0
0.2
0.4
0.6
0.8
1.0
y/d_e, t_{pe} ~ 4950.00

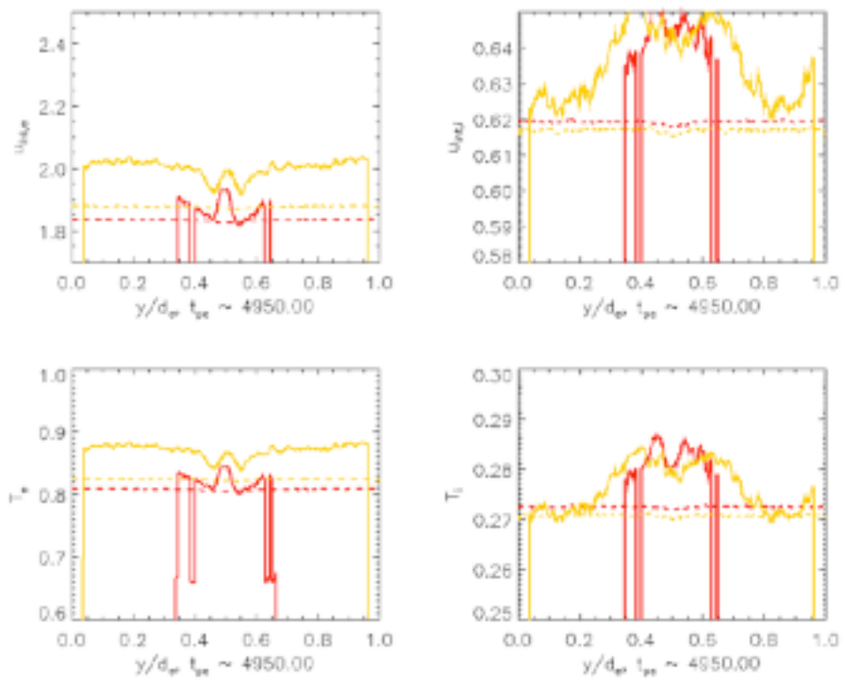

0.25
0.20
0.15
0.10
0.05
0.00
mean T_e
−2000
−1000
0
1000
2000
y/d_e, ω_{pe} t ~ 2317.50


0.25
0.20
0.15
0.10
0.05
0.00
mean T_e
−2000
−1000
0
1000
2000
y/d_e, ω_{pe} t ~ 2317.50

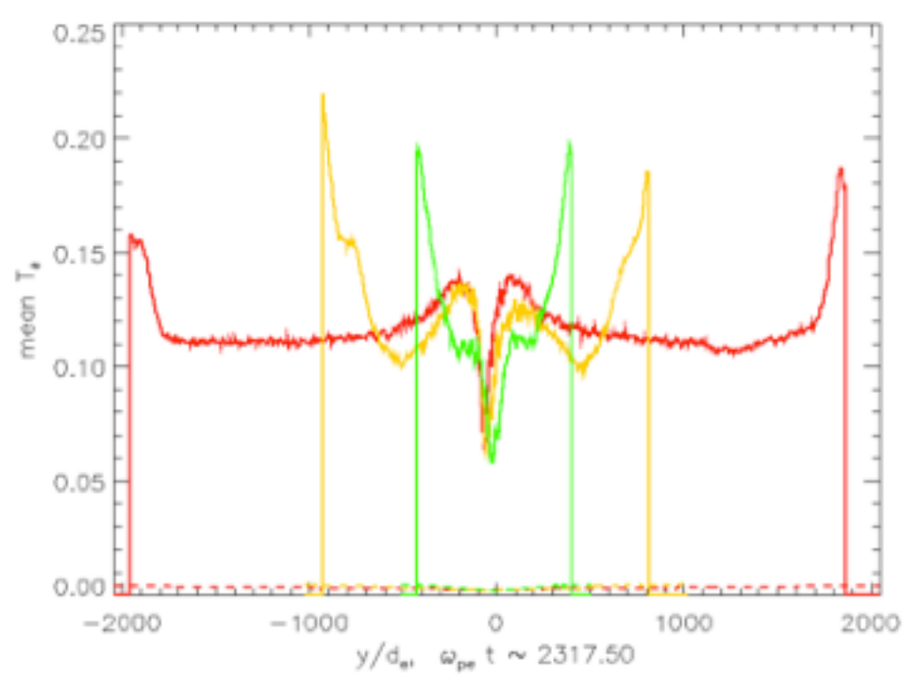
Heating should not depend on nonphysical parameters

- Check for convergence by varying computational parameters
- To trust the numerical results, need to make sure numerical heating is relatively small
- Particles per cell, domain size, boundary conditions, etc.

ppc = 64 (yellow), ppc = 256 (red)



m_y = 4096 (green), 8192 (yellow), 16384

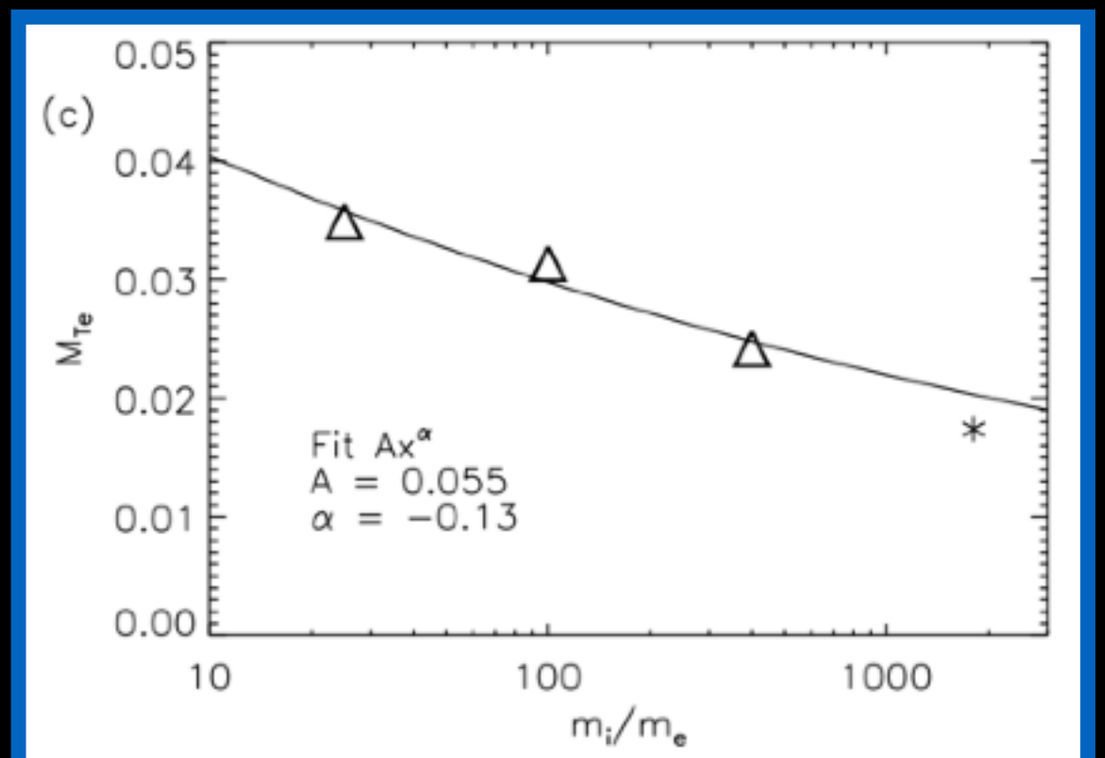


Electron heating will decrease with higher m_i/m_e

- In our simulations, we use an artificial mass ratio of $m_i/m_e = 25$
  - Why? This makes the problem computationally tractable
- We can expect our measured heating will decrease with higher mass ratio;

$$M_{Te} \sim (m_i/m_e)^{-0.13}$$

(Drake et al., 2014)



- Note: this scaling is consistent with the analytical model of Egedal et al.