ArcPIC status

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Outline

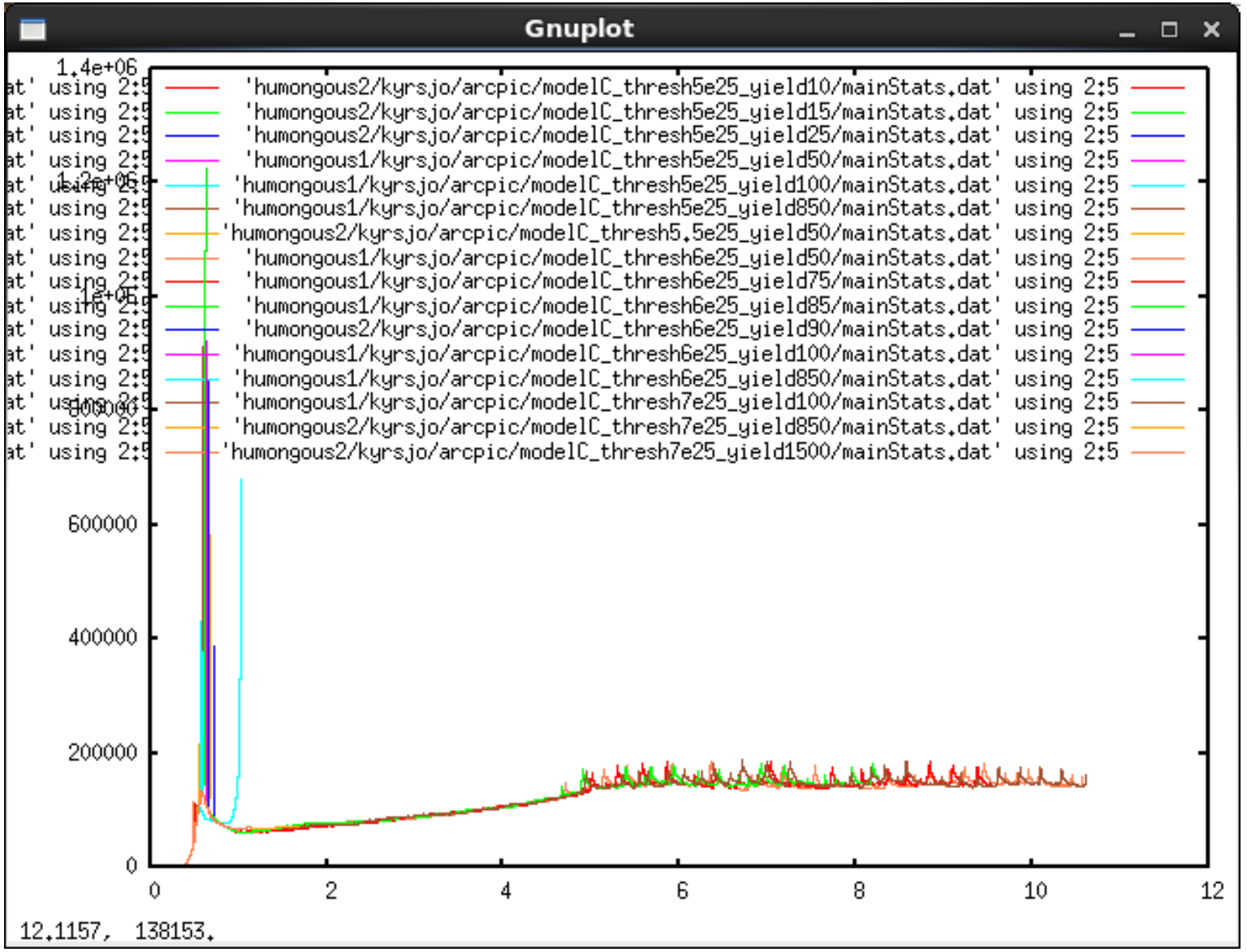
- PIC & field emission
  - See separate presentation
- Heatspike yield & threshold
- Field movie
- Particle weight scan
- Evaporation scan
- Model refinements
- Other stuff

Heatspike yield & threshold

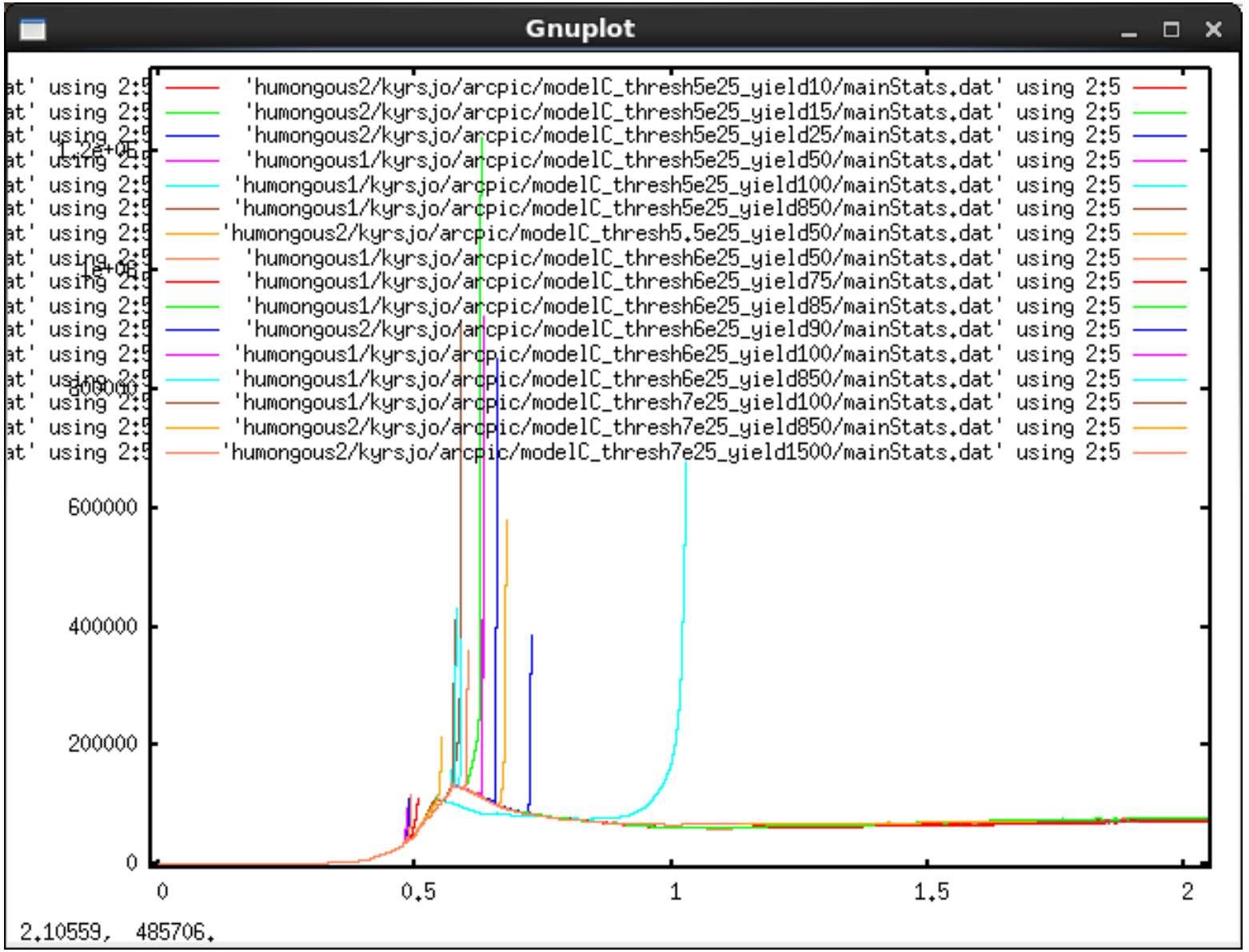
- Ran the new model (“NewHS-modelC”) many times to find the minimum yield and heatspike threshold sufficient for a “runaway” breakdown
- Results on next slide:
  - Number = time in ns until “breakaway” from zero-heatspike ion number curve
  - **Red**: Rapid runaway
  - **Yellow**: Runaway but was able to follow for some time
  - **Green**: No significant difference from no-heatspike curve

Yield	Threshold [particles / cm² / s]							
	1.0E+25	2.0E+25	3.0E+25	4.0E+25	5.0E+25	5.5E+25	6.0E+25	7.0E+25
1		0.570	inf					
5		0.570	0.603	inf				
10				0.666	inf			
15					inf			
25				0.598	0.720			
50			0.575		0.630	inf	inf	
75							inf	
85							inf	
90							0.655	
95							0.589	
100	0.480	0.500	0.574		0.587		0.630	inf
250	0.486							
500	0.485							
850	0.480	0.490	0.571		0.572		0.577	inf
1000								
1500								inf

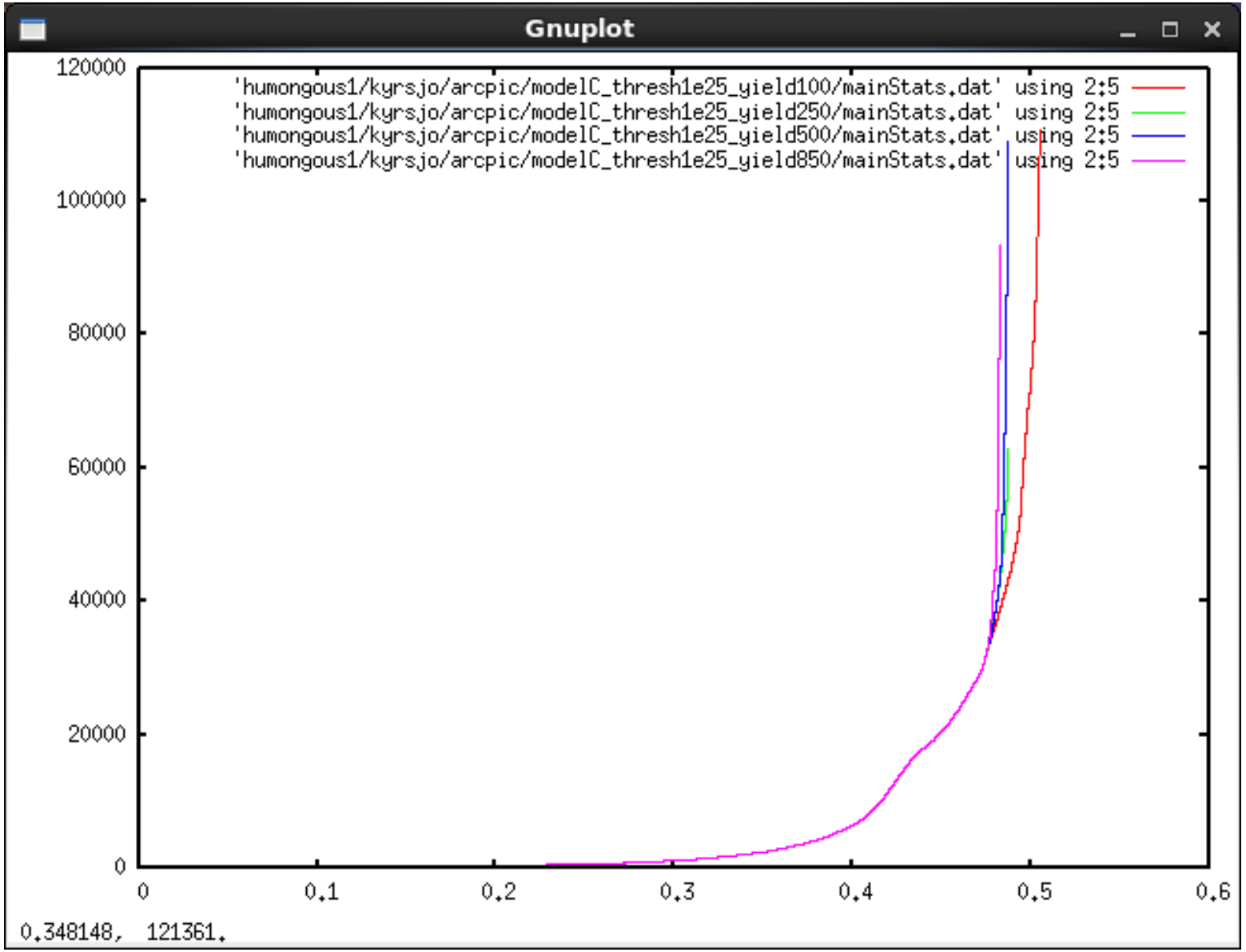
Heatspike yield & threshold: all runs



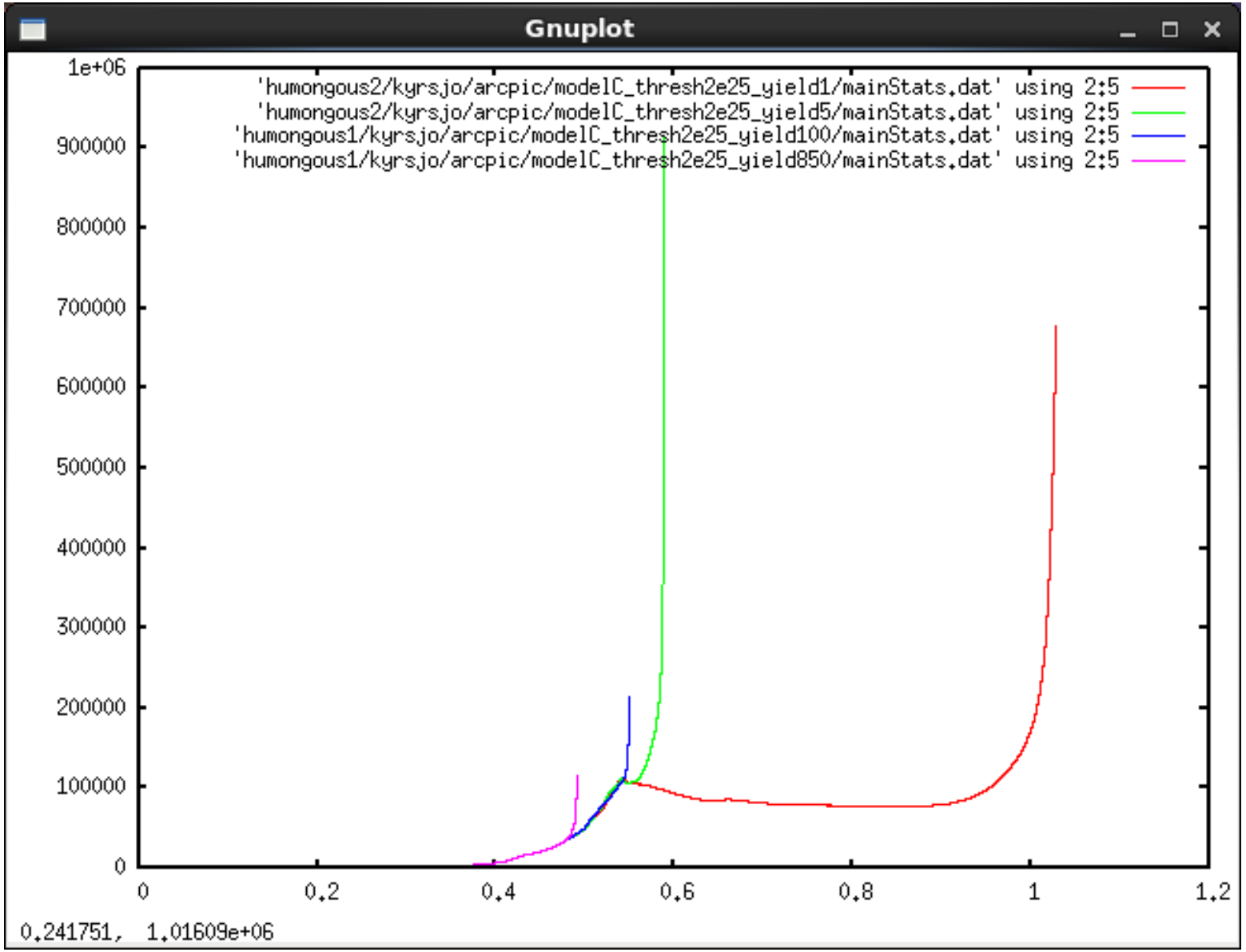
Heatspike yield & threshold: all runs



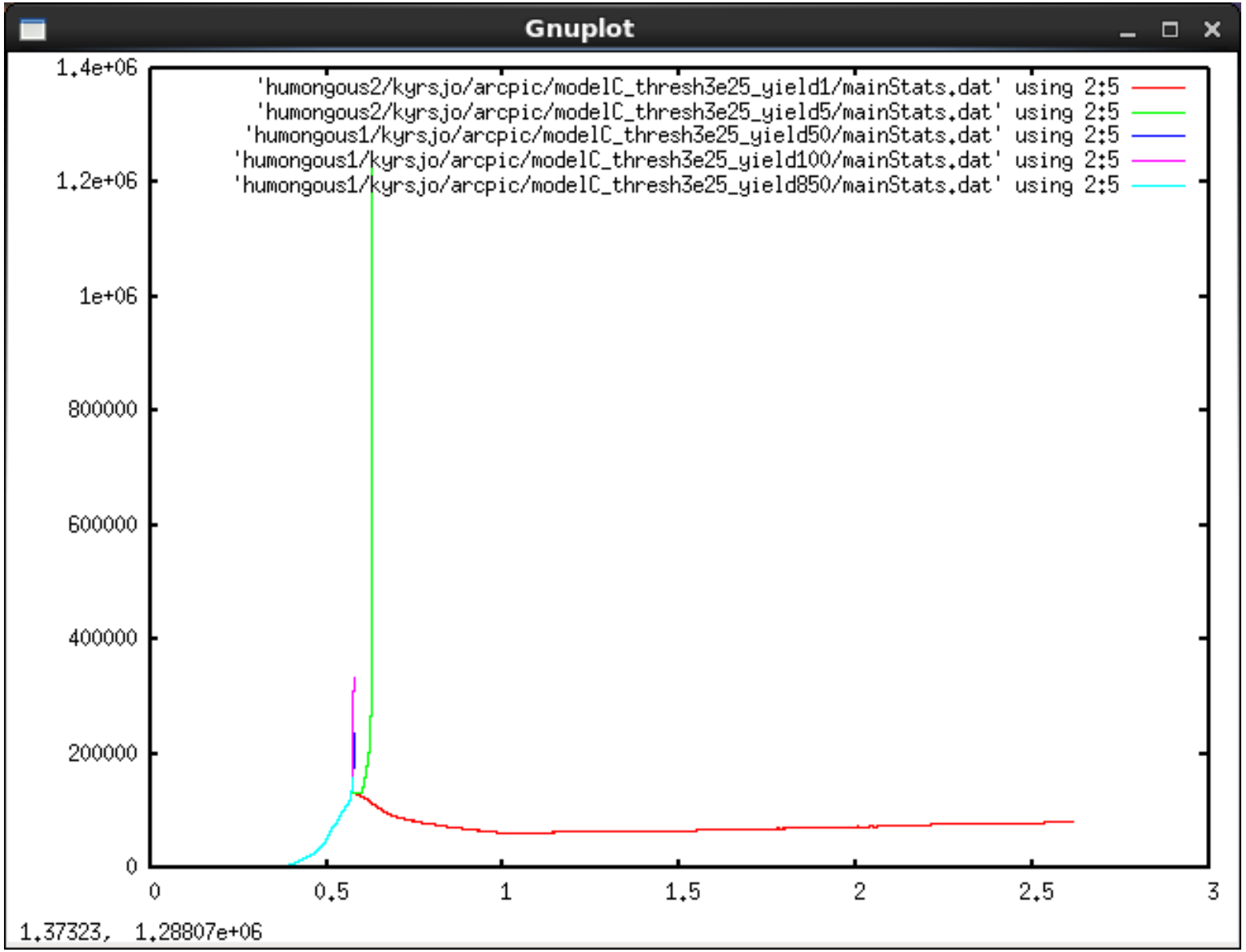
Heatspike threshold = 1e25 ions/cm²/s



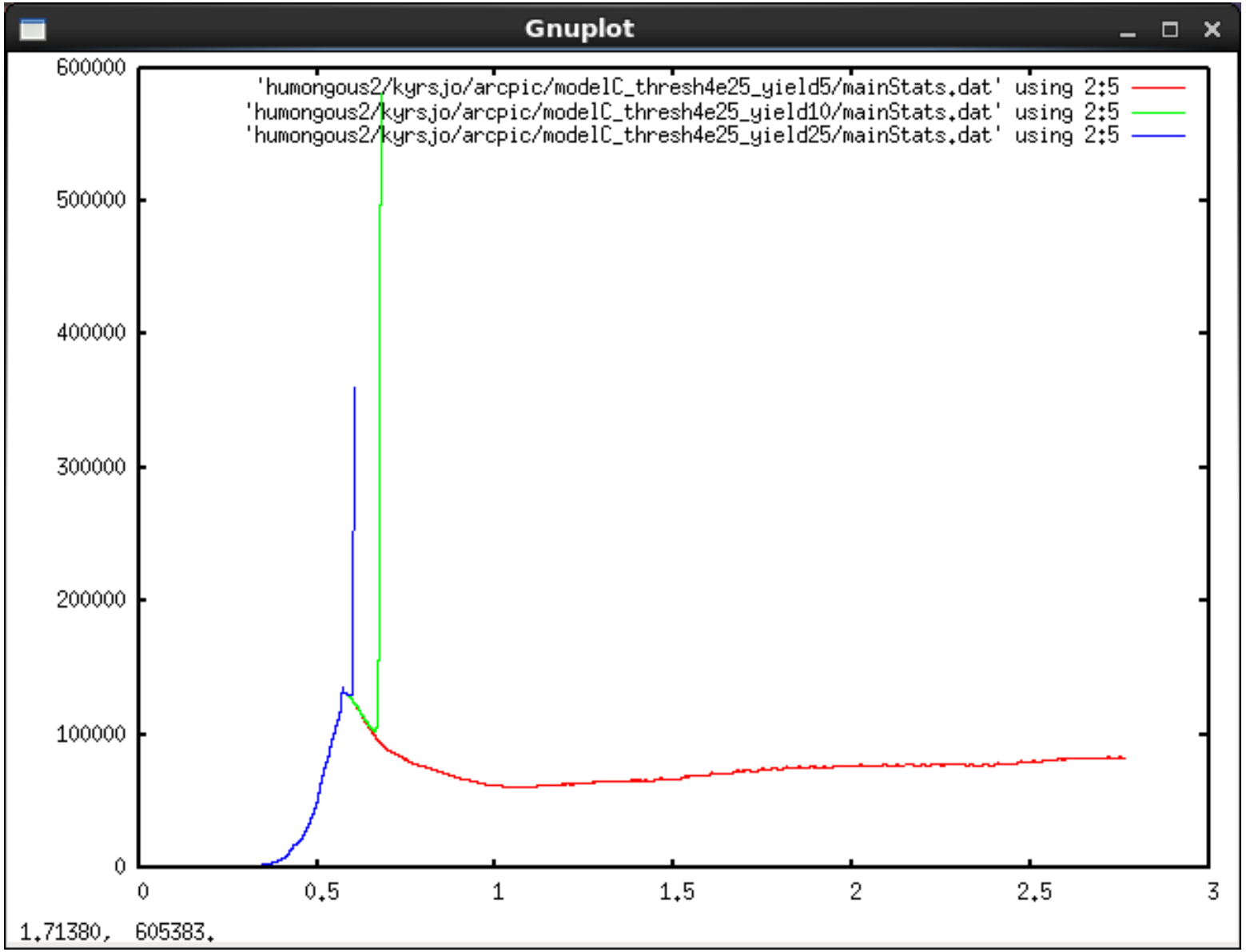
Heatspike threshold = 2e25 ions/cm²/s



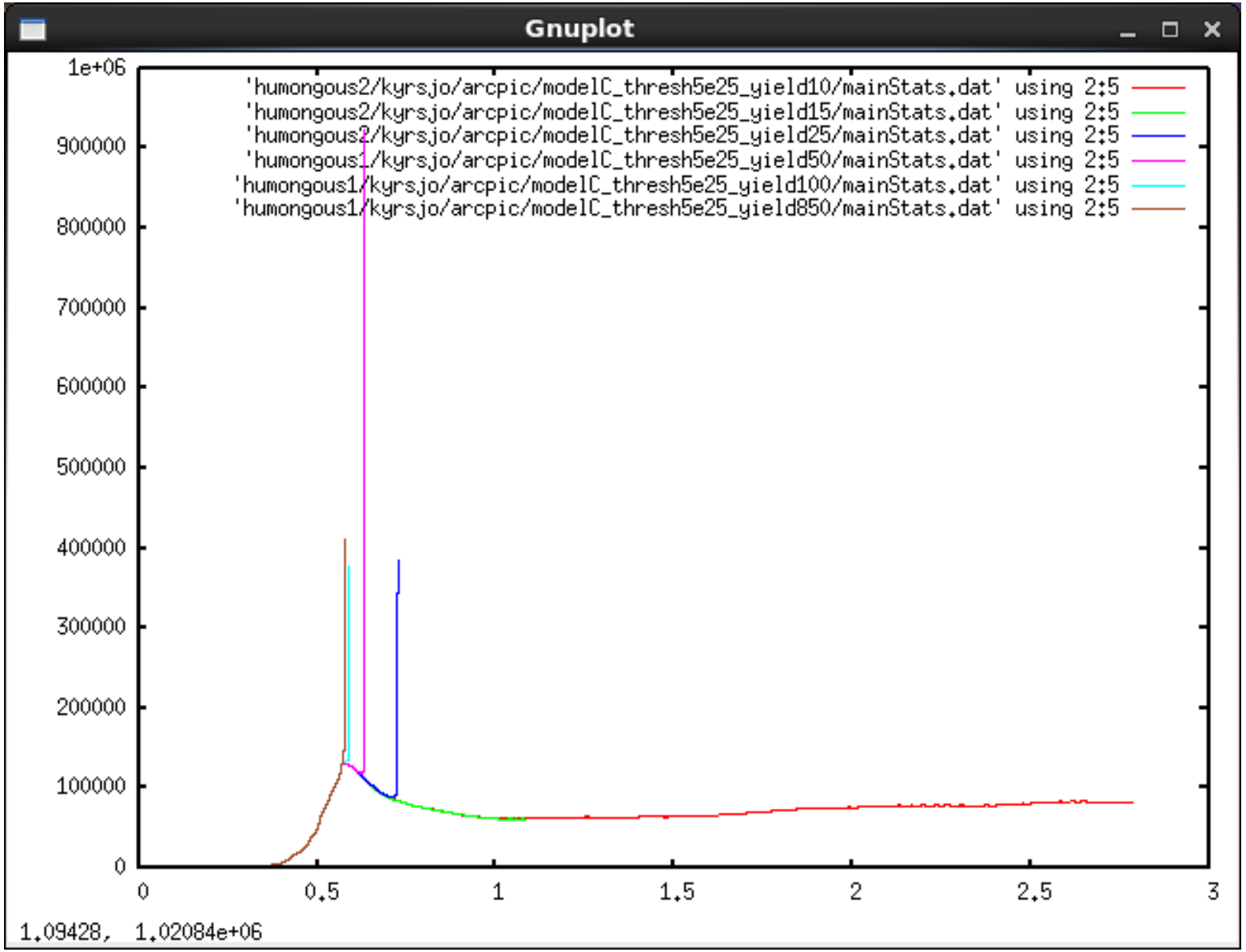
Heatspike threshold = 3e25 ions/cm²/s



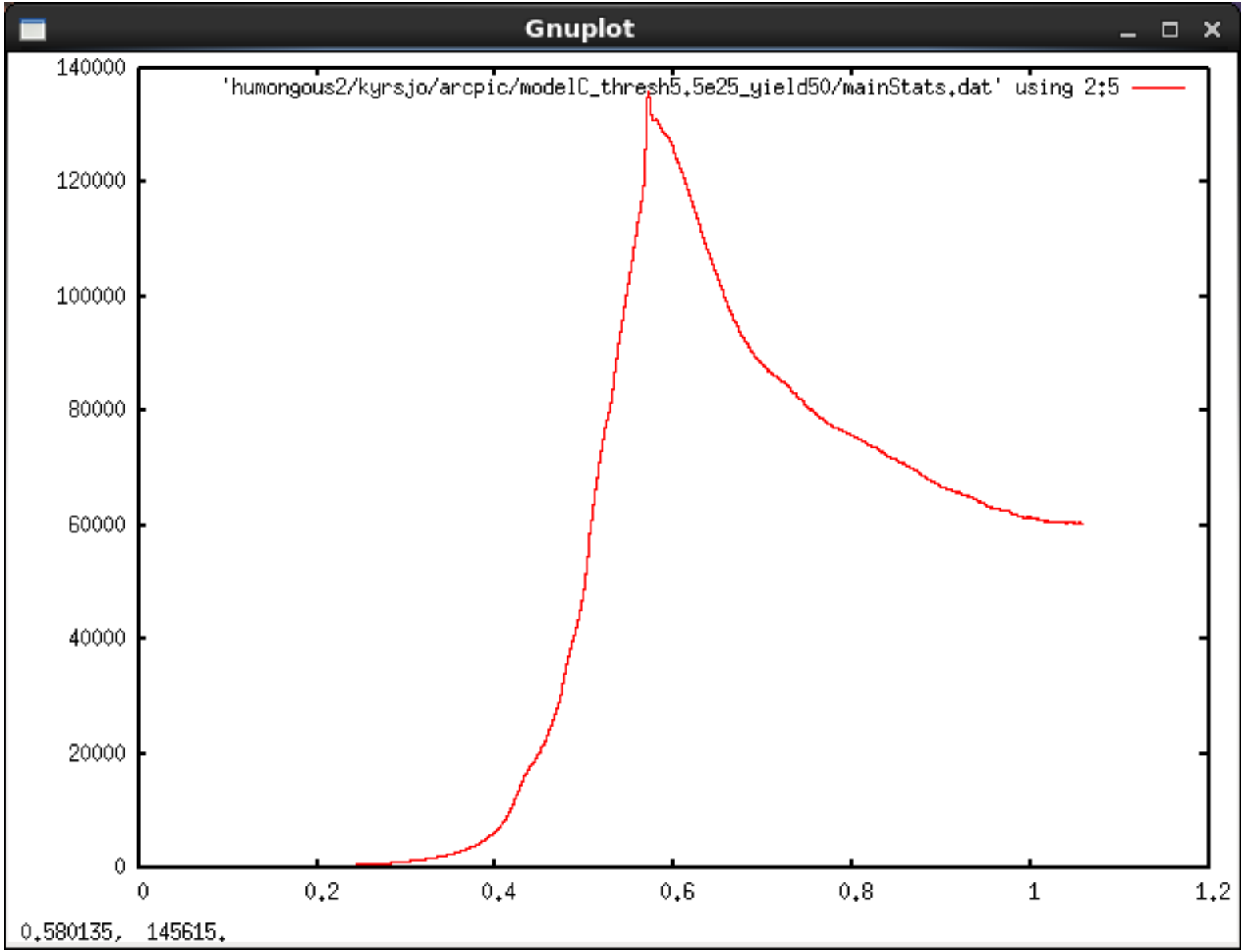
Heatspike threshold = 4e25 ions/cm²/s



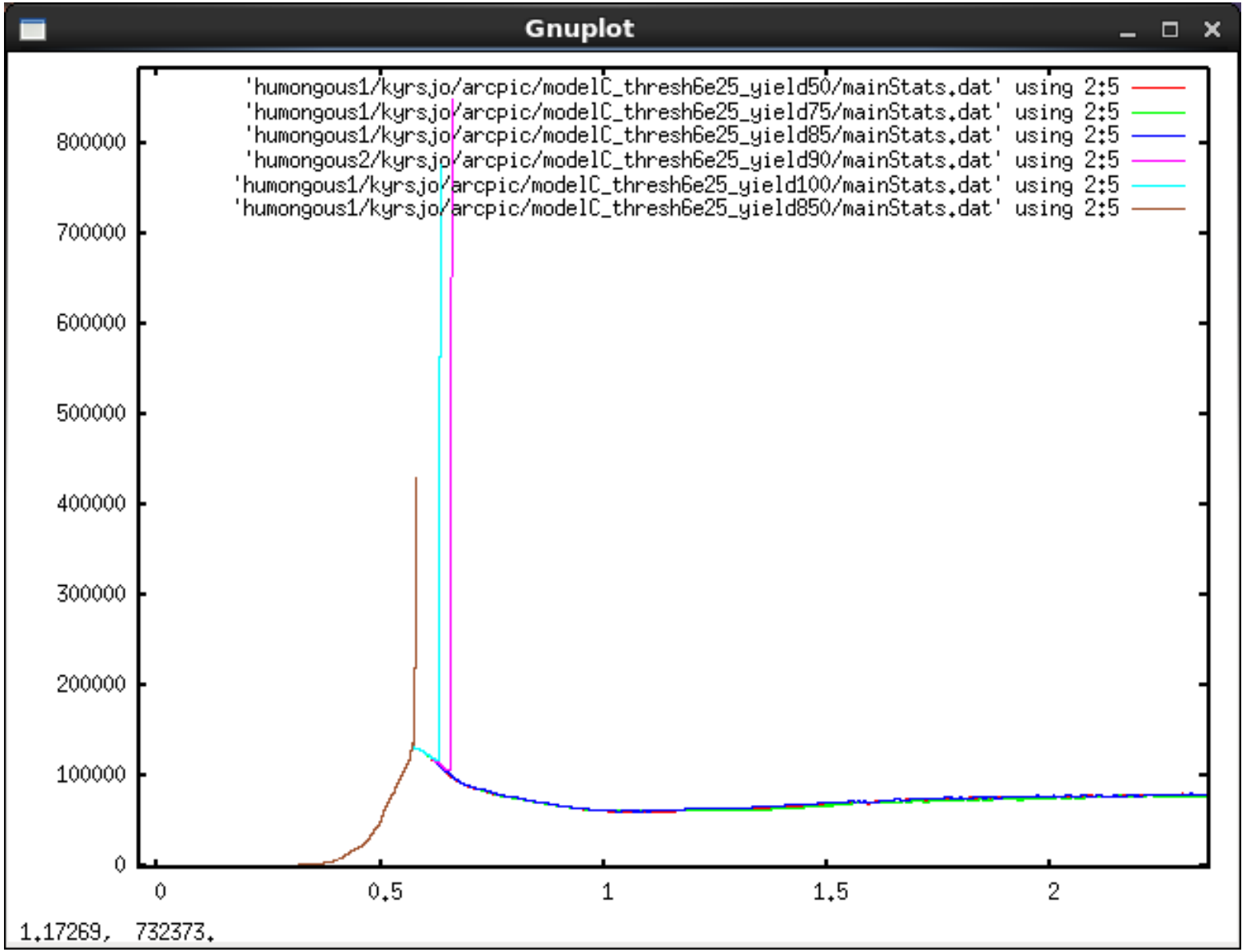
Heatspike threshold = 5e25 ions/cm²/s



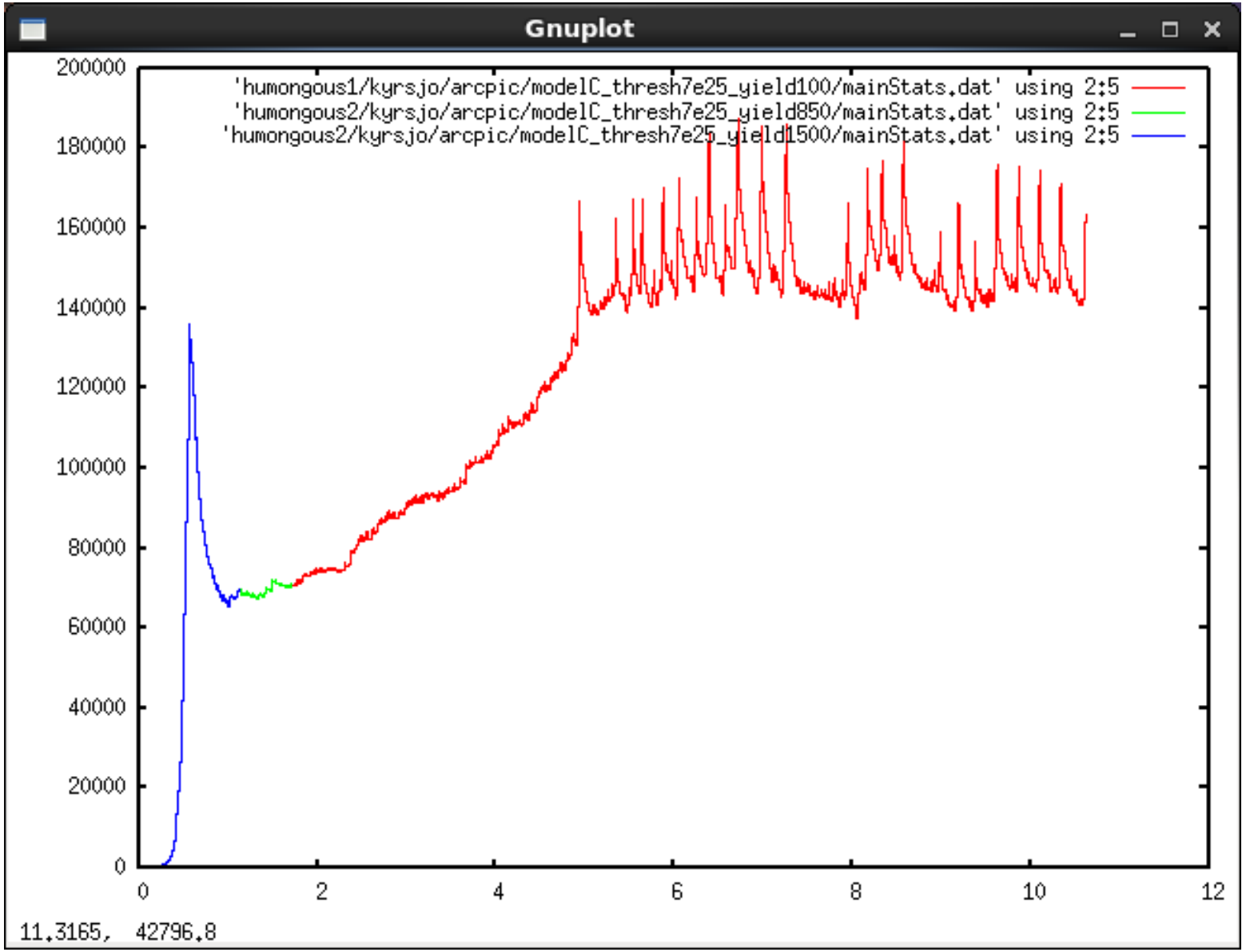
Heatspike threshold = 5.5e25 ions/cm²/s



Heatspike threshold = 6e25 ions/cm²/s

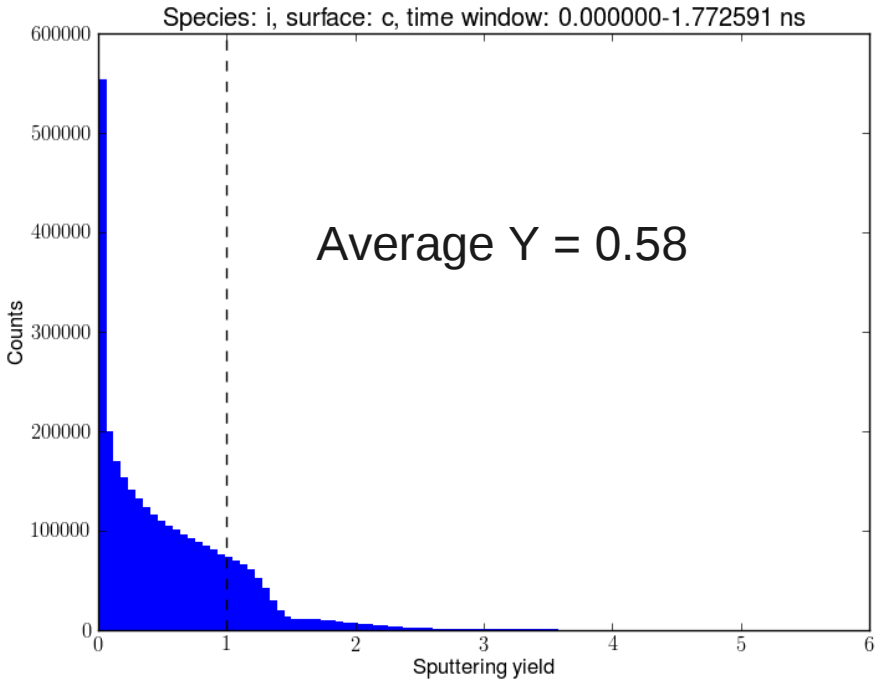


Heatspike threshold = 7e25 ions/cm²/s



Heatspike yield & threshold: conclusions

- Most impactors have low energy
  =>Y < 1
- Increasing neutral population necessary for neutral population growth
- Some is provided by evaporation (Lotta's expanding run from last year)
- Heatspike, even with Y=1 (given low-enough threshold), provides enough neutrals



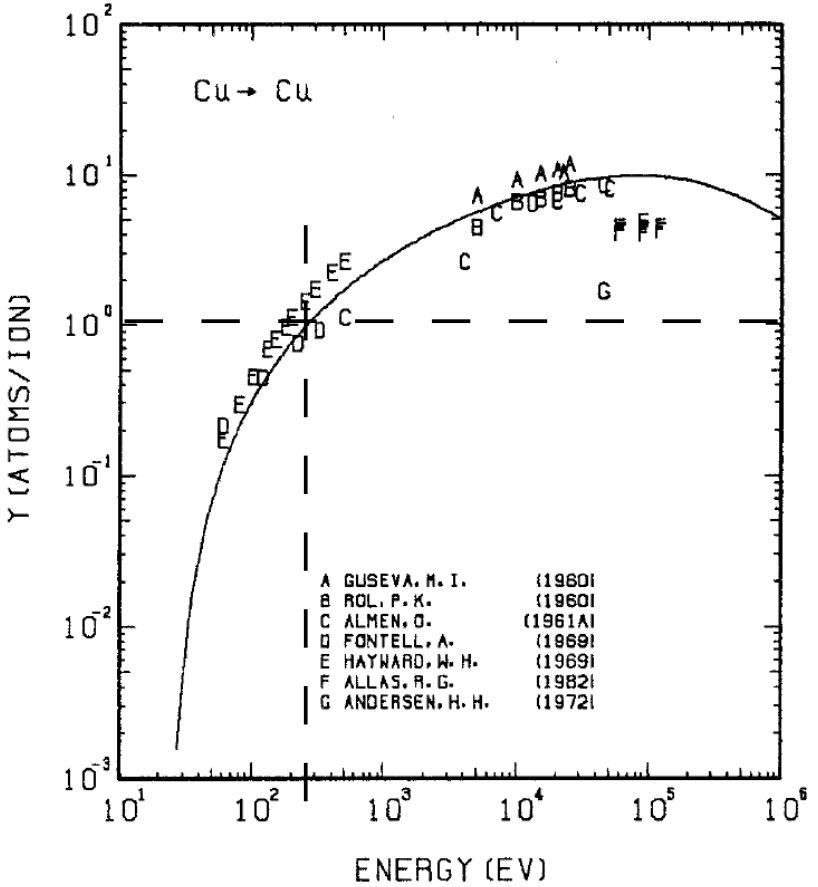


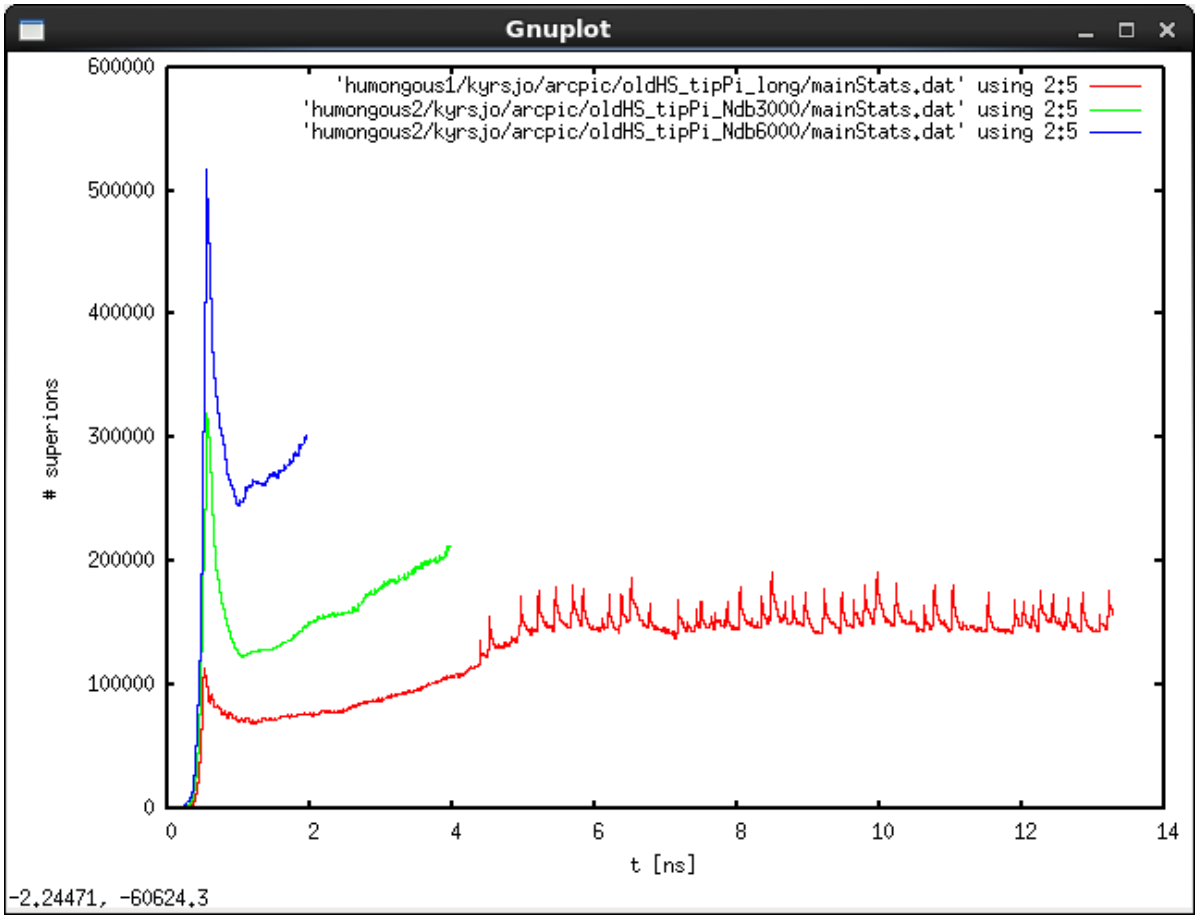
FIG. 123 ENERGY DEPENDENCE OF THE SPUTTERING YIELD OF CU WITH CU+.
A= 1.00, O= 1.00, Us= 3.49EV, s= 2.50,
W= 0.21Us.

YASUNORI YAMAMURA* and HIRO TAWARA:
ENERGY DEPENDENCE OF ION-INDUCED SPUTTERING YIELDS FROM MONATOMIC SOLIDS AT NORMAL INCIDENCE

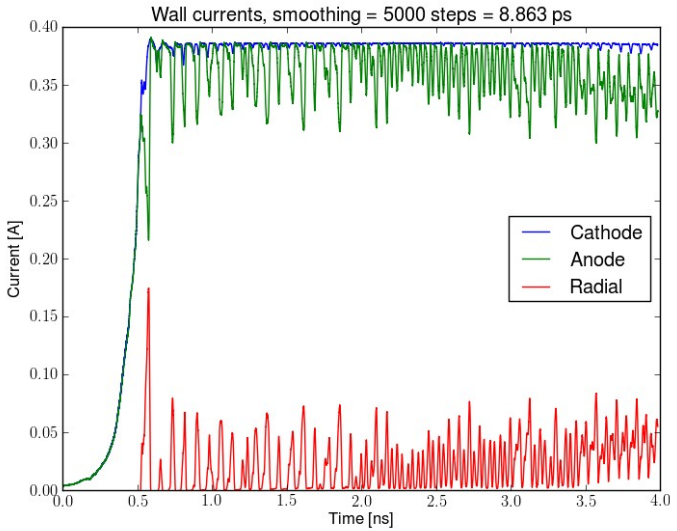
Field movie

Particle weight scan

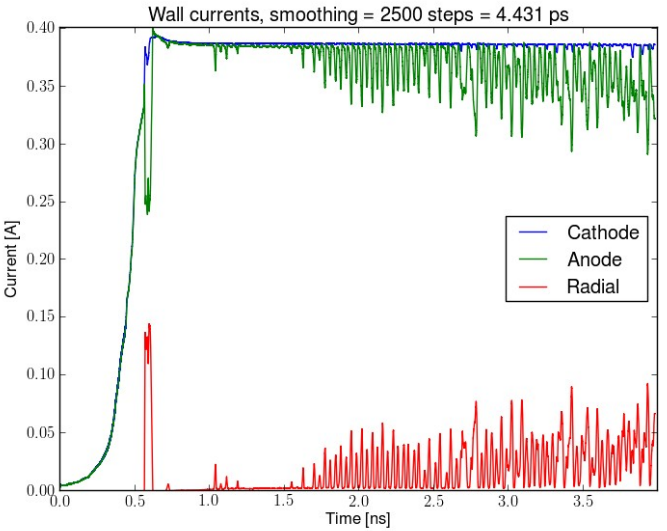
- Ran simulations with different particle weights
- Nsp = n_ref*Ldb^3/Ndb
  - Ndb = 1500 (standard)
    -> Nsp = 21.35
  - Ndb = 3000
    -> Nsp = 10.67
  - Ndb = 6000
    -> Nsp = 5.34



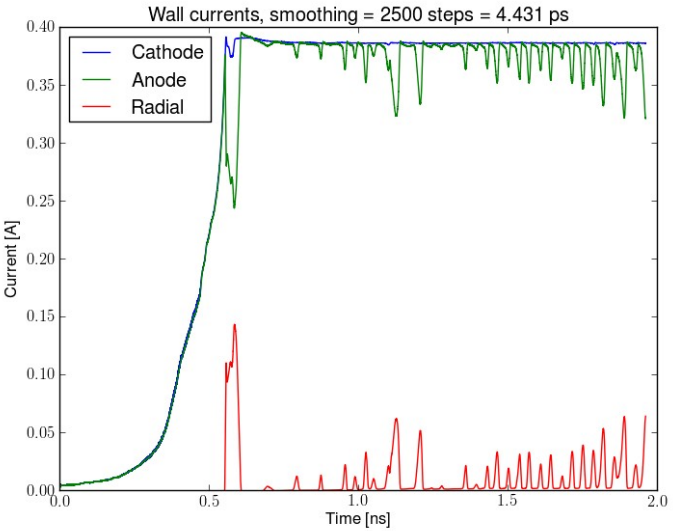
Particle weight scan



Ndb = 1500



Ndb = 3000

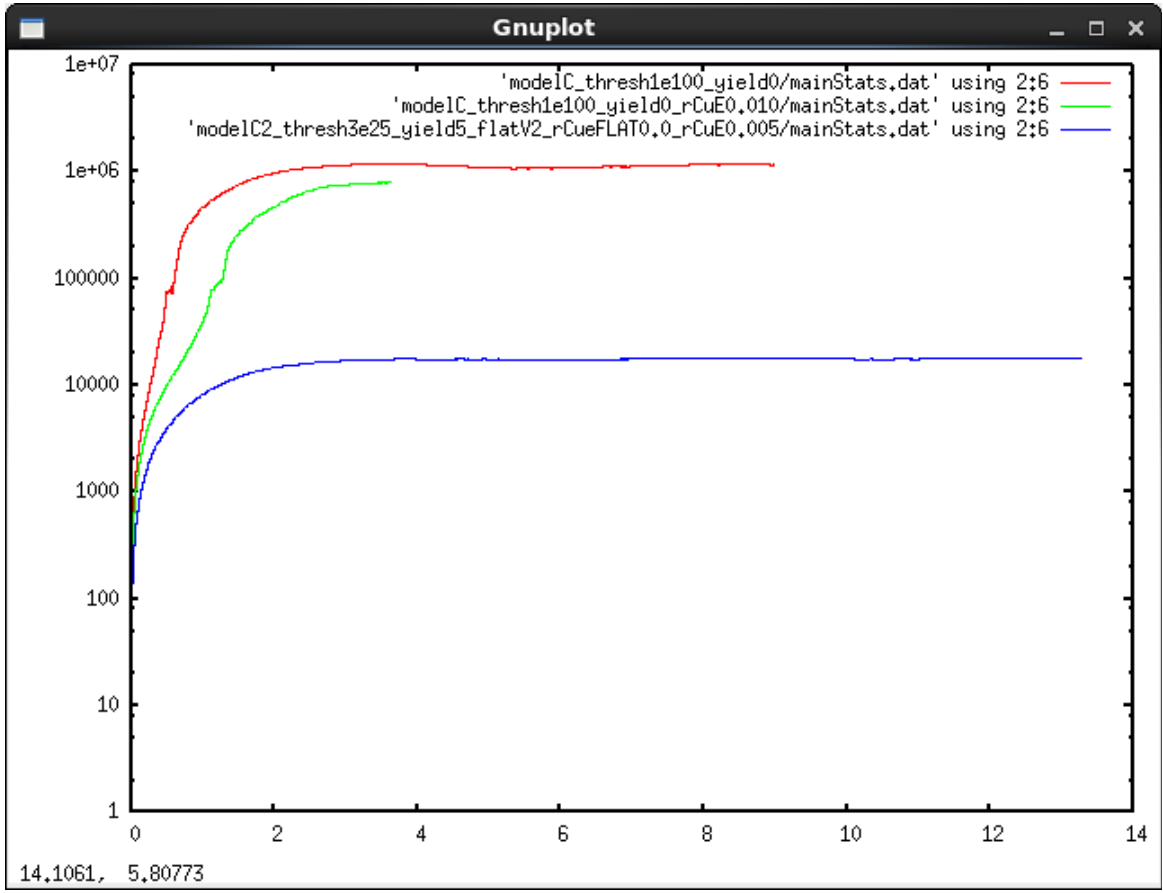


Ndb = 6000

- Convergence seems OK
- Have to confirm that slow-pulsing frequency is the same

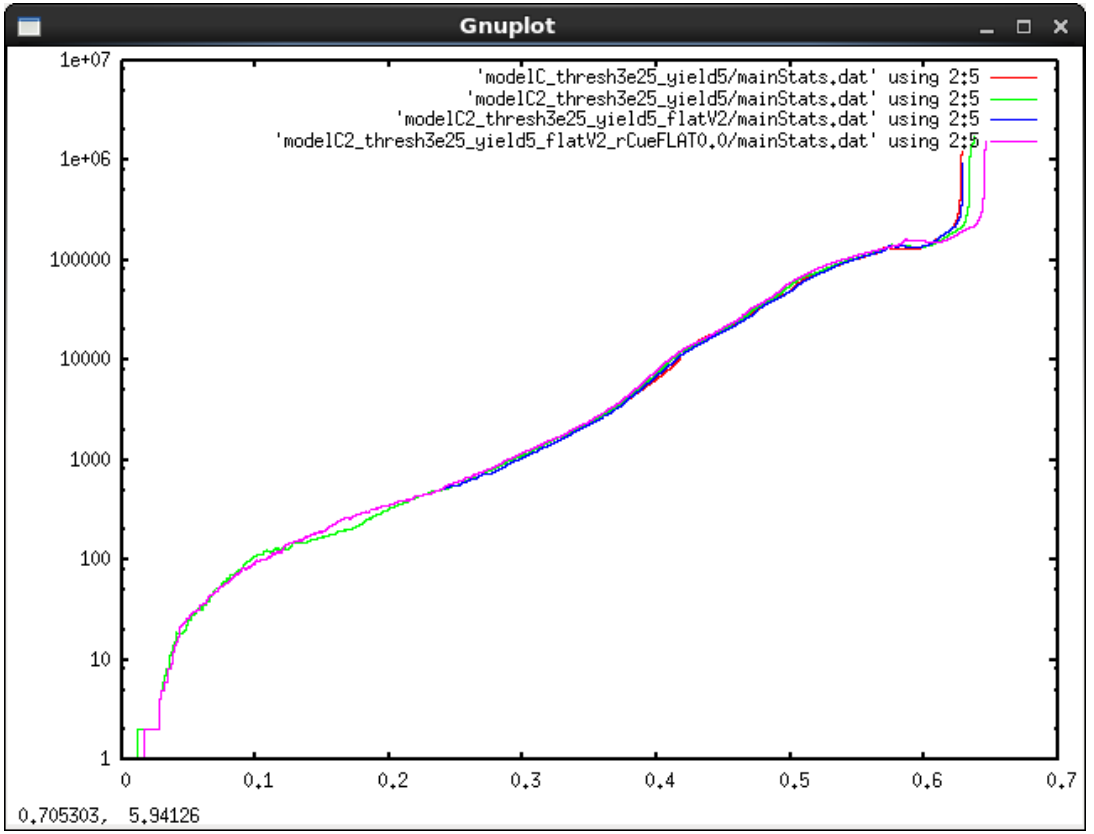
Evaporation scan

- Tried to change neutral evaporation ratio from 0.015 to 0.010 and 0.005*
- 0.010 also broke down, but it took longer
  - Heatspikes OFF
- 0.005 didn't break down
  - New model



Model refinements

- Flat surface emission:
  - May start as Remission OR Remission_theor
  - Separate evaporation ratio
  - Evaporation located at flat surface, not at tip
  - Uniform injection
- More output - separately specify
  - emitted_flat
  - emitted_SEY
  - emitted_evap
  - emitted_sputter_cat
  - emitted_sputter_ano
  - emitted_heatspike



- Need to understand why I don't reproduce old results **exactly** in the beginning (no flat surface interaction)

Other stuff

- Helsingfors/Helsinki summer student Miika Haataja
  - Field emission + space charge benchmark
  - Neutrals-in-gap without evaporation
  - Presented work Monday 26/8
  - Will produce report this week
- Increased current after breakdown may be due to SEY, not flat emission
  - SEY for low energy ions < 0.5...

Harddrives “humongous1”
and “humongous2” (2x 2 TB)
for local scratch space
(USB drives are cheap, local, and unbureaucratic..)