AVEC Phase-2 Benchmarks 20160428

For results that have been adjusted to discount run-to-run variability, see:
http://www.esrl.noaa.gov/gsd/ato/AVECPhase-2Benchmarks20160428_adjusted.pdf

Run directories:

These should be group readable for users in the m2190 project:

/global/cscratch1/sd/michalak/NGGPS/release_v8.3 (FV3)
/global/cscratch1/sd/michalak/avec-run

Archiving the results at NERSC:

```
CO:/global/cscratch1/sd/michalak 1161 > his
A:/home/m/michalak-> ls -ltr
/home/m/michalak:
-rw-------     1 hpssroot  mp24              212 Nov  5  2007 michalak.seaborg.20071105.tar.gz
-rw-r-----     1 michalak  mp24       123168 Apr 26 11:14 gfdl-input-20160426.tar.idx
-rw-r-----     1 michalak  mp24       152012507136 Apr 26 11:14 gfdl-input-20160426.tar
-rw-r-x---     1 michalak  mp24       19466455040 Apr 26 12:24 GFS_INPUT.tar
drwxr-s---     7 michalak  mp24              512 Apr 26 13:13 FV3_INPUT_DATA.x
drwxr-s---     7 michalak  mp24              512 Apr 26 13:22 FV3_INPUT_DATA
drwxr-s---     7 michalak  mp24              512 Apr 26 13:25 FV3_REF_DATA
drwxr-s---     5 michalak  mp24              512 Apr 26 15:13 MPAS_20160426
drwxr-s---    10 michalak  mp24              512 Apr 28 14:10 phase-2
drwxr-s---     6 michalak  mp24              512 Apr 28 15:26 NGGPS
drwxr-s---    27 michalak  mp24              512 Apr 28 16:04 avec-run
```

Cases:

FV3 cases:

Notes for FV3 with correction from Rusty. The following are lists of scripts in the
/global/project/projectdirs/m2190/phase-2/FV3_20160411/NGGPS/fv3_gfs_build/FV3GFS/RUN/PERF/CORI
directory and they refer to data in the /global/cscratch1/sd/rbenson on cori.

Criterion 4 tests:

perf_c640_32bit.gt	Lower res, 24 nodes: 768 MPI tasks, 2-way threaded (> 8.5 min/day)
perf_c640_32bit.lt	Lower res, 30 nodes: 960 MPI tasks, 2-way threaded (< 8.5 min/day)
perf_c768_32bit.gt	Nom. res, 36 nodes: 576 MPI tasks, 4-way threaded (> 8.5 min/day)
perf_c768_32bit.lt	Nom. res, 48 nodes: 768 MPI tasks, 4-way threaded (< 8.5 min/day)

perf_c896_32bit.gt Higher res, 48 nodes: 768 MPI tasks, 4-way threaded (> 8.5 min/day)
perf_c896_32bit.lt Higher res, 74 nodes: ~~1184~~ 1176 MPI tasks, 4-way threaded (< 8.5 min/day) (16~~8~~ unused)
tracers_15 Nom. res, 48 nodes: 768 MPI tasks, 4-way threaded with 15 tracers
tracers_30 Nom. res, 48 nodes: 768 MPI tasks, 4-way threaded with 30 tracers

Criterion 5 tests:

perf_c3072_32bit 3km uniform res. 96 nodes: 3072 MPI tasks, 2-way threaded
perf_varres_32bit var res (nested). 97 nodes: ~~3104~~ 3096 MPI tasks, 2-way threaded (8~~16~~ unused)

MPAS cases:

data is here: /global/cscratch1/sd/mgduda/AVEC2
Each of these directories has a script file and a namelist.atmosphere file. The script file and namelist.atmosphere file have to be edited for each of the gt/mid/lt configurations.
src is here: /global/project/projectdirs/m2190/phase-2/MPAS_20160408

Criterion 4 tests:

15km, gt, 2048 cores		2048/32=64
15km, mid, 2592 cores		2592/32=81
15km, lt, 3072 cores		3072/32=96
13km, gt, 2752 cores		2752/32=86
13km, mid, 3456 cores		3456/32=108
13km, lt, 4160 cores		4160/32=130
11km, gt, 4608 cores		4608/32=144
11km, mid, 5760 cores		5760/32=180
11km, lt, 6912 cores		6912/32=216

Results:

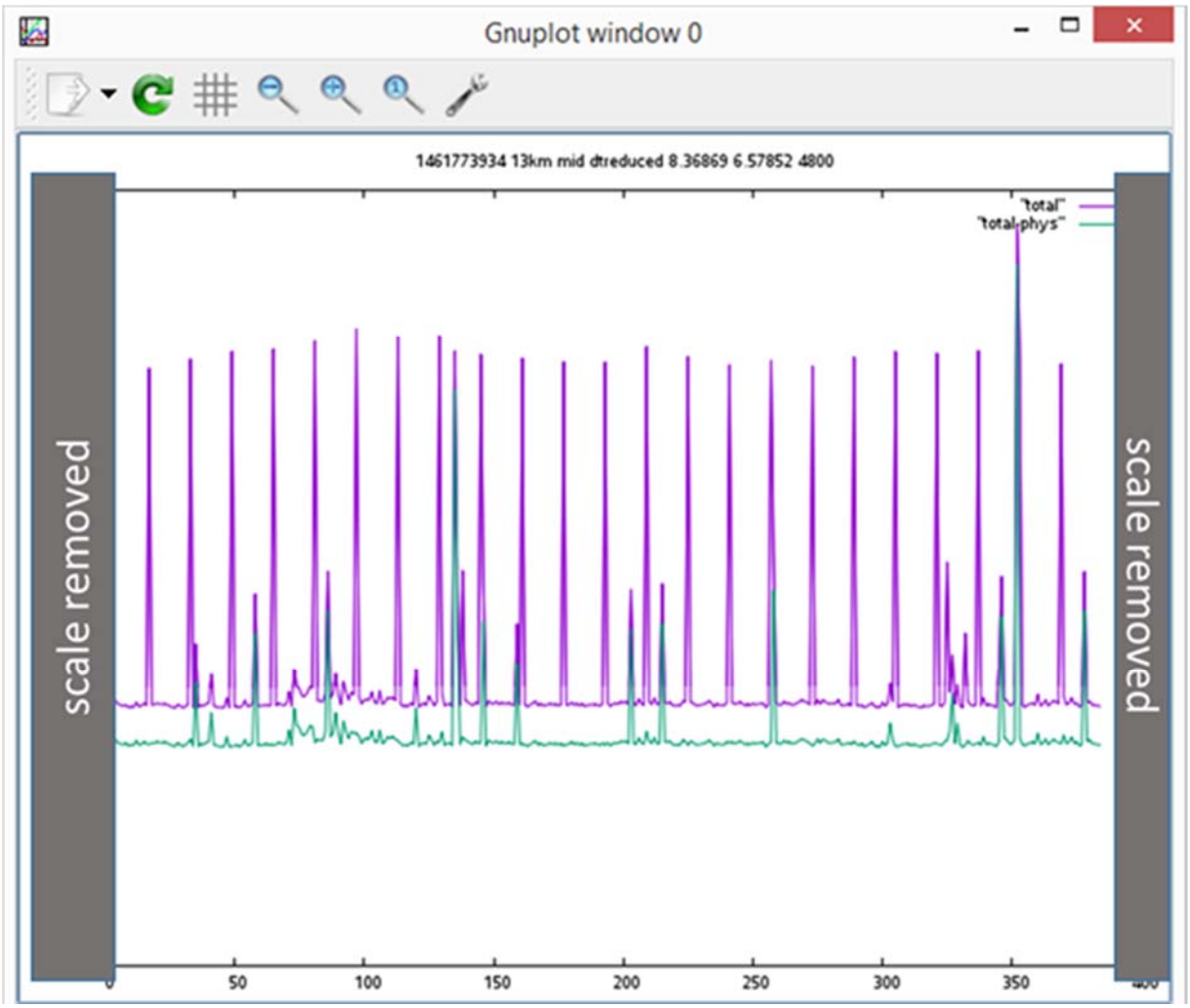
Example

The examples here are simply for illustrating how the results will be presented. These were gathered on a heavily loaded system and don't represent the actual benchmarking results.
Here is an example of a result for MPAS (gathered 4/27 in non-dedicated mode):
The title of the graph is <case> <total min.> <total-physics min.> <# cores>
In title fo the example plot, below:

The case is "1461773934 13km mid dtreduced"
Total is 8.36869 minutes

Total-physics is 6.57852 minutes
cores is 4800

The “total” plot shows the maximum over MPI tasks of the total time for a given time step. The “total-phys” plot shows the total time *minus* the maximum time over MPI tasks in physics, which is what we consider cost per step of the dycore itself. The regular spikes in the “total” plot represent hourly radiation physics. The irregular spikiness of the “total-phys” plot is likely caused by contention from other jobs running on the system. For these dedicated-time runs on Cori we expect that the “total-phys” plots will be relatively flat.



Benchmark results

Status as of 3:45 am, 4/28 -- here’s the queue. Should start at 7am MT.

As of 3:40 am 4/28:

```
CO:/global/project/projectdirs/m2190/phase-2/rundies 1062 > !sq
squeue -u michalak
          JOBID     USER  ACCOUNT       NAME  PARTITION    QOS NODES   TIME_LIMIT         TIME   ST           START_TIME
          2035251   michalak    m2190   3km_mid   regular normal   256        30:00       0:00   PD                    N/A
          2035252   michalak    m2190 C3072_2013  regular normal     96         30:00      0:00   PD                    N/A
          2035253   michalak    m2190 15-3km_mid  regular normal   256         30:00      0:00   PD                    N/A
          2035254   michalak    m2190 VARRES_201  regular normal     97         30:00      0:00   PD                    N/A
          2035255   michalak    m2190   13km_gt   regular normal     86         30:00      0:00   PD                    N/A
          2035256   michalak    m2190 C768_20150  regular normal     36         30:00      0:00   PD                    N/A
          2035257   michalak    m2190   13km_lt   regular normal   130        30:00       0:00   PD                    N/A
          2035258   michalak    m2190 C768_20150  regular normal     48         30:00      0:00   PD                    N/A
          2035259   michalak    m2190   13km_mid  regular normal   108        30:00       0:00   PD                    N/A
          2035260   michalak    m2190 13km_gt_dt  regular normal     86         30:00      0:00   PD                    N/A
          2035261   michalak    m2190 13km_lt_dt  regular normal   130         30:00      0:00   PD                    N/A
          2035262   michalak    m2190 13km_mid_d  regular normal   150         30:00      0:00   PD                    N/A
          2035263   michalak    m2190 15km_gt_dt  regular normal     60         30:00      0:00   PD                    N/A
          2035264   michalak    m2190 C640_20150  regular normal     24         30:00      0:00   PD                    N/A
          2035265   michalak    m2190 15km_lt_dt  regular normal     88         30:00      0:00   PD                    N/A
          2035266   michalak    m2190 C640_20150  regular normal     30         30:00      0:00   PD                    N/A
          2035267   michalak    m2190 15km_mid_d  regular normal     72         30:00      0:00   PD                    N/A
          2035268   michalak    m2190   11km_gt   regular normal   144        30:00       0:00   PD                    N/A
          2035269   michalak    m2190 C896_20150  regular normal     48         30:00      0:00   PD                    N/A
          2035270   michalak    m2190   11km_lt   regular normal   216        30:00       0:00   PD                    N/A
          2035271   michalak    m2190 C896_20150  regular normal     74         30:00      0:00   PD                    N/A
          2035272   michalak    m2190   11km_mid  regular normal   180        30:00       0:00   PD                    N/A
          2035273   michalak    m2190 13km_gt_dt  regular normal     86         30:00      0:00   PD                    N/A
          2035274   michalak    m2190 13km_lt_dt  regular normal   130         30:00      0:00   PD                    N/A
          2035275   michalak    m2190 13km_mid_d  regular normal   150         30:00      0:00   PD                    N/A
          2035276   michalak    m2190 tracers_15  regular normal     48         30:00      0:00   PD                    N/A
          2035277   michalak    m2190 13km_mid_1  regular normal   108         30:00      0:00   PD                    N/A
          2035278   michalak    m2190 tracers_30  regular normal     48         30:00      0:00   PD                    N/A
          2035279   michalak    m2190 13km_mid_3  regular normal   108         30:00      0:00   PD                    N/A
          2035280   michalak    m2190             wrap   regularx normal  1600        10:00         0:00   PD
          N/A
```

Struck through entries above were cancelled before they could run. These were duplicates, but deleting the from the queue threw off the slurm dependencies. So I cancelled everything in red and resubmitted. Have added the 3km and varres jobs back too after all the 15 and 11 km Crit 4 runs but before the tracer runs.

```
            JOBID       USER  ACCOUNT       NAME  PARTITION    QOS NODES   TIME_LIMIT       TIME   ST           START_TIME
          2035863   michalak    m2190 15km_gt_dt    regular normal    60        30:00       0:17    R  2016-04-28T08:20:34
          2035670   michalak    m2190       wrap   regularx normal  1600        10:00       0:00   PD                    N/A
          2035864   michalak    m2190 C640_20150    regular normal    24        30:00       0:00   PD                    N/A
          2035865   michalak    m2190 15km_lt_dt    regular normal    88        30:00       0:00   PD                    N/A
          2035866   michalak    m2190 C640_20150    regular normal    30        30:00       0:00   PD                    N/A
          2035867   michalak    m2190 15km_mid_d    regular normal    72        30:00       0:00   PD                    N/A
        * 2035868   michalak    m2190    11km_gt    regular normal   144        30:00       0:00   PD                    N/A
          2035869   michalak    m2190 C896_20150    regular normal    48        30:00       0:00   PD                    N/A
       ** 2035870   michalak    m2190    11km_lt    regular normal   216        30:00       0:00   PD                    N/A
          2035871   michalak    m2190 C896_20150    regular normal    74        30:00       0:00   PD                    N/A
          2035872   michalak    m2190   11km_mid    regular normal   180        30:00       0:00   PD                    N/A
          2035873   michalak    m2190    3km_mid    regular normal   256        30:00       0:00   PD                    N/A
          2035874   michalak    m2190 C3072_2013    regular normal    96        30:00       0:00   PD                    N/A
          2035875   michalak    m2190 15-3km_mid    regular normal   256        30:00       0:00   PD                    N/A
          2035876   michalak    m2190 VARRES_201    regular normal    97        30:00       0:00   PD                    N/A
          2035877   michalak    m2190 tracers_15    regular normal    48        30:00       0:00   PD                    N/A
          2035878   michalak    m2190 13km_mid_1    regular normal   108        30:00       0:00   PD                    N/A
          2035879   michalak    m2190 tracers_30    regular normal    48        30:00       0:00   PD                    N/A
          2035880   michalak    m2190 13km_mid_3    regular normal   108        30:00       0:00   PD                    N/A
          2035903   michalak    m2190 15km_gt_dt    regular normal    60        30:00       0:00   PD                    N/A
          2035904   michalak    m2190 C3072_2013    regular normal    96        30:00       0:00   PD                    N/A
          2035905   michalak    m2190 15-3km_mid    regular normal   256        30:00       0:00   PD                    N/A
          2035906   michalak    m2190    3km_mid    regular normal   256        30:00       0:00   PD                    N/A
          2035907   michalak    m2190 tracers_15    regular normal    48        30:00       0:00   PD                    N/A
          2035908   michalak    m2190 13km_mid_1    regular normal   108        30:00       0:00   PD                    N/A
          2035909   michalak    m2190 tracers_30    regular normal    48        30:00       0:00   PD                    N/A
          2035910   michalak    m2190 13km_mid_3    regular normal   108        30:00       0:00   PD                    N/A
```

* 0957: Issued a scontrol hold on 2035868 and will try to slide in the gt and lt 15km 90s runs that didn't seem to go in the script. (but the mid did (?)) -- that didn't work - released the hold on the 11km_mid run

** 1010: Try again: Issued a scontrol hold on 2035870and will try to slide in the gt and lt 15km 90s runs that didn't seem to go in the script.

1027: resubmittted these

JOBID	USER	ACCOUNT	NAME	PARTITION	QOS	NODES	TIME_LIMIT	TIME	ST	START_TIME
~~2035974~~	~~michalak~~	~~m2190~~	~~15km_gt_dt~~	~~regular~~	~~normal~~	~~60~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035975~~	~~michalak~~	~~m2190~~	~~15km_lt_dt~~	~~regular~~	~~normal~~	~~88~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
2035976	michalak	m2190	C640_20150	regular	normal	30	30:00	0:00	PD	N/A
~~2035977~~	~~michalak~~	~~m2190~~	~~11km_gt~~	~~regular~~	~~normal~~	~~144~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035978~~	~~michalak~~	~~m2190~~	~~C896_20150~~	~~regular~~	~~normal~~	~~48~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035979~~	~~michalak~~	~~m2190~~	~~11km_lt~~	~~regular~~	~~normal~~	~~216~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035980~~	~~michalak~~	~~m2190~~	~~C896_20150~~	~~regular~~	~~normal~~	~~74~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035981~~	~~michalak~~	~~m2190~~	~~11km_mid~~	~~regular~~	~~normal~~	~~180~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035982~~	~~michalak~~	~~m2190~~	~~C3072_2013~~	~~regular~~	~~normal~~	~~96~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035983~~	~~michalak~~	~~m2190~~	~~15-3km_mid~~	~~regular~~	~~normal~~	~~256~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035984~~	~~michalak~~	~~m2190~~	~~3km_mid~~	~~regular~~	~~normal~~	~~256~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035985~~	~~michalak~~	~~m2190~~	~~tracers_15~~	~~regular~~	~~normal~~	~~48~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035986~~	~~michalak~~	~~m2190~~	~~13km_mid_1~~	~~regular~~	~~normal~~	~~108~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035987~~	~~michalak~~	~~m2190~~	~~tracers_30~~	~~regular~~	~~normal~~	~~48~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035988~~	~~michalak~~	~~m2190~~	~~13km_mid_3~~	~~regular~~	~~normal~~	~~108~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2035989~~	~~michalak~~	~~m2190~~	~~wrap~~	~~regularx~~	~~normal~~	~~1600~~	~~10:00~~	~~0:00~~	~~PD~~	~~N/A~~

1045: resubmitted

```
CO:/global/project/projectdirs/m2190/phase-2/rundies 1391 > !sq
squeue -u michalak
```

JOBID	USER	ACCOUNT	NAME	PARTITION	QOS	NODES	TIME_LIMIT	TIME	ST	START_TIME
2036014	michalak	m2190	15km_gt_dt	regular	normal	60	30:00	0:07	R	2016-04-28T09:45:05
2036015	michalak	m2190	15km_lt_dt	regular	normal	88	30:00	0:00	PD	N/A
2036016	michalak	m2190	11km_gt	regular	normal	144	30:00	0:00	PD	N/A
2036017	michalak	m2190	C896_20150	regular	normal	48	30:00	0:00	PD	N/A
2036018	michalak	m2190	11km_lt	regular	normal	216	30:00	0:00	PD	N/A
2036019	michalak	m2190	C896_20150	regular	normal	74	30:00	0:00	PD	N/A
2036020	michalak	m2190	11km_mid	regular	normal	180	30:00	0:00	PD	N/A
2036021	michalak	m2190	tracers_15	regular	normal	48	30:00	0:00	PD	N/A
2036022	michalak	m2190	13km_mid_1	regular	normal	108	30:00	0:00	PD	N/A
~~2036023~~	~~michalak~~	~~m2190~~	~~tracers_30~~	~~regular~~	~~normal~~	~~48~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2036024~~	~~michalak~~	~~m2190~~	~~13km_mid_3~~	~~regular~~	~~normal~~	~~108~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2036025~~	~~michalak~~	~~m2190~~	~~C3072_2013~~	~~regular~~	~~normal~~	~~96~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2036026~~	~~michalak~~	~~m2190~~	~~15-3km_mid~~	~~regular~~	~~normal~~	~~256~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
~~2036027~~	~~michalak~~	~~m2190~~	~~3km_mid~~	~~regular~~	~~normal~~	~~256~~	~~30:00~~	~~0:00~~	~~PD~~	~~N/A~~
2036028	michalak	m2190	wrap	regularx	normal	1600	10:00	0:00	PD	N/A

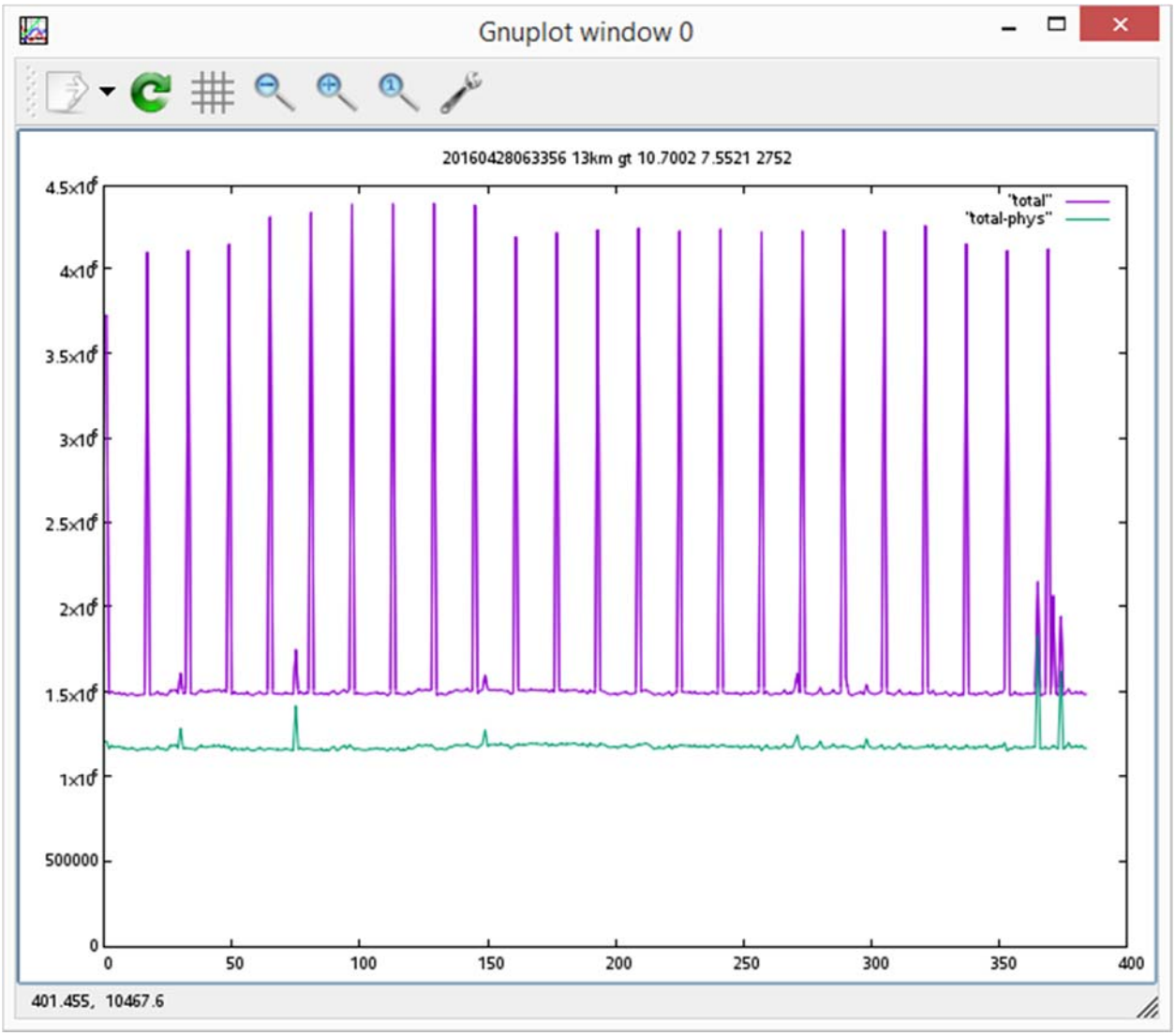
Runs

0700 MT: first runs started: /global/cscratch1/sd/michalak/avec-run/20160428060002_3km_mid

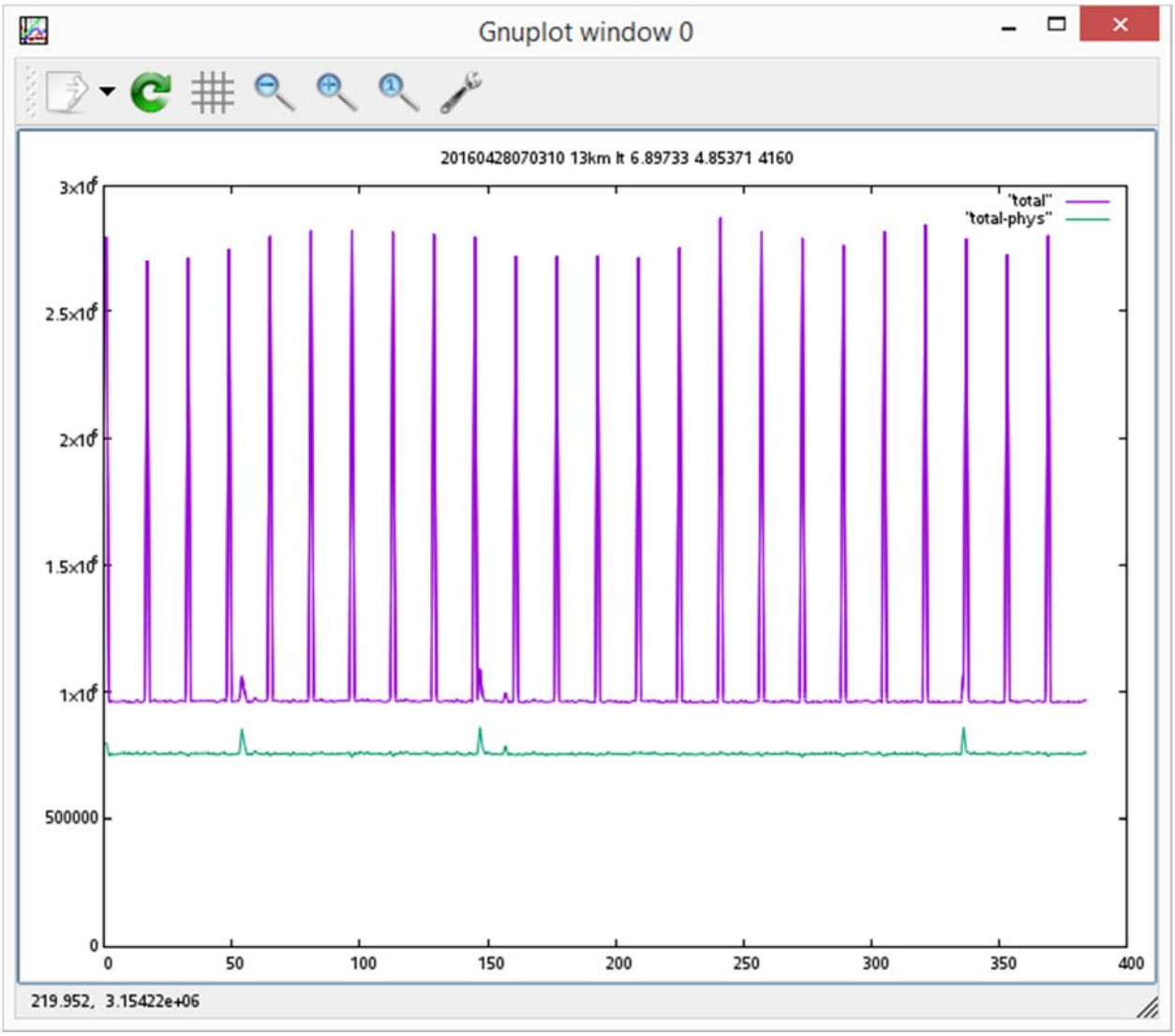
0733 MT: First actual result for job

The labels above each plot refer to the figure below them.
Note that times in my notes are MT, but times in chart titles are PT

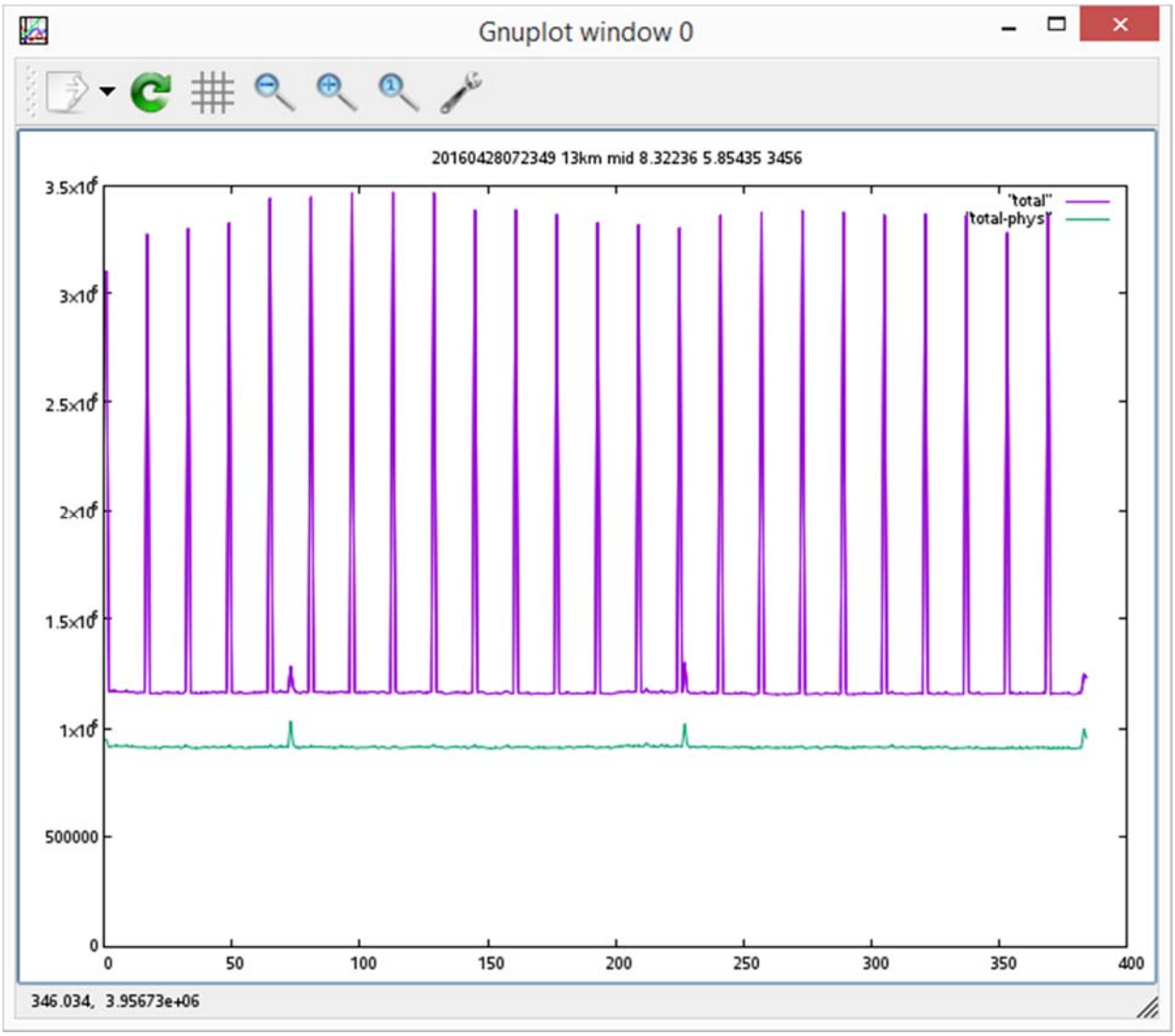
MPAS: job id 2035255 13km_gt:



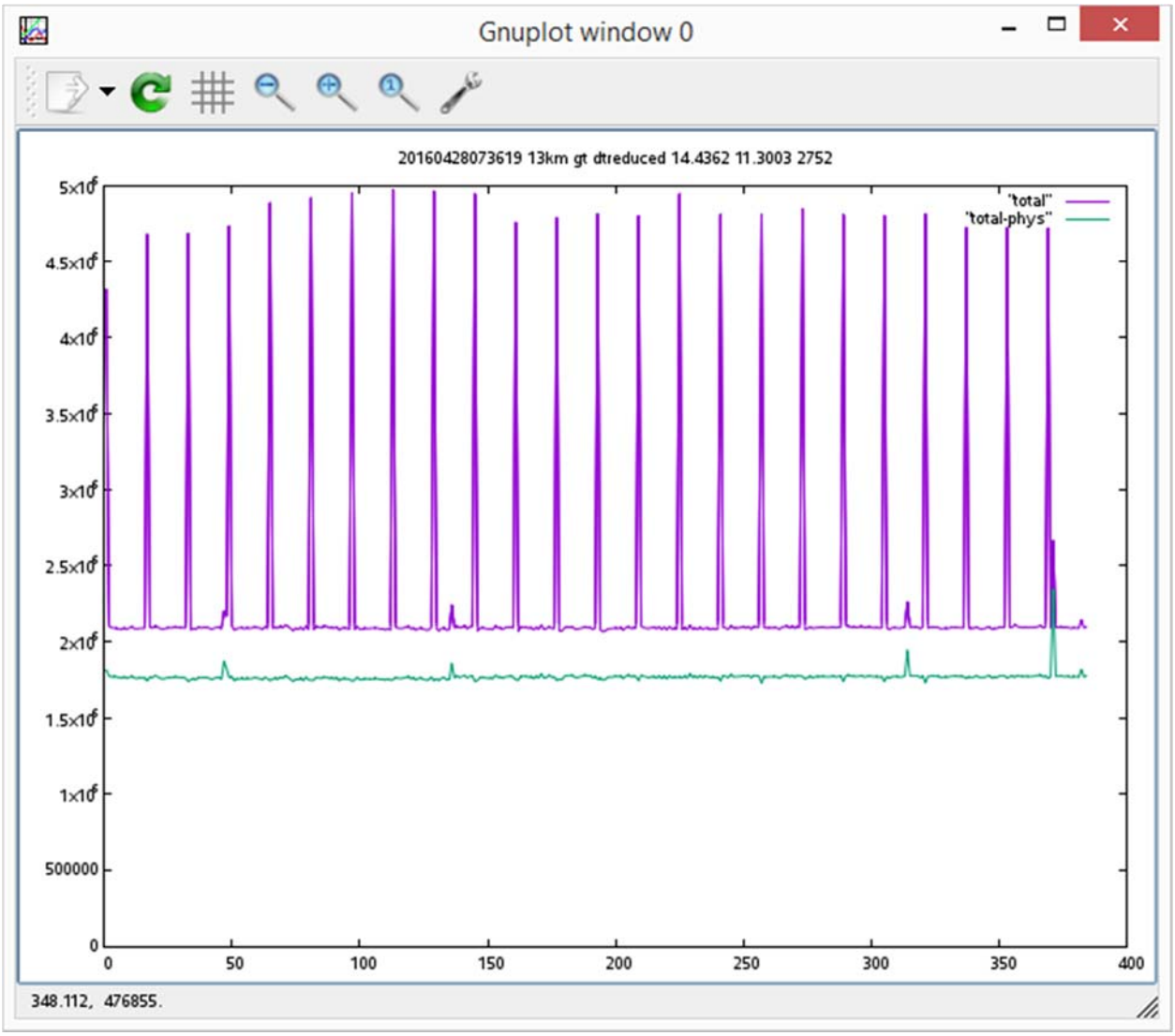
MPAS: job id 2035257 13km_lt:



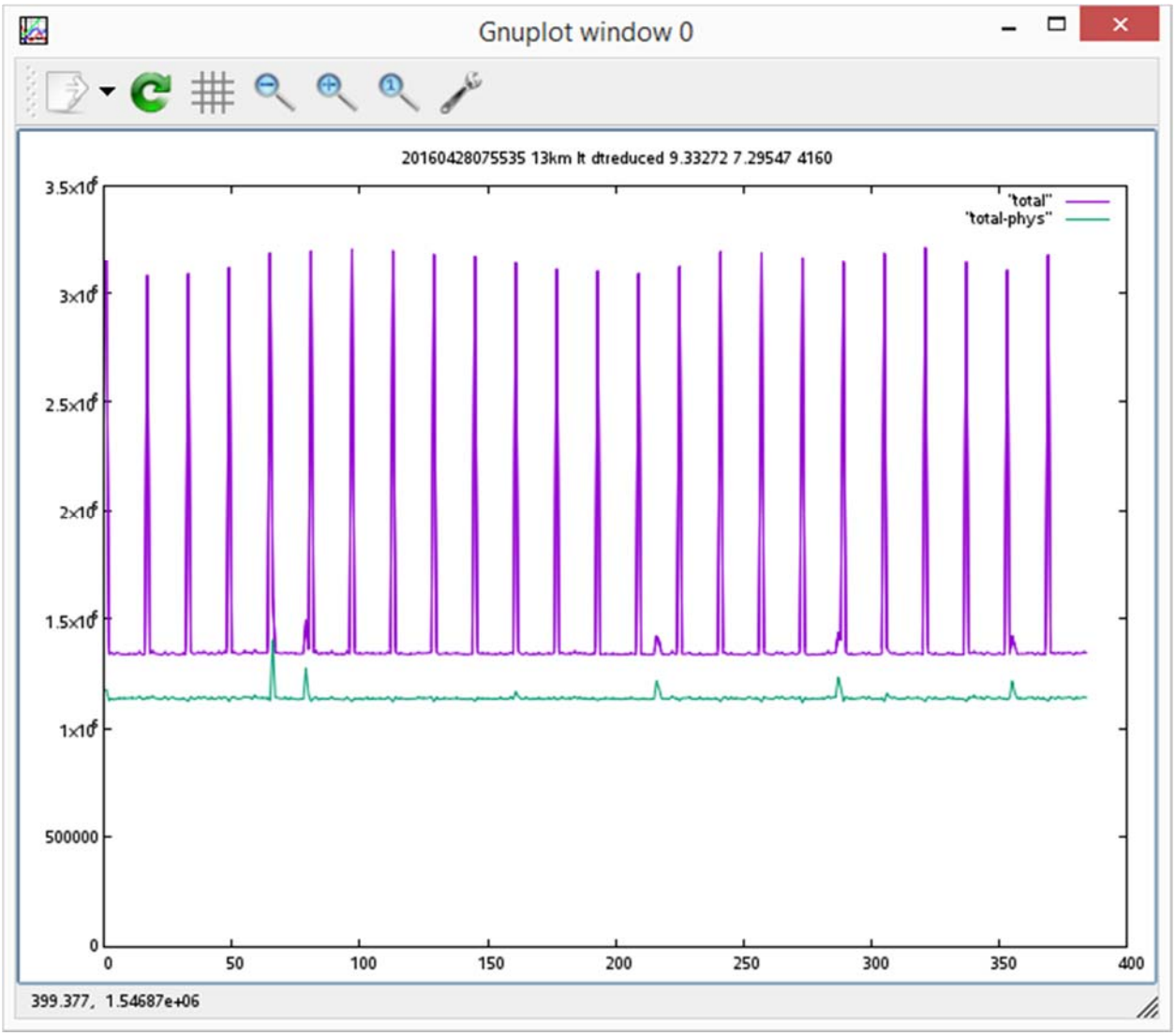
MPAS: job id 2035259 13km_mid:



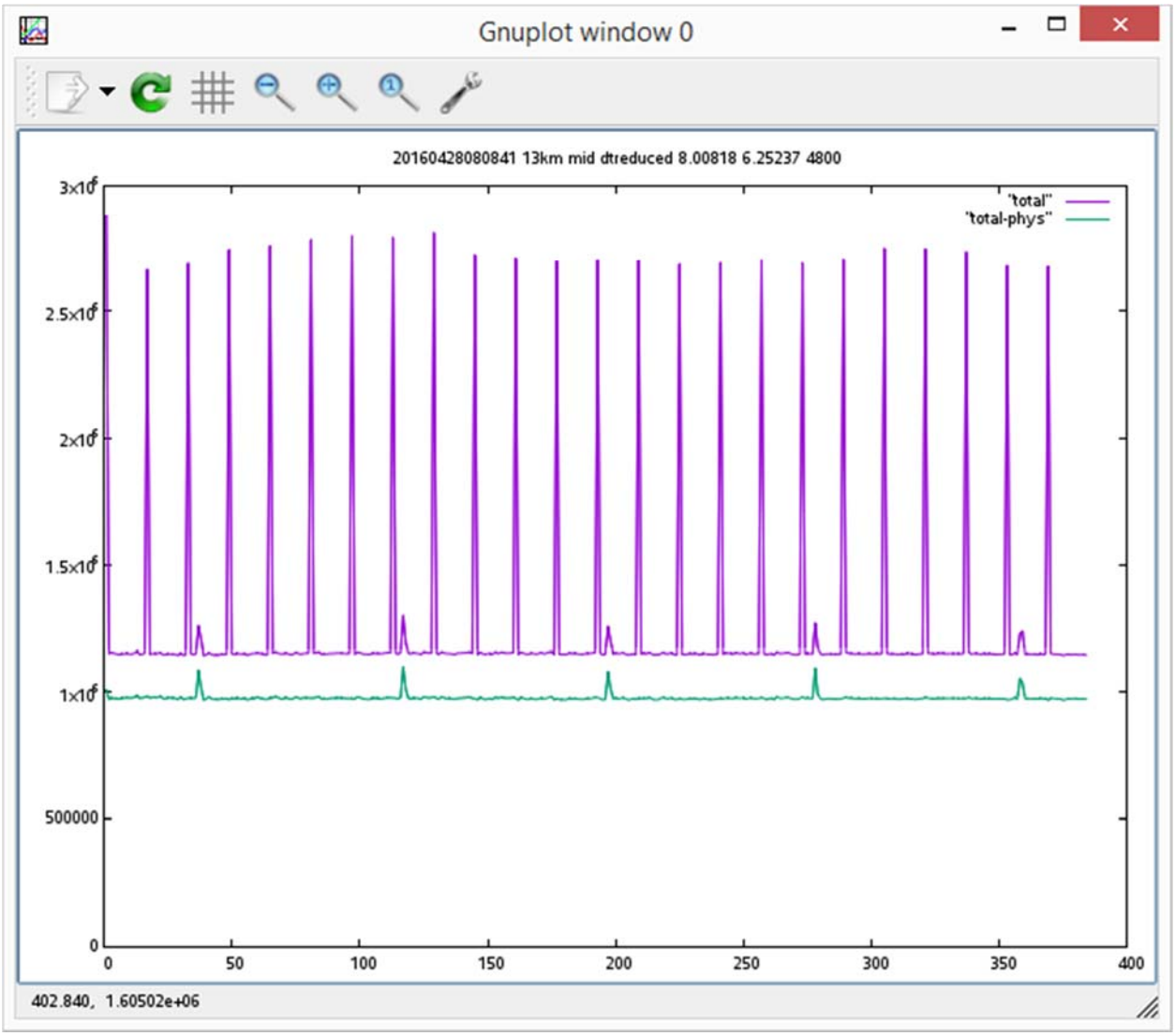
MPAS: Job ID: 2035260 13km_gt dtreduced:



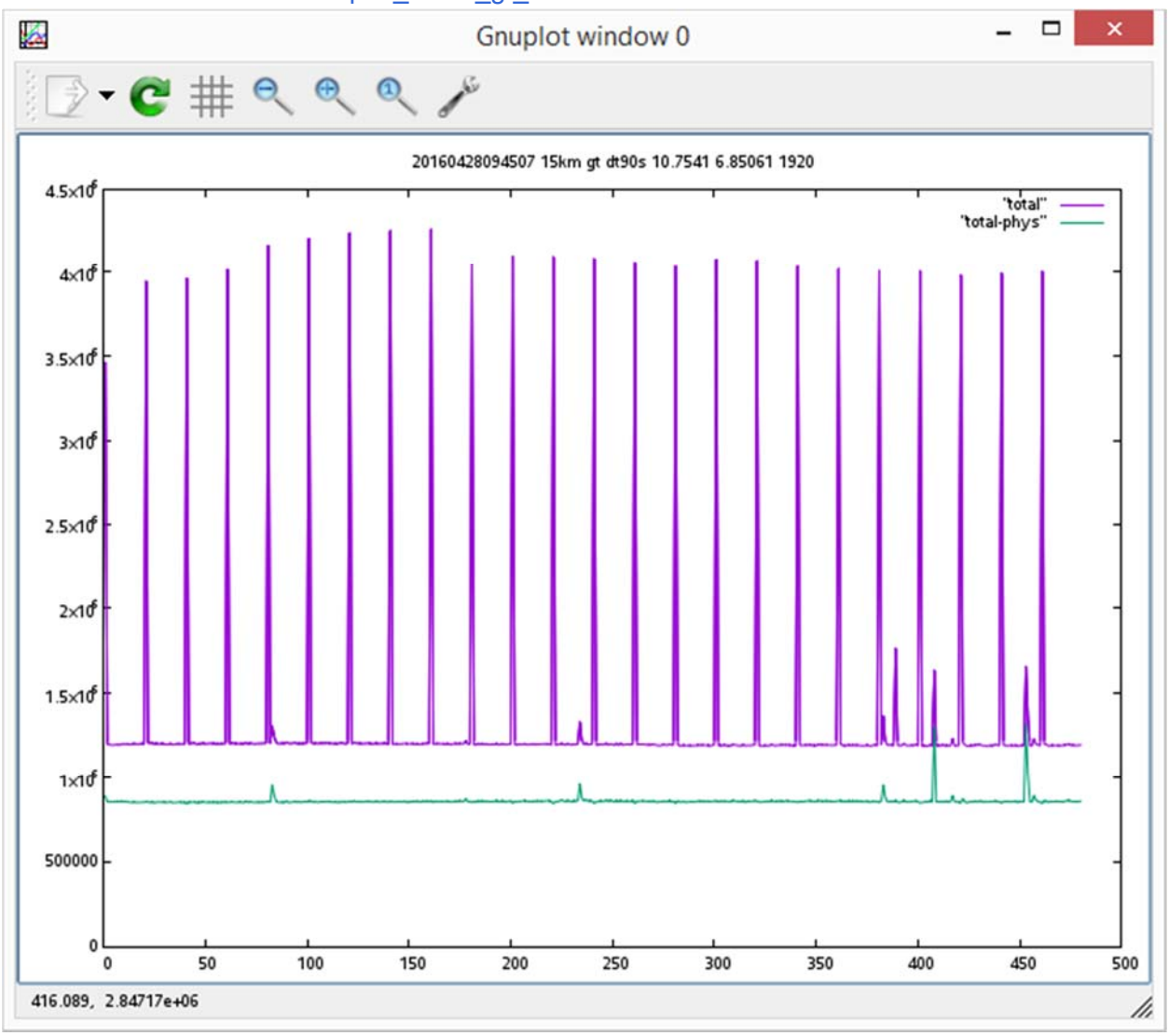
MPAS: Job ID: 2035261 13km_lt dtreduced:



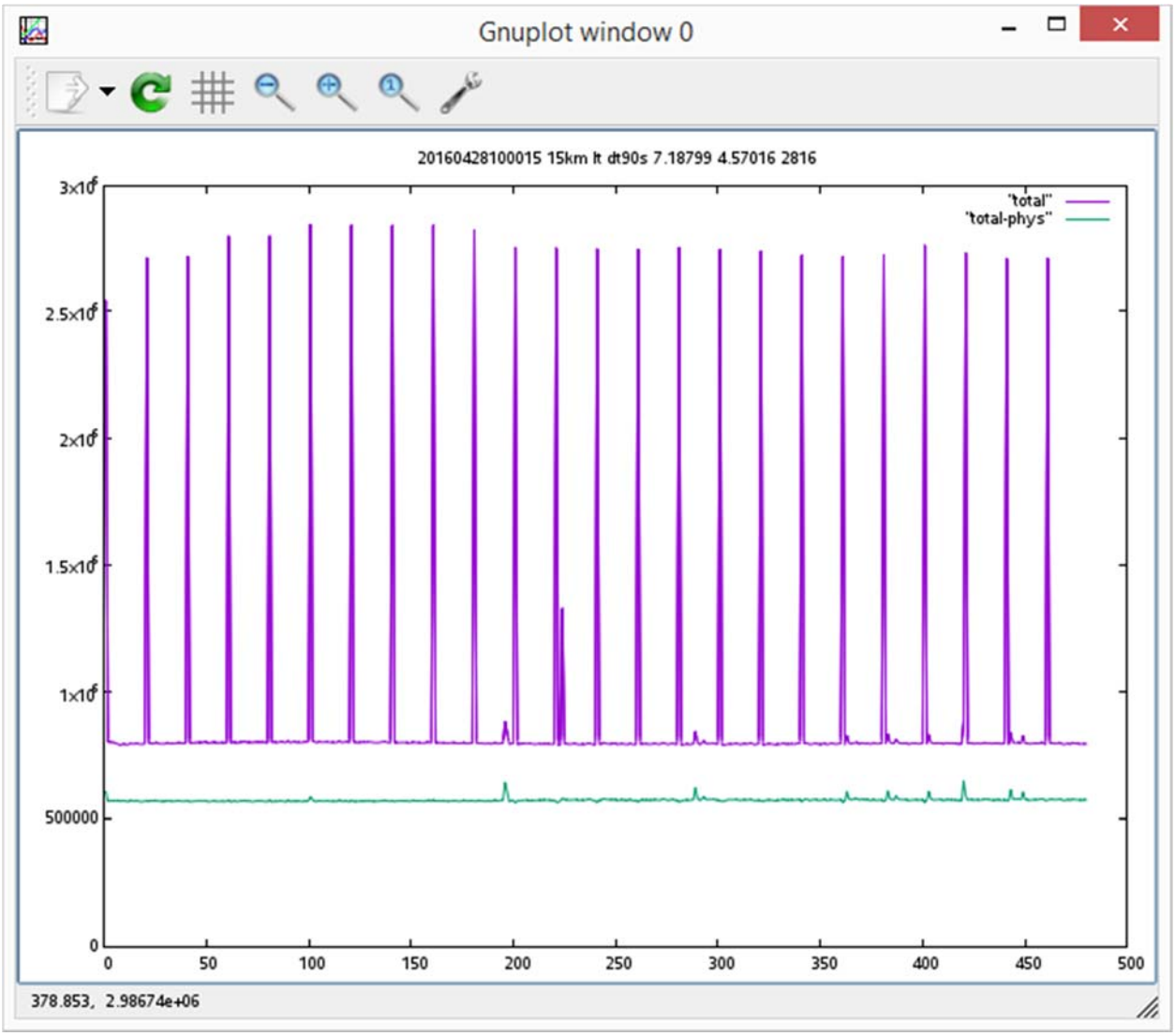
MPAS: Job ID: 2035262 13km_mid dtreduced:


Gnuplot window 0
20160428080841 13km mid dtreduced 8.00818 6.25237 4800
"total"
"total-phys"
3x10^6
2.5x10^6
2x10^6
1.5x10^6
1x10^6
500000
0
0
50
100
150
200
250
300
350
400
402.840, 1.60502e+06

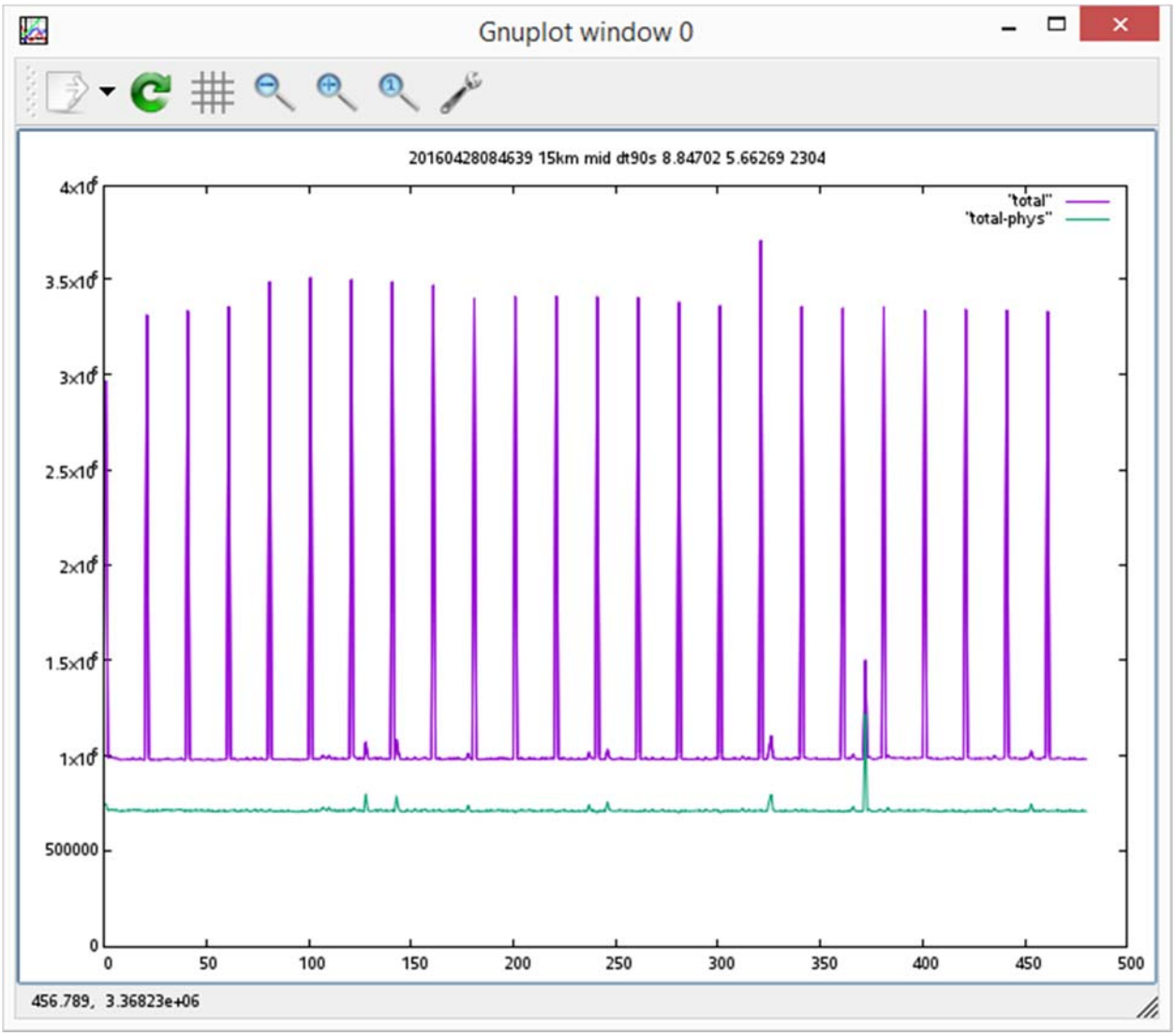
MPAS: Job ID 2036014 .mpas_15km_gt_dt90s



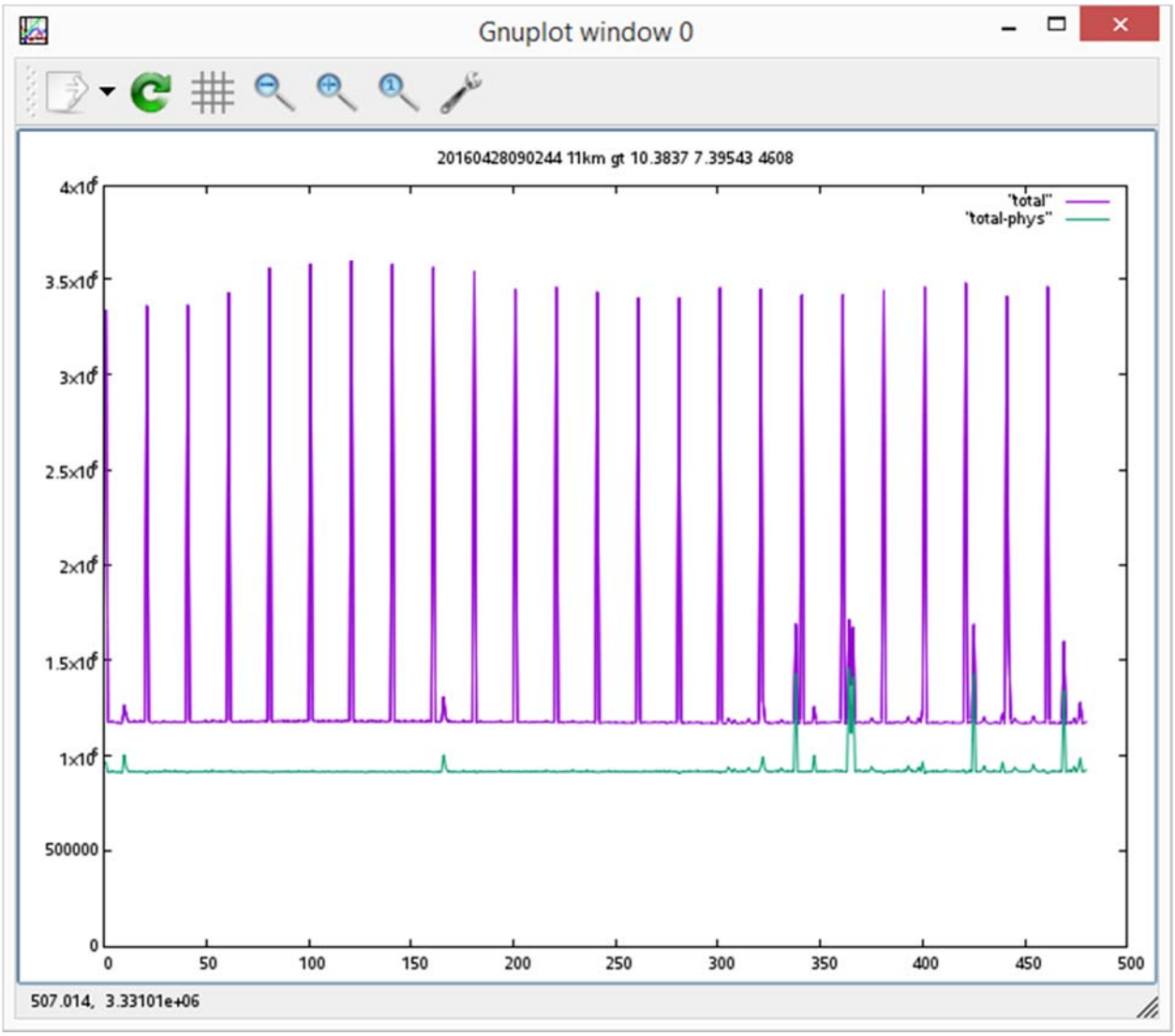
MPAS: Job ID 2036015 .mpas_15km_lt_dt90s:



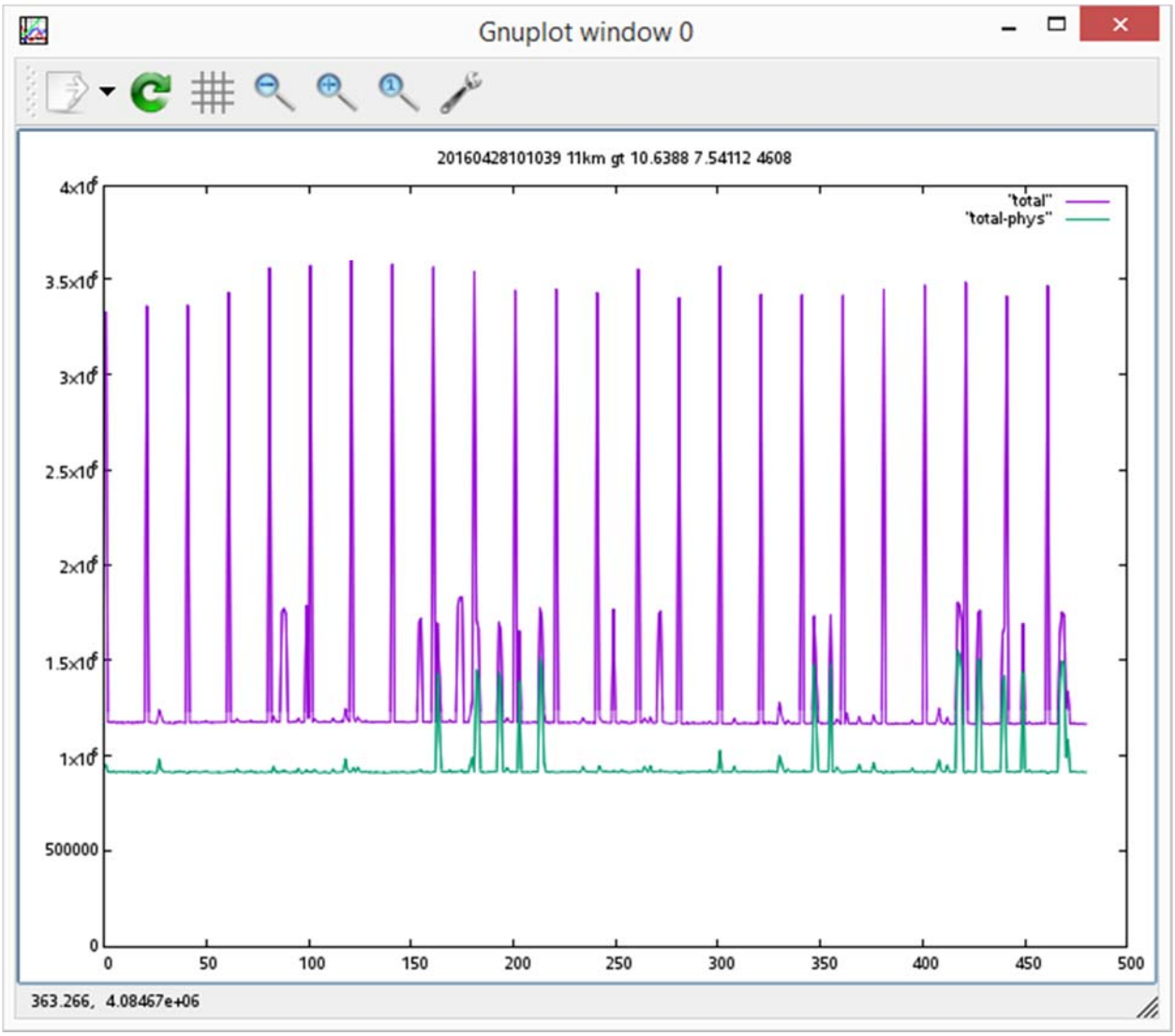
MPAS: Job ID 2035867 .mpas_15km_mid_dt90s



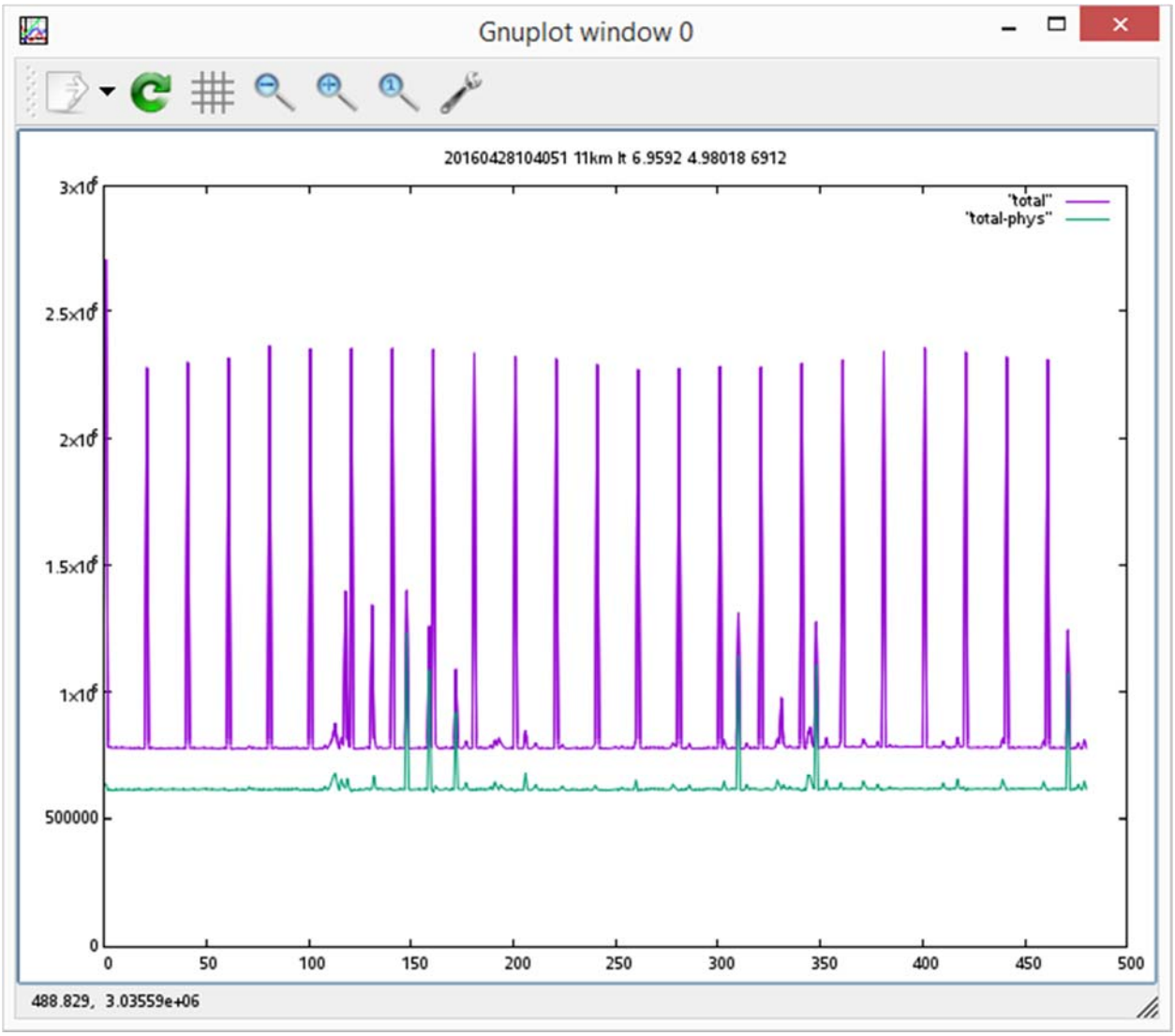
MPAS 11km gt --- noise at the end because another of our jobs started when it shouldn't have. Will rerun



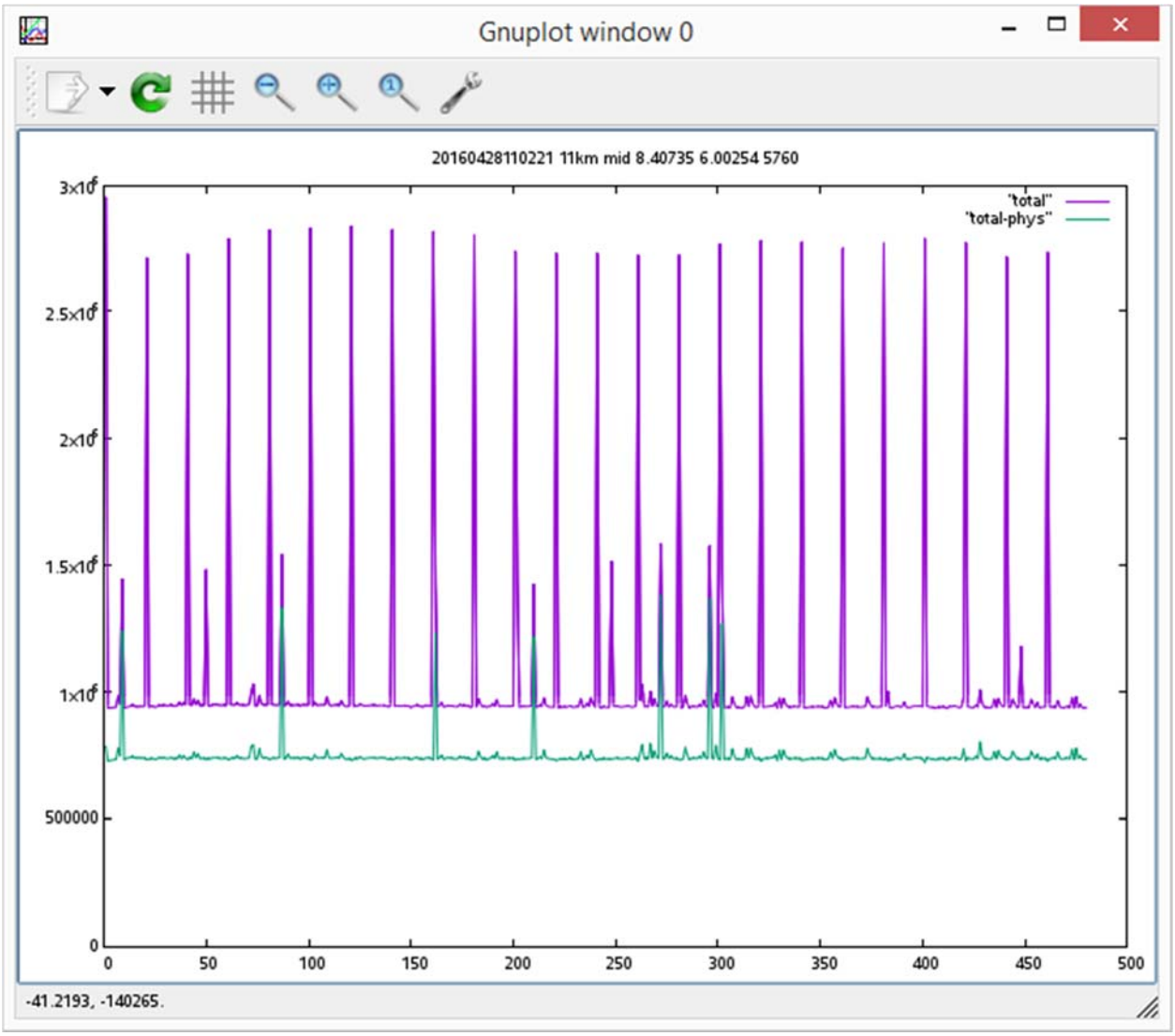
MPAS: Job ID 2036016 11km gt -- this is the rerun -- it actually looks worse than the one above. I'm sure nothing else was running for this one. Will try another rerun later of there is time.



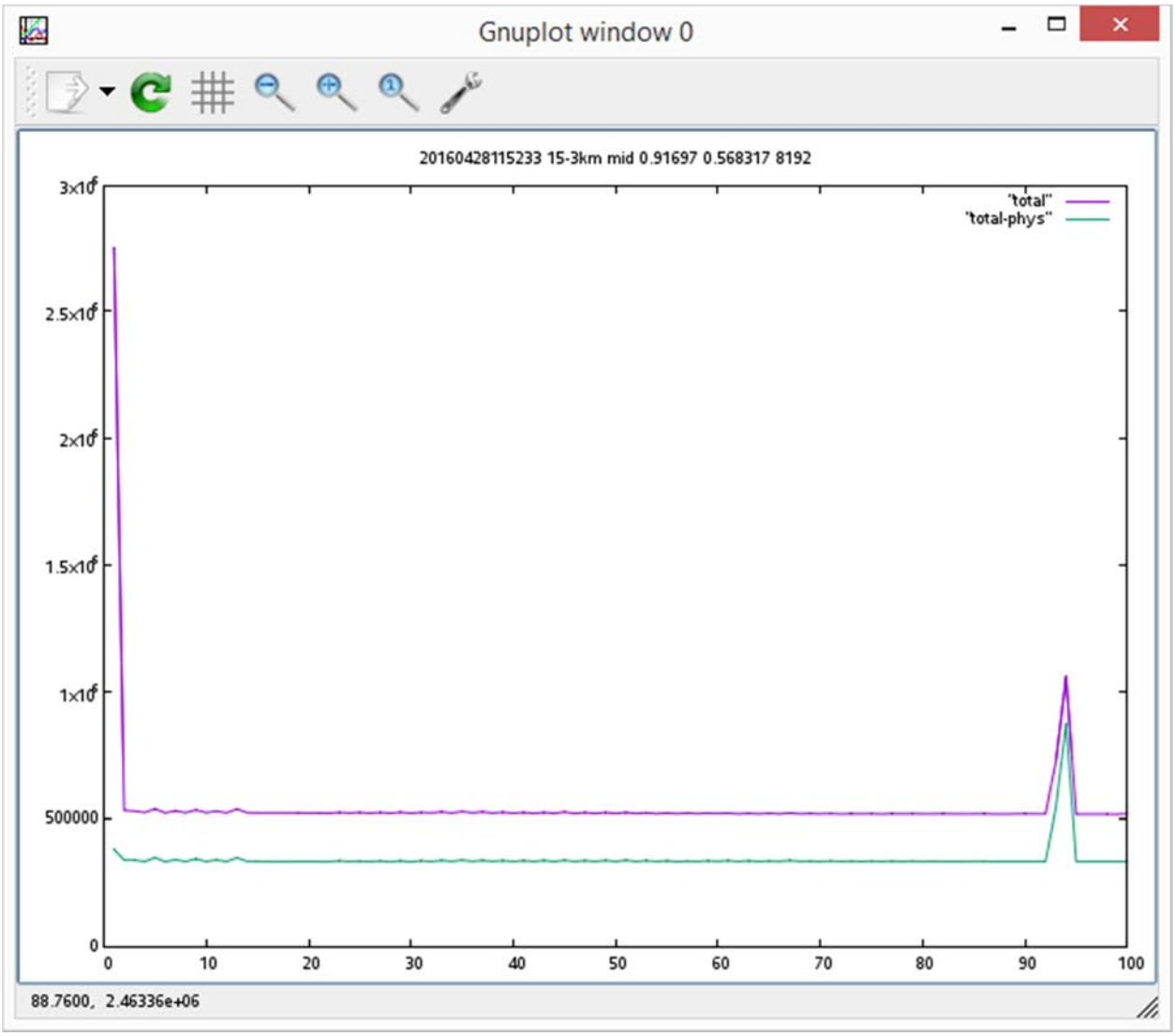
MPAS: Job ID 2036018 11km lt:



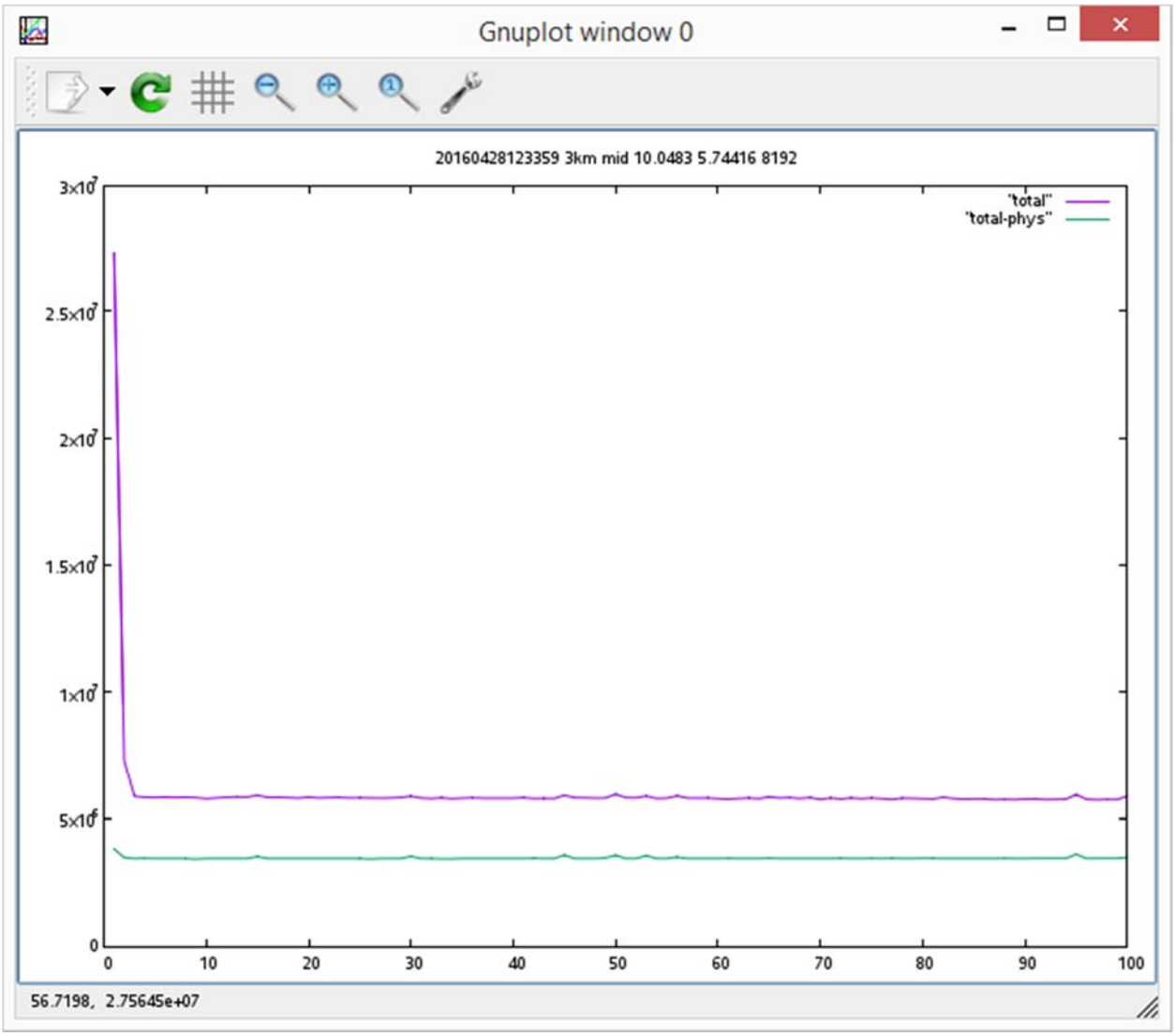
MPAS: 2036020 Job ID 11km mid:



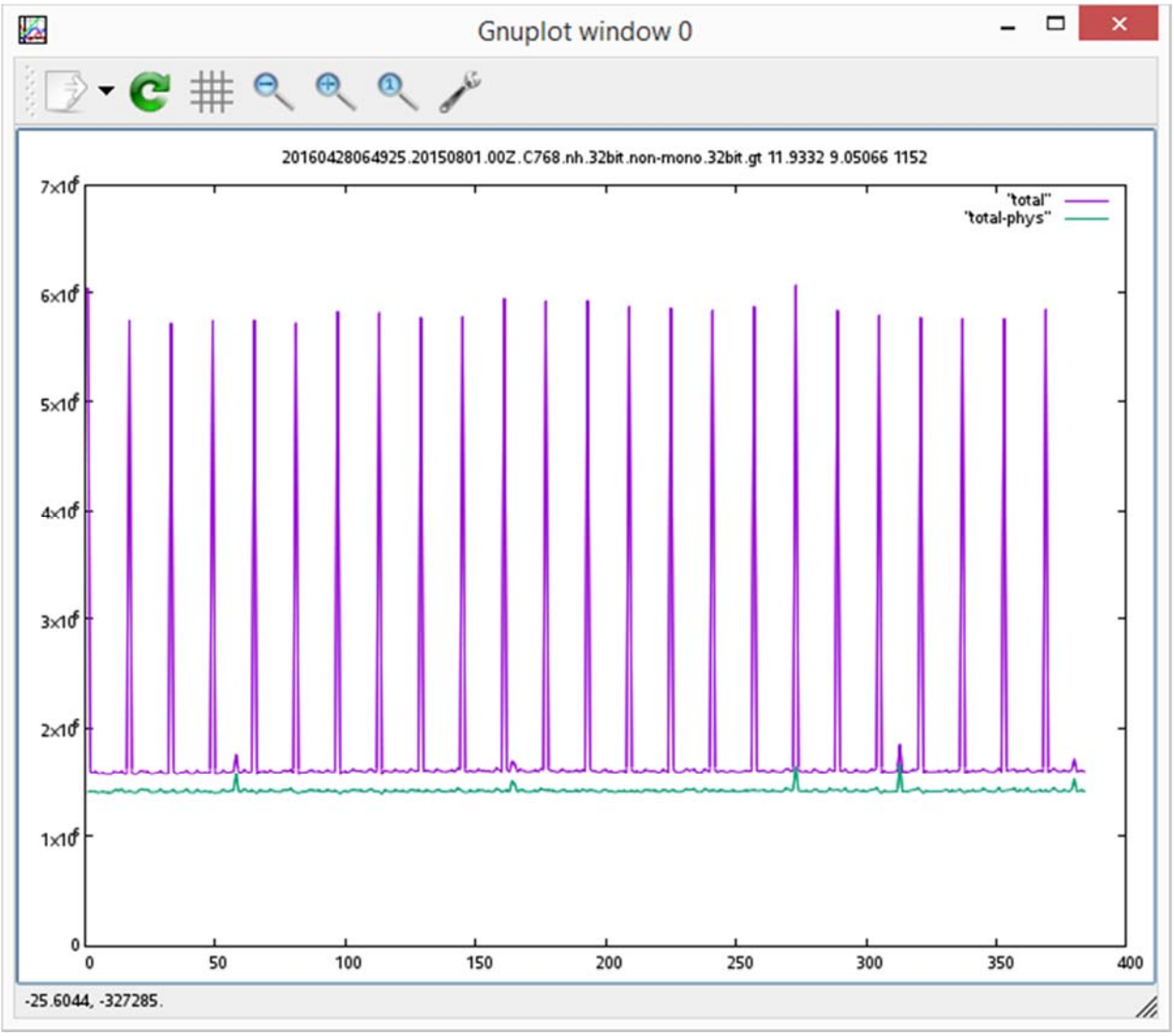
MPAS: Job ID: 2036252 15-3km



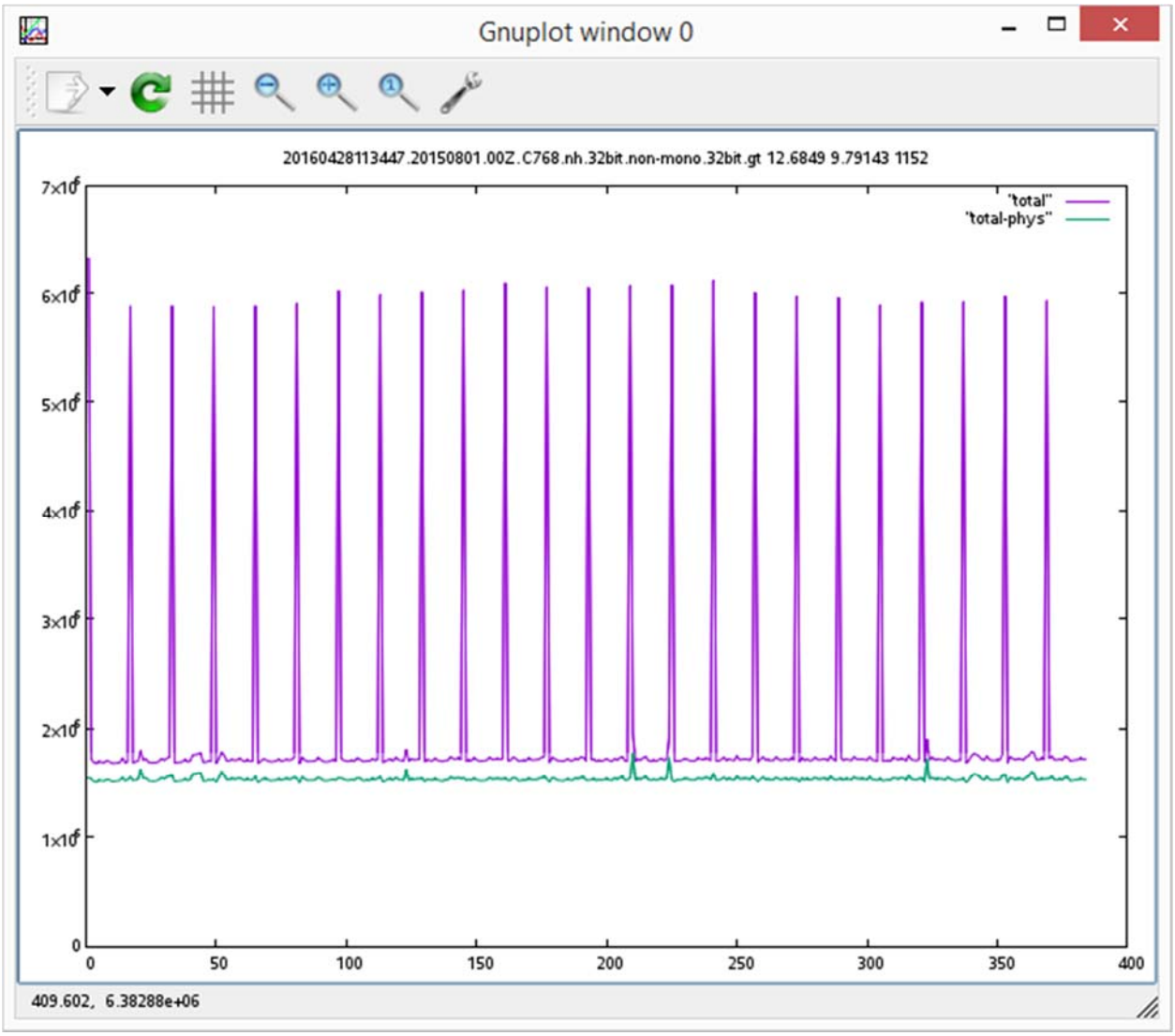
MPAS: Job ID: 2036415 3km Uniform resolution


Gnuplot window 0
20160428123359 3km mid 10.0483 5.74416 8192
"total"
"total-phys"
3x10^7
2.5x10^7
2x10^7
1.5x10^7
1x10^7
5x10^6
0
0
10
20
30
40
50
60
70
80
90
100
56.7198, 2.75645e+07

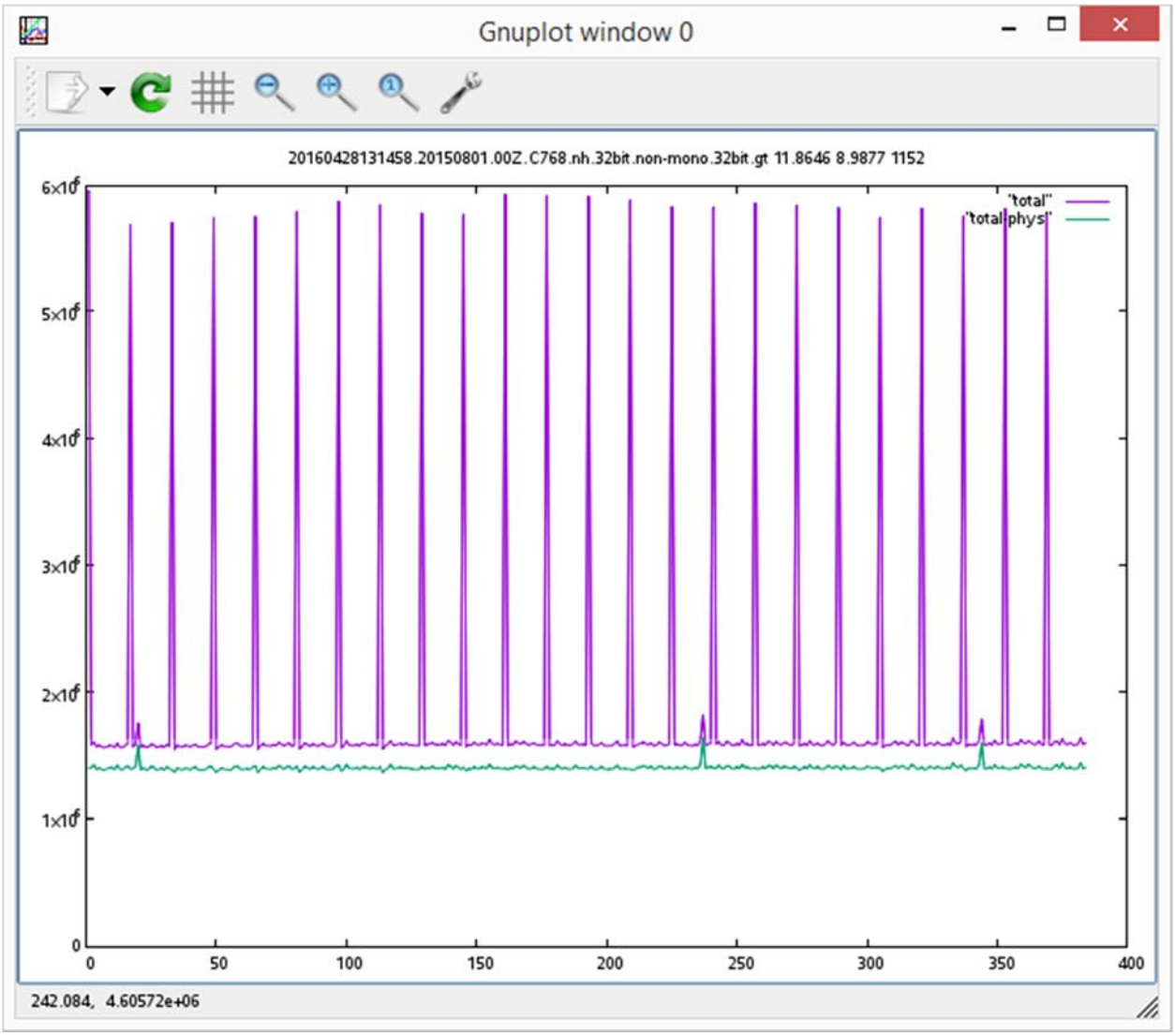
FV3: job id 2035256 perf_c768_32bit.gt Nom. res, 36 nodes: 576 MPI tasks, 4-way threaded (> 8.5 min/day):



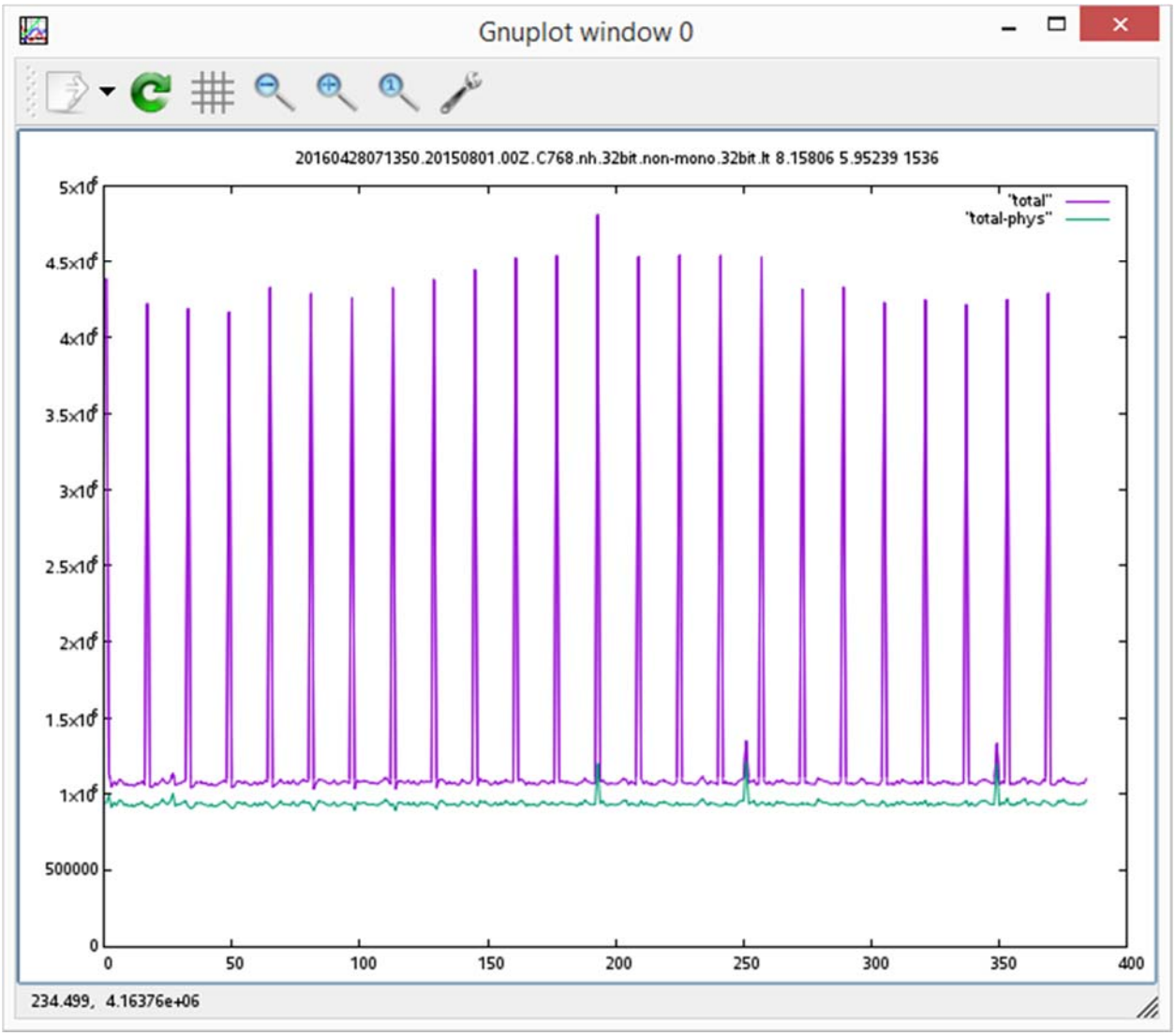
FV3: RERUN job id 2036250 perf_c768_32bit.gt Nom. res, 36 nodes: 576 MPI tasks, 4-way threaded (> 8.5 min/day)



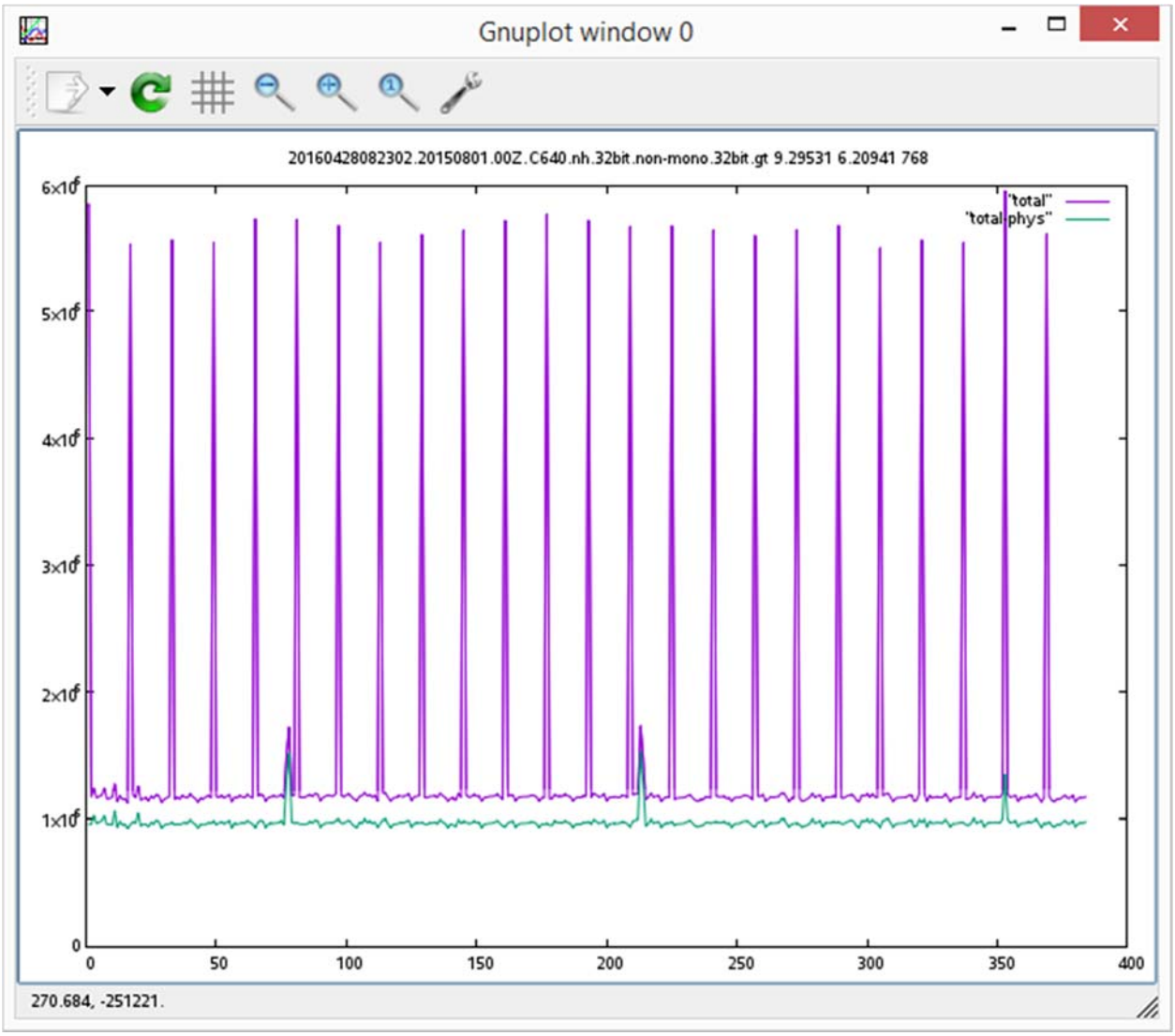
FV3: RERUN job id 2037448perf_c768_32bit.gt Nom. res, 36 nodes: 576 MPI tasks, 4-way threaded (> 8.5 min/day)



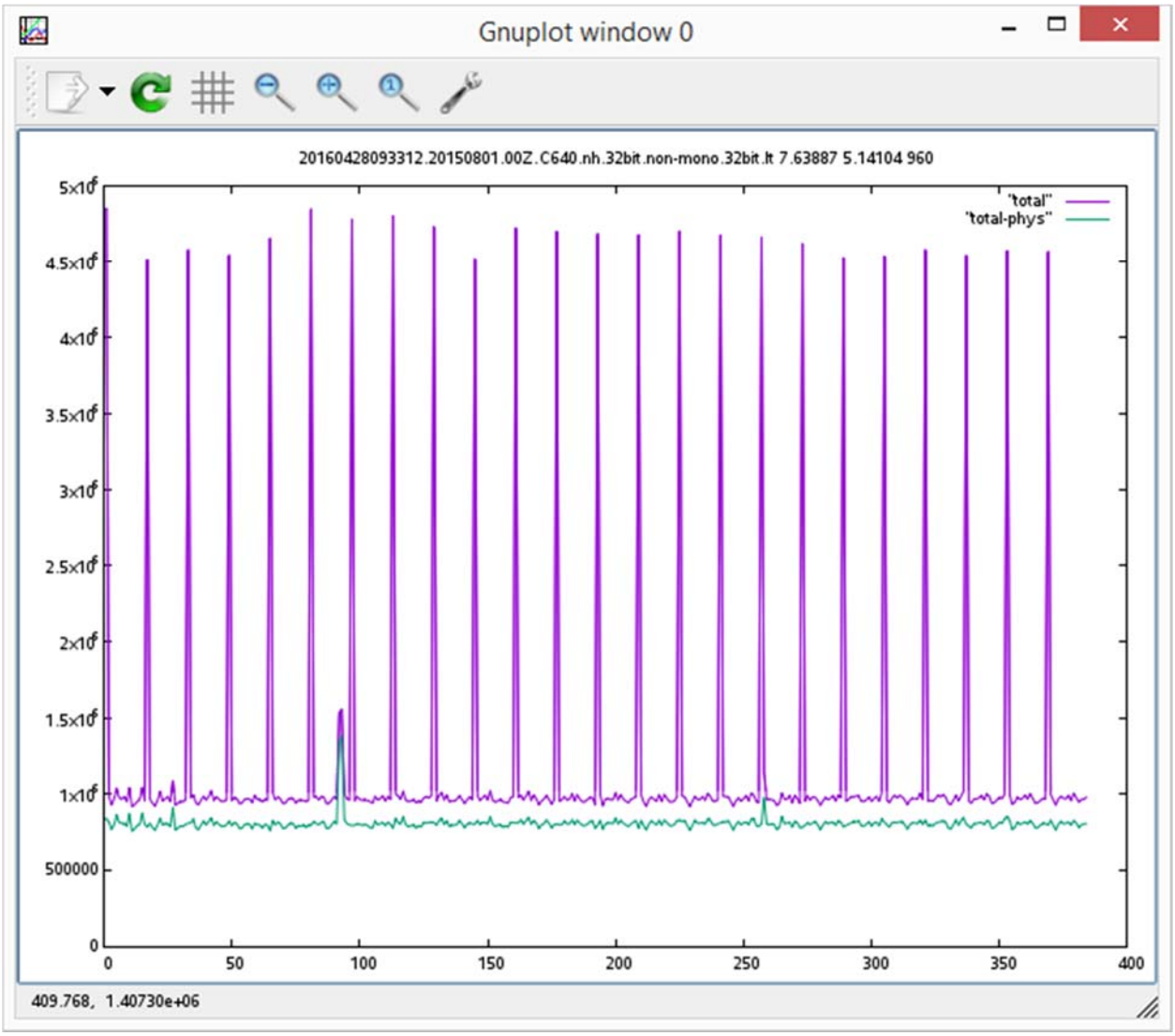
FV3: Job ID 2035258 perf_c768_32bit.lt Nom. res, 48 nodes: 768 MPI tasks, 4-way threaded (< 8.5 min/day):



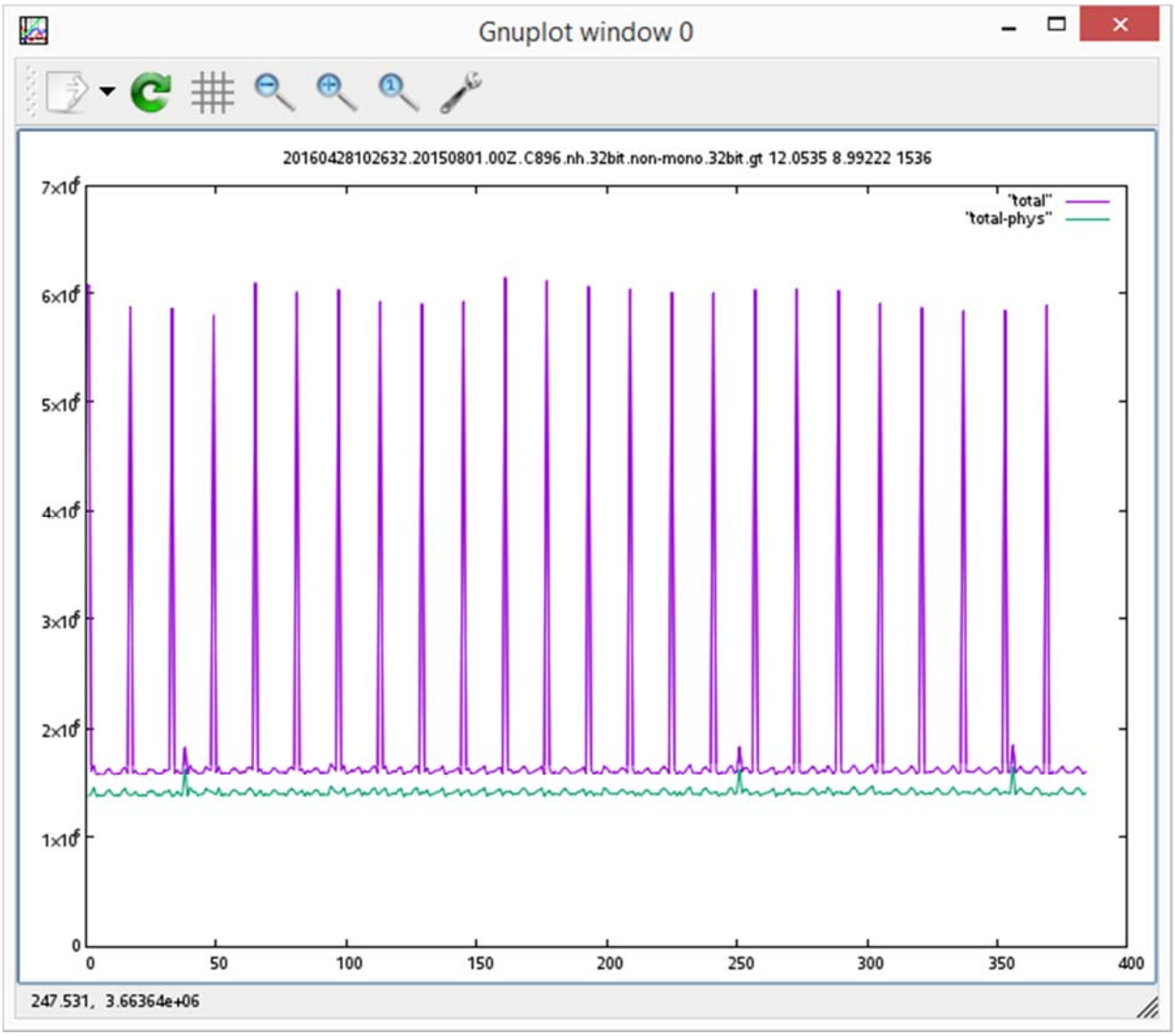
FV3: Job ID 2035864 perf_c640_32bit.gt Lower res, 24 nodes: 768 MPI tasks, 2-way threaded (> 8.5 min/day)



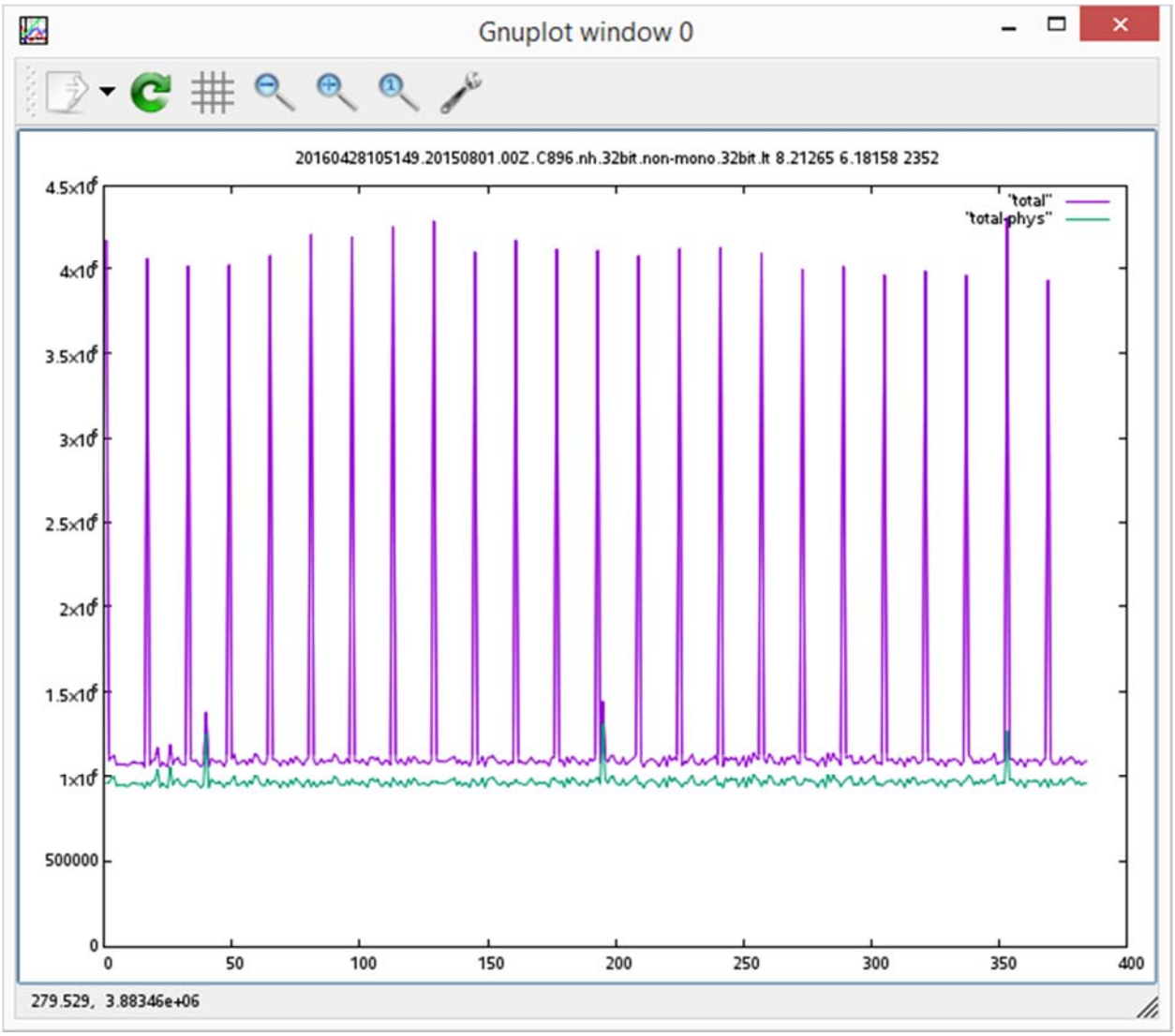
FV3: Job ID 2035976 perf_c640_32bit.lt Lower res, 24 nodes: 768 MPI tasks, 2-way threaded (< 8.5 min/day)



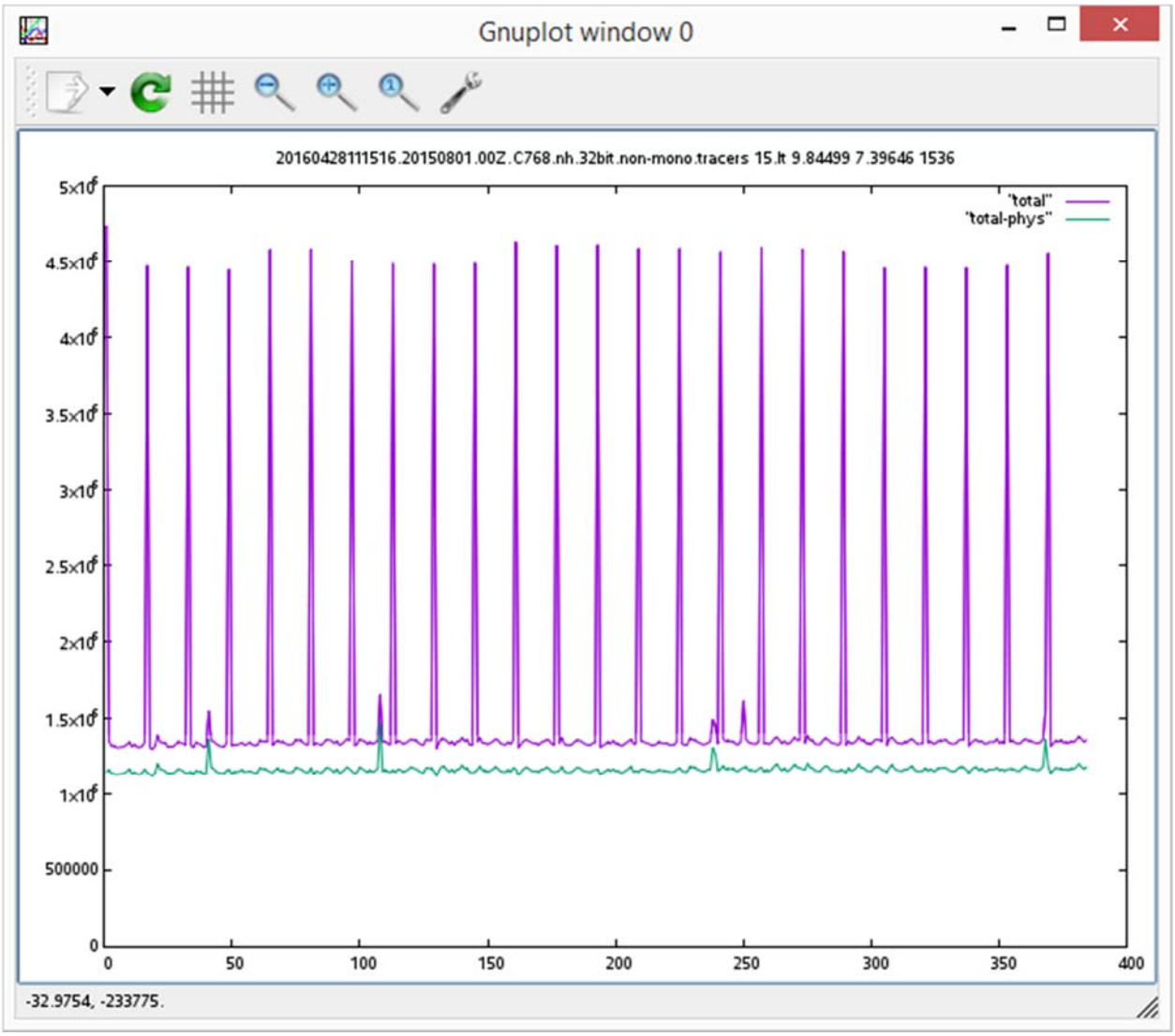
FV3: Job ID 2036017 C896.nh.32bit.non-mono.32bit.gt



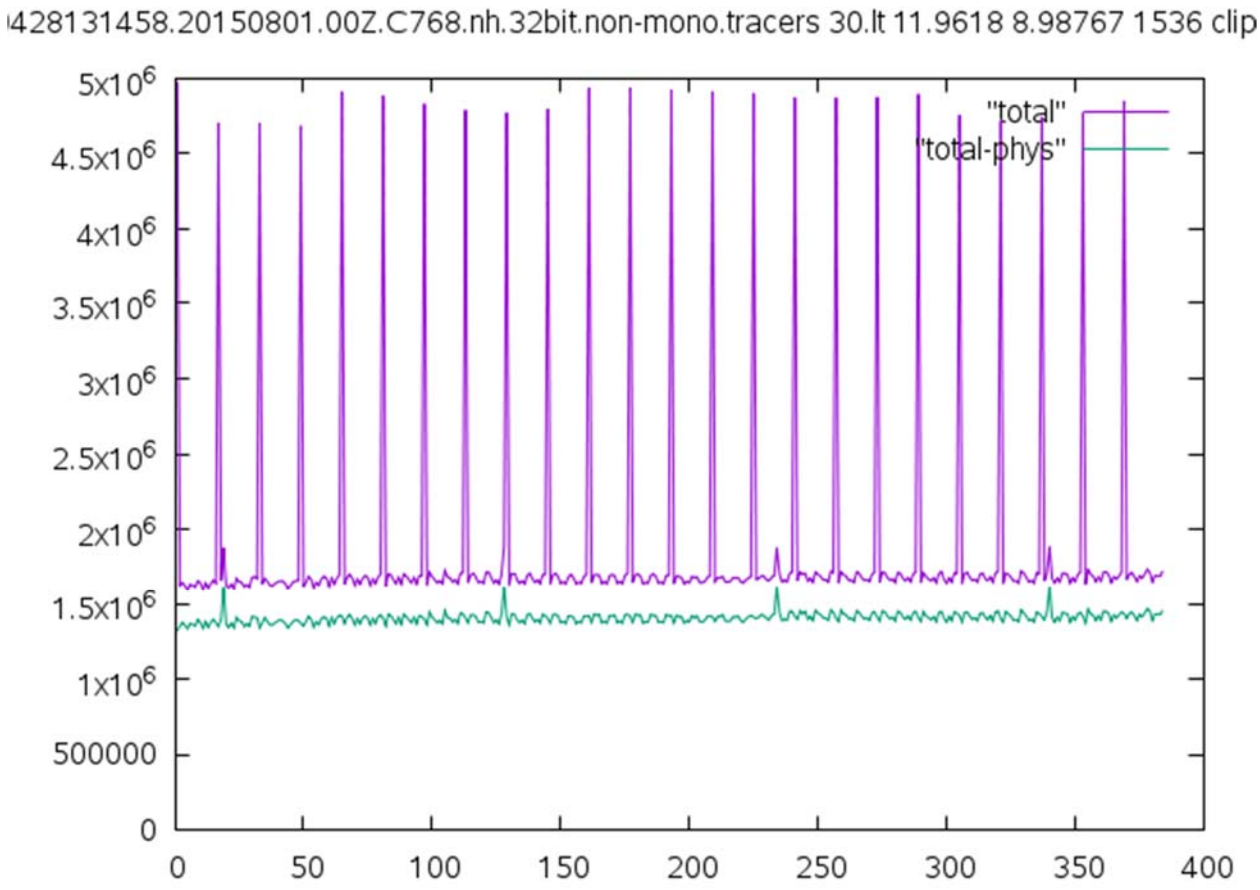
FV3: job id 2036019 C896.nh.32bit.non-mono.32bit.lt:



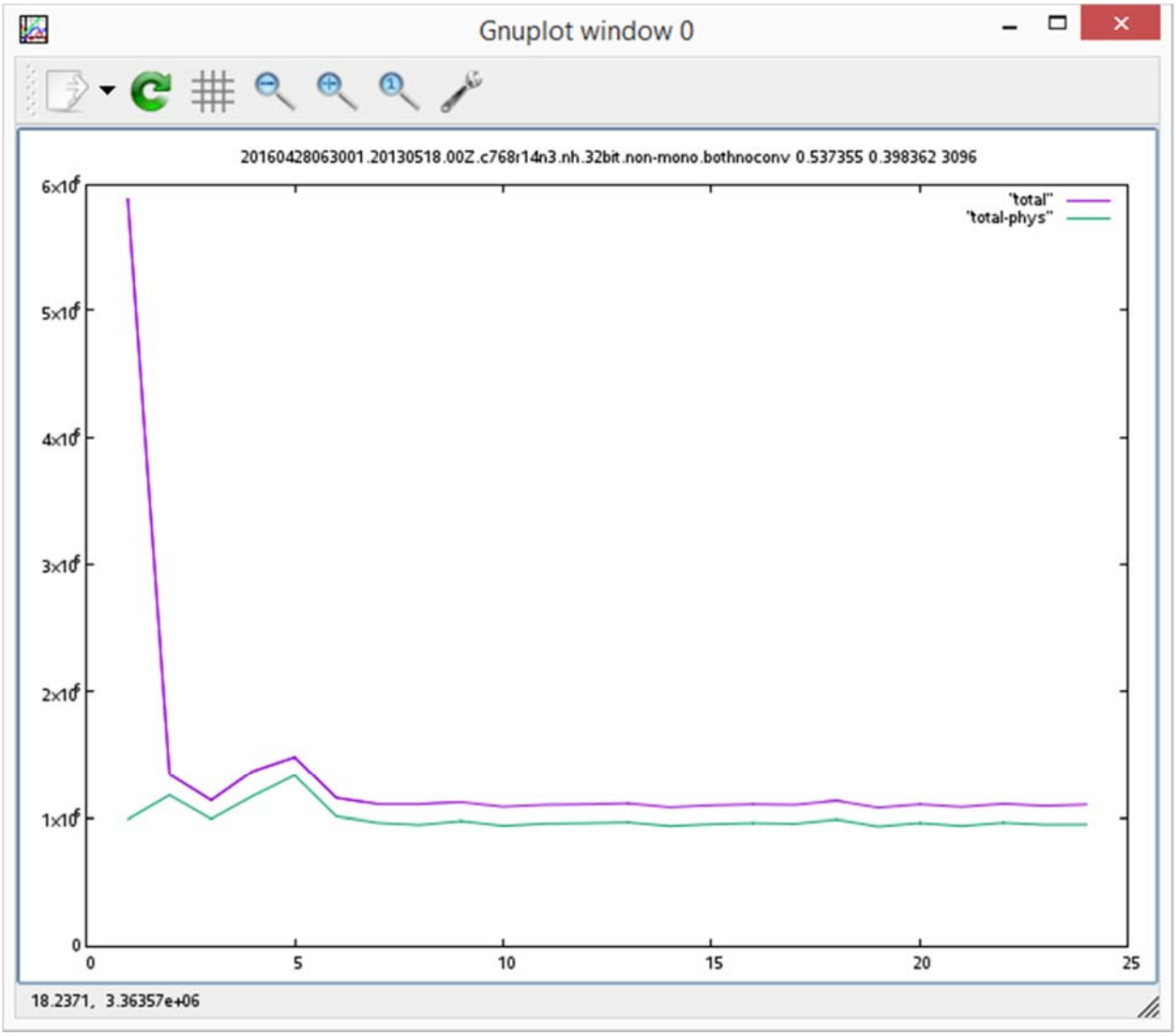
FV3: Job ID 2036021 13km 15 tracer run:



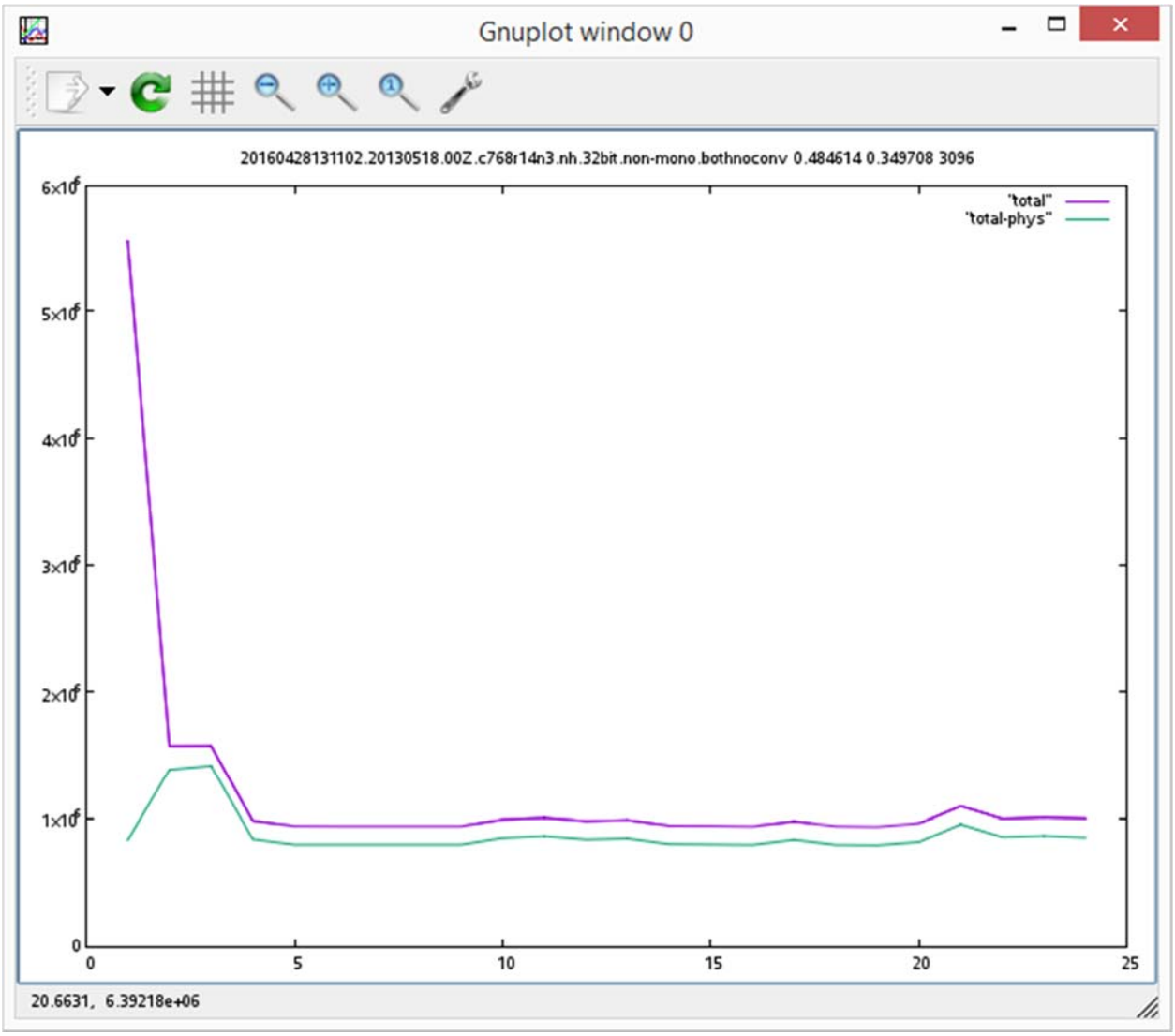
FV3 -- 30 tracer run (added 5/25/16; was run on 4/28 but never plotted and posted). The clipping is 5 sigma -- basically no clipping.



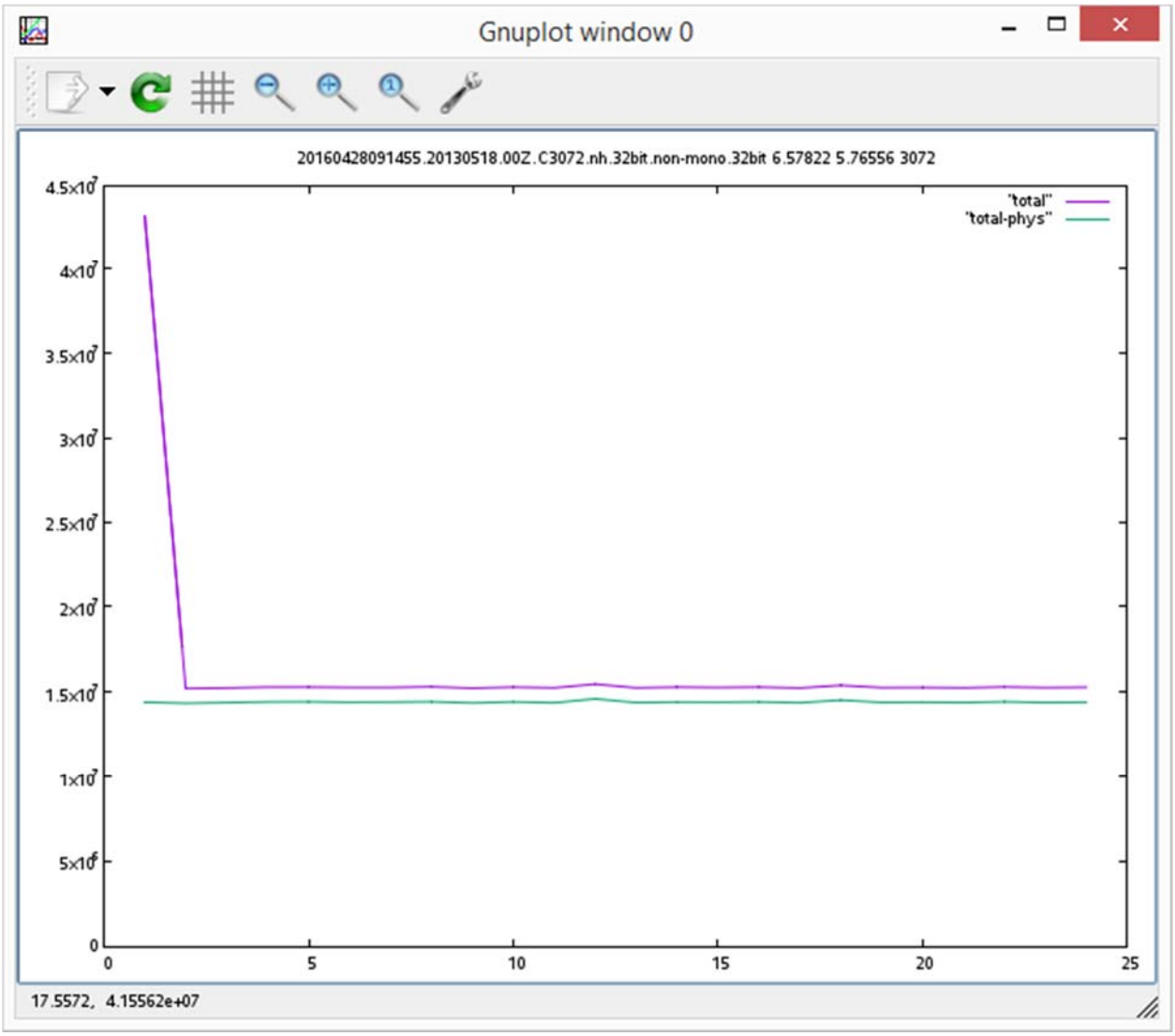
FV3:job id 2035254 perf_varres_32bit var res (nested). 97 nodes: 3096 MPI tasks, 2-way thrded (16 unused):



FV3:job id 2036416 RERUN perf_varres_32bit var res (nested). 97 nodes: 3096 MPI, 2-way tds (16 unused):



FV3: Job ID 2035874 (not sure about the jobid) 3km uniform res

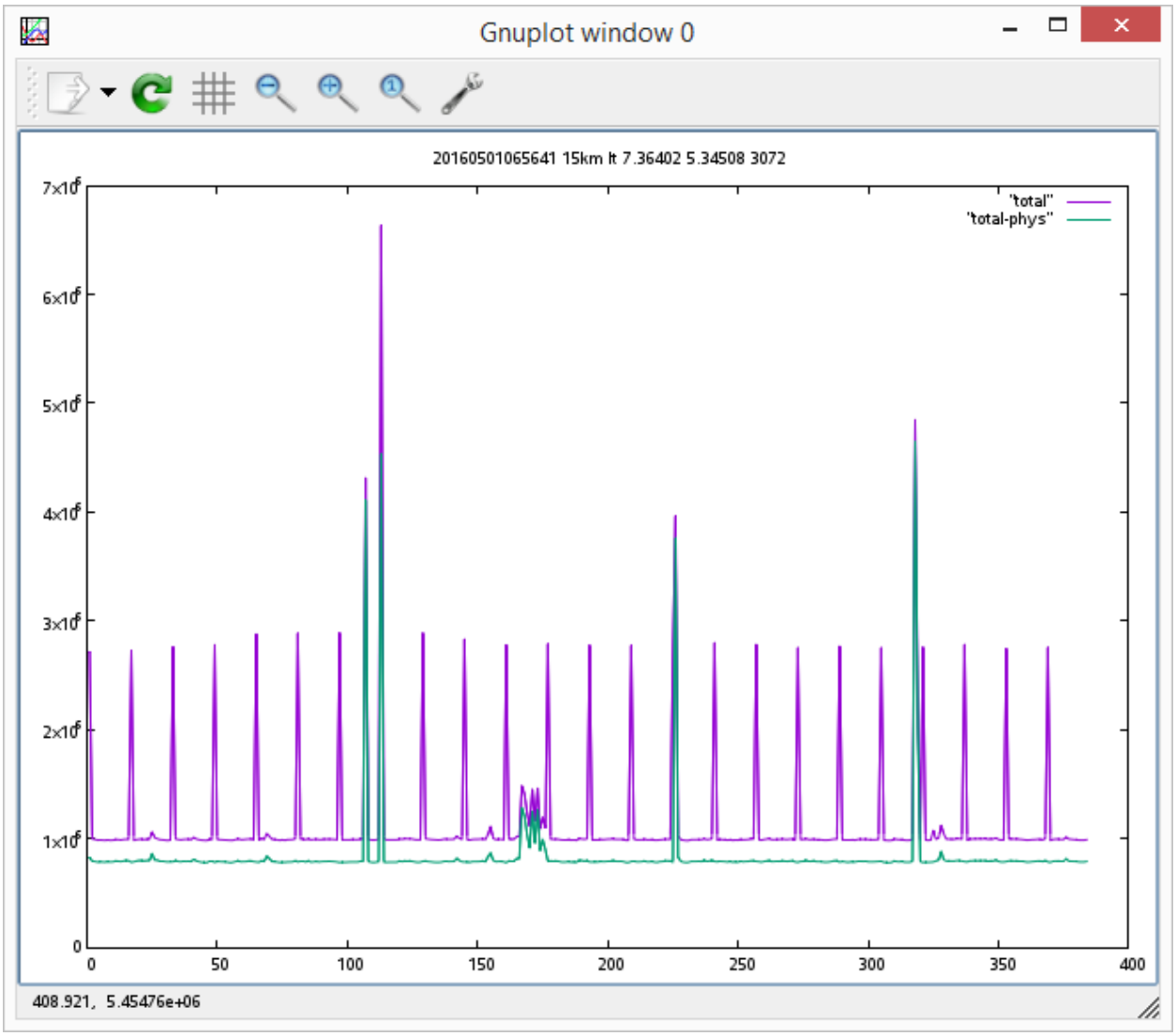

Gnuplot window 0
20160428091455.20130518.00Z.C3072.nh.32bit.non-mono.32bit 6.57822 5.76556 3072
"total"
"total-phys"
4.5x10^7
4x10^7
3.5x10^7
3x10^7
2.5x10^7
2x10^7
1.5x10^7
1x10^7
5x10^6
0
0
5
10
15
20
25
17.5572, 4.15562e+07

20160502 Some retests on Cori 05/01 (non dedicated)

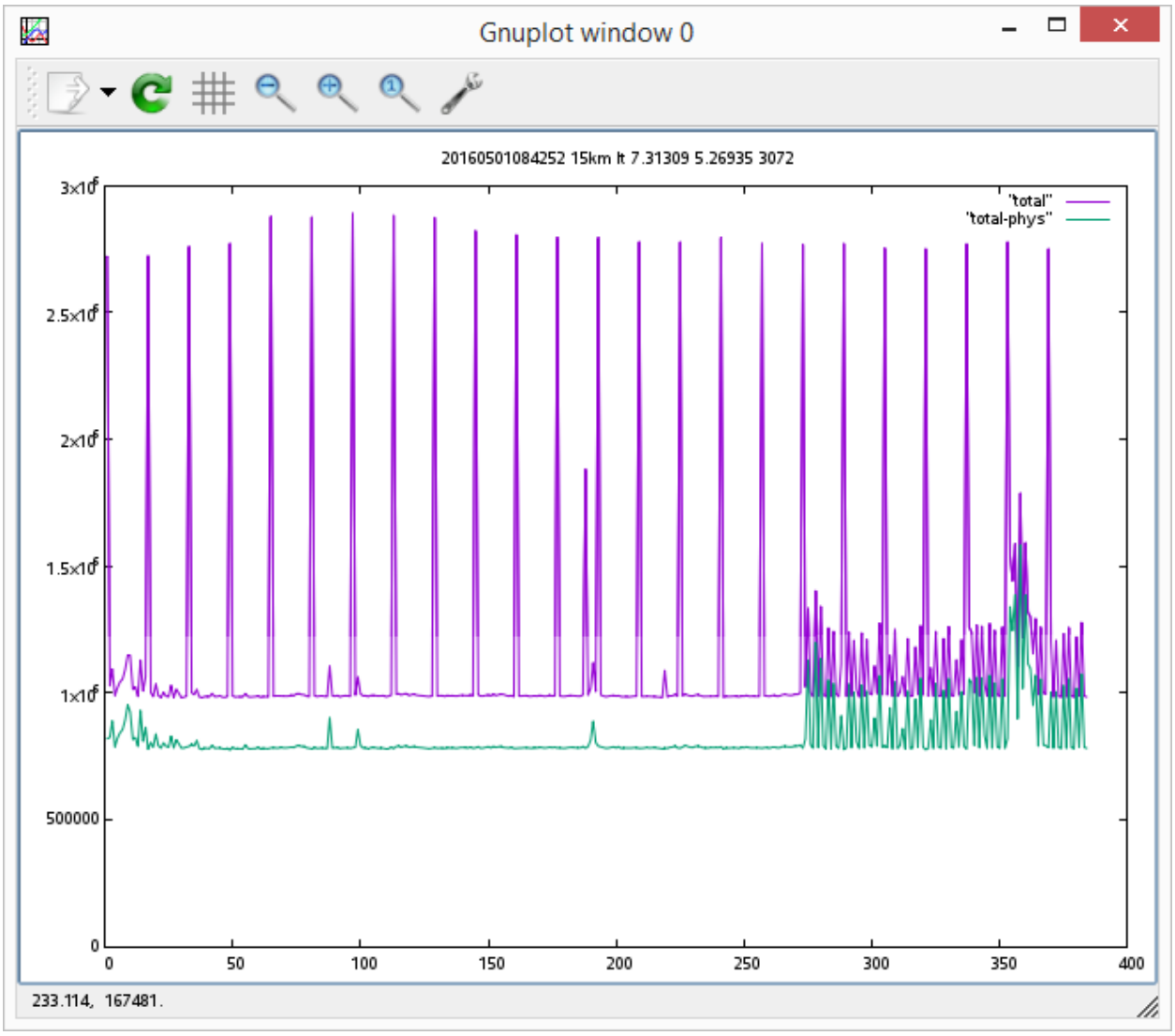
Did a set of reruns on Cori yesterday (5/1) in the regular/premium queue with other jobs running. I did three of each hoping we might be able to factor out the variability and compare with the runs done 4/28.
Here's the series of runs that were done:

```
set jobs= ( \
mpas_15km_lt 3072 tasks\                Didn't run 4/28, used dt-reduced version
Mpas_15km_mid 2592 tasks\               Didn't run 4/28, used dt-reduced version
mpas_15km_gt  2048 tasks\               Didn't run 4/28, used dt-reduced version
mpas_13km_gt_dtreduced.rerun \          Because 4/28 used non-dt reduced core counts
mpas_13km_lt_dtreduced.rerun \          Because 4/28 used non-dt reduced core counts
(same set as above two other times for replication)
)
```

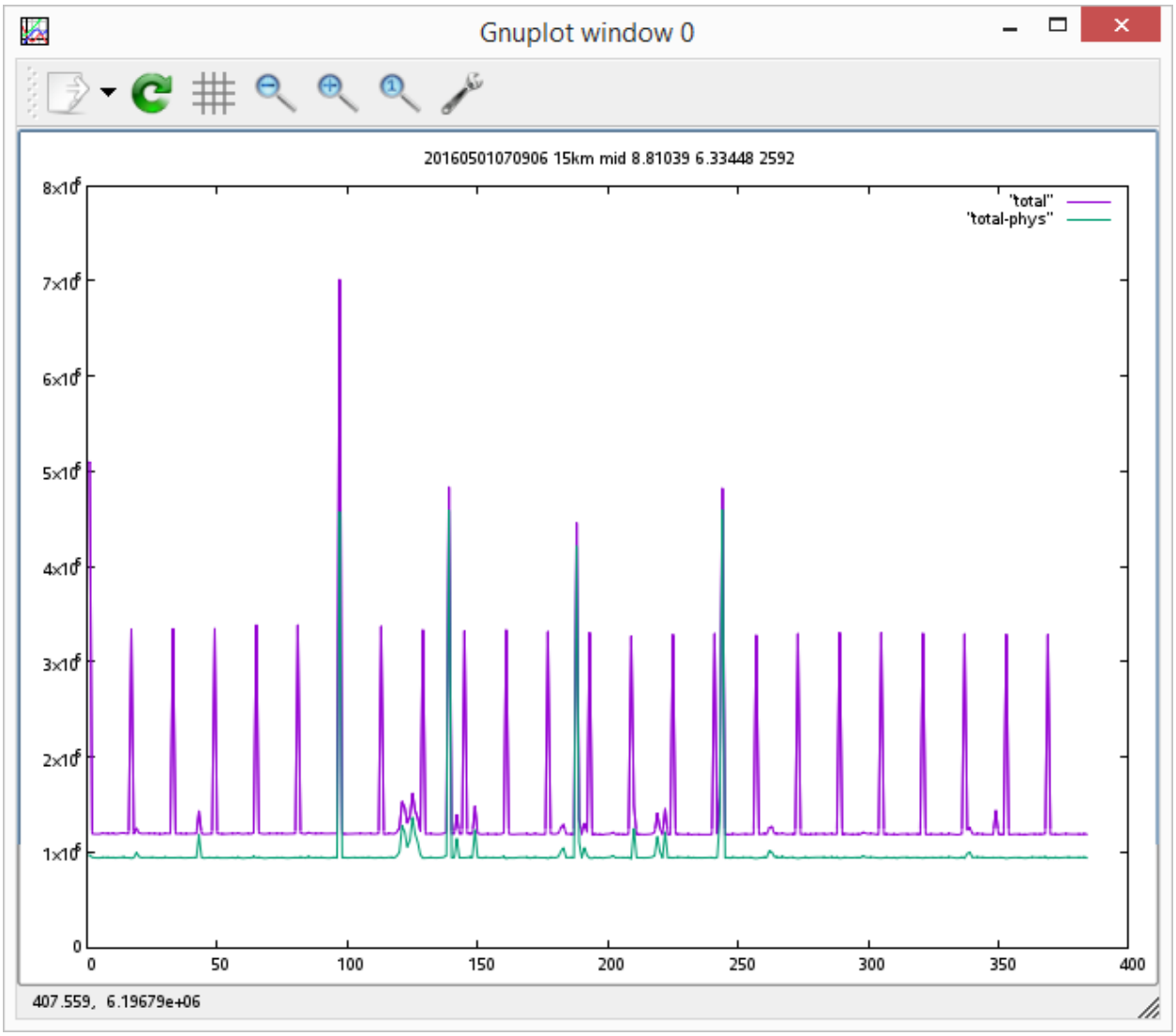
Mpas_15km_lt (1st) 3072 tasks



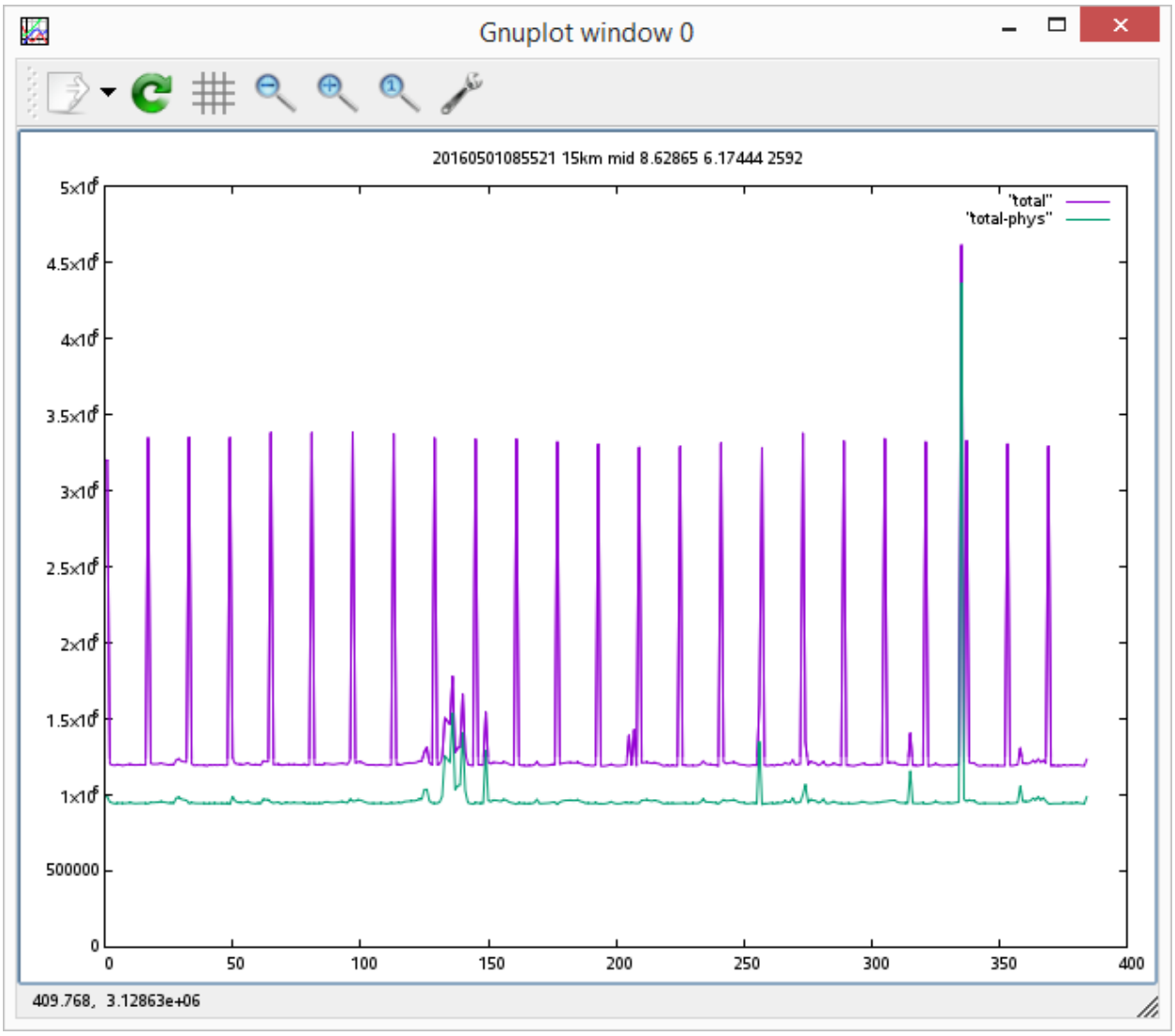
Mpas_15km_lt (2nd) 3072



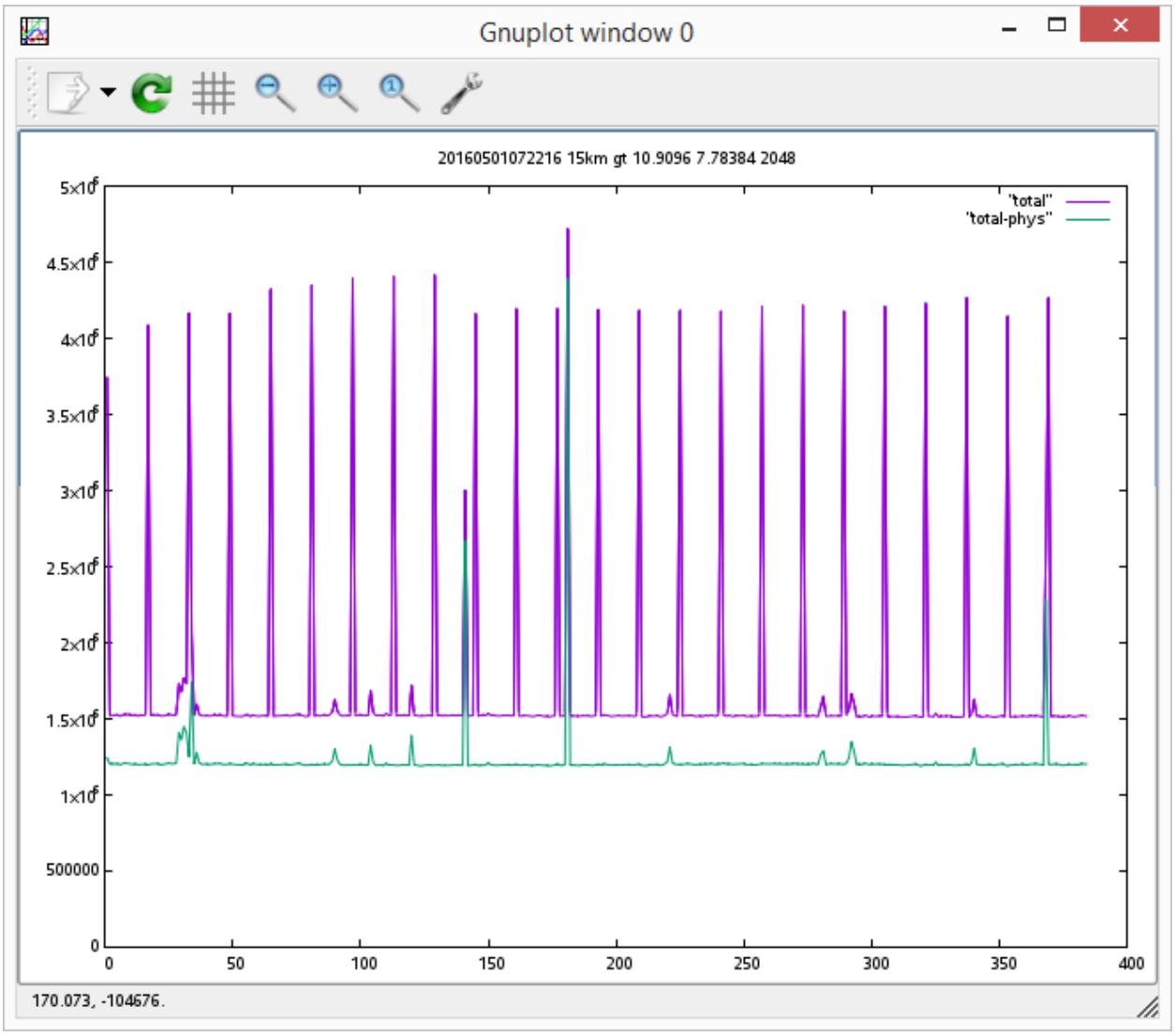
Mpas_15km_mid (1st) 2592 tasks



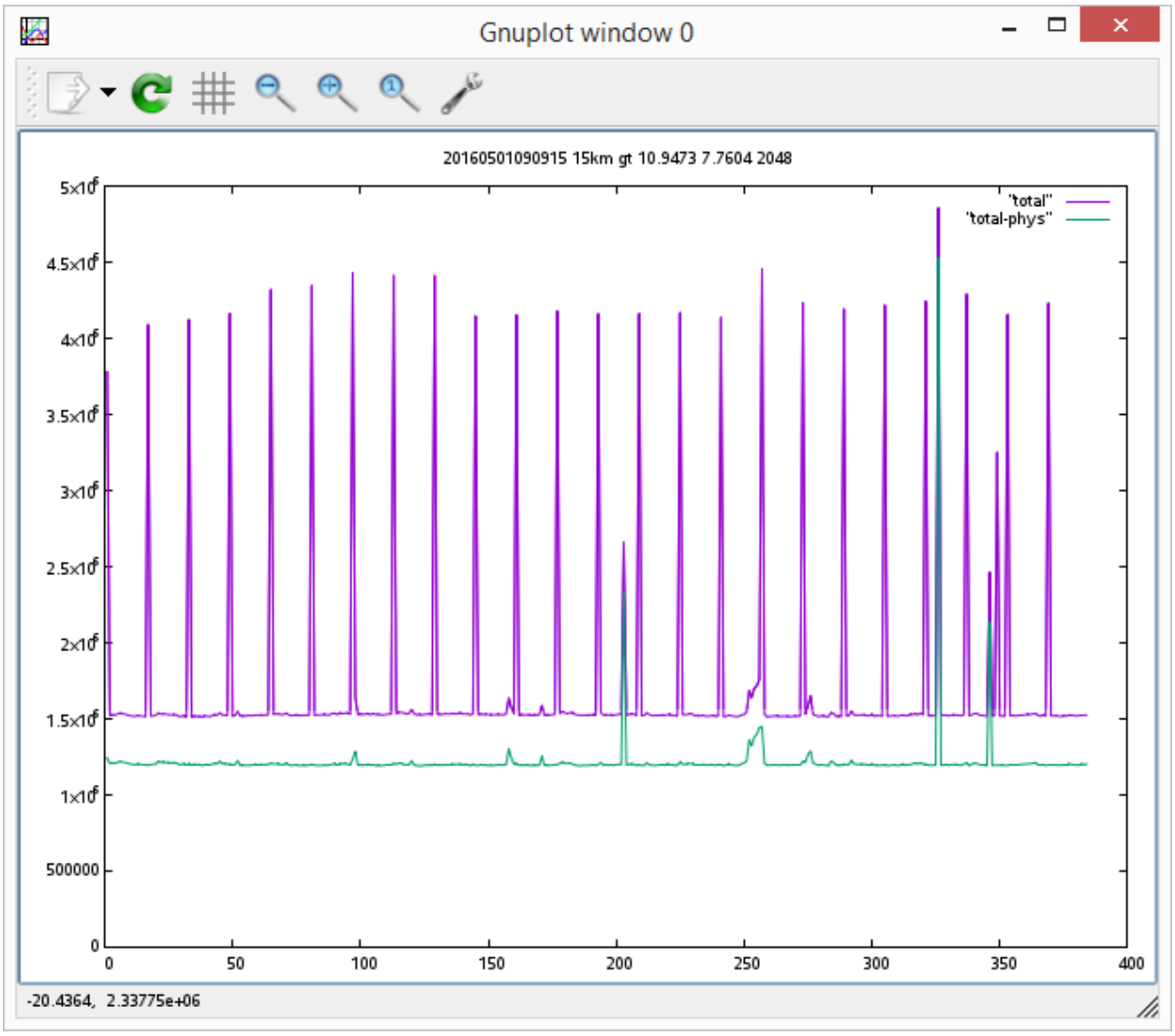
Mpas_15km_mid (2nd) 2592 tasks



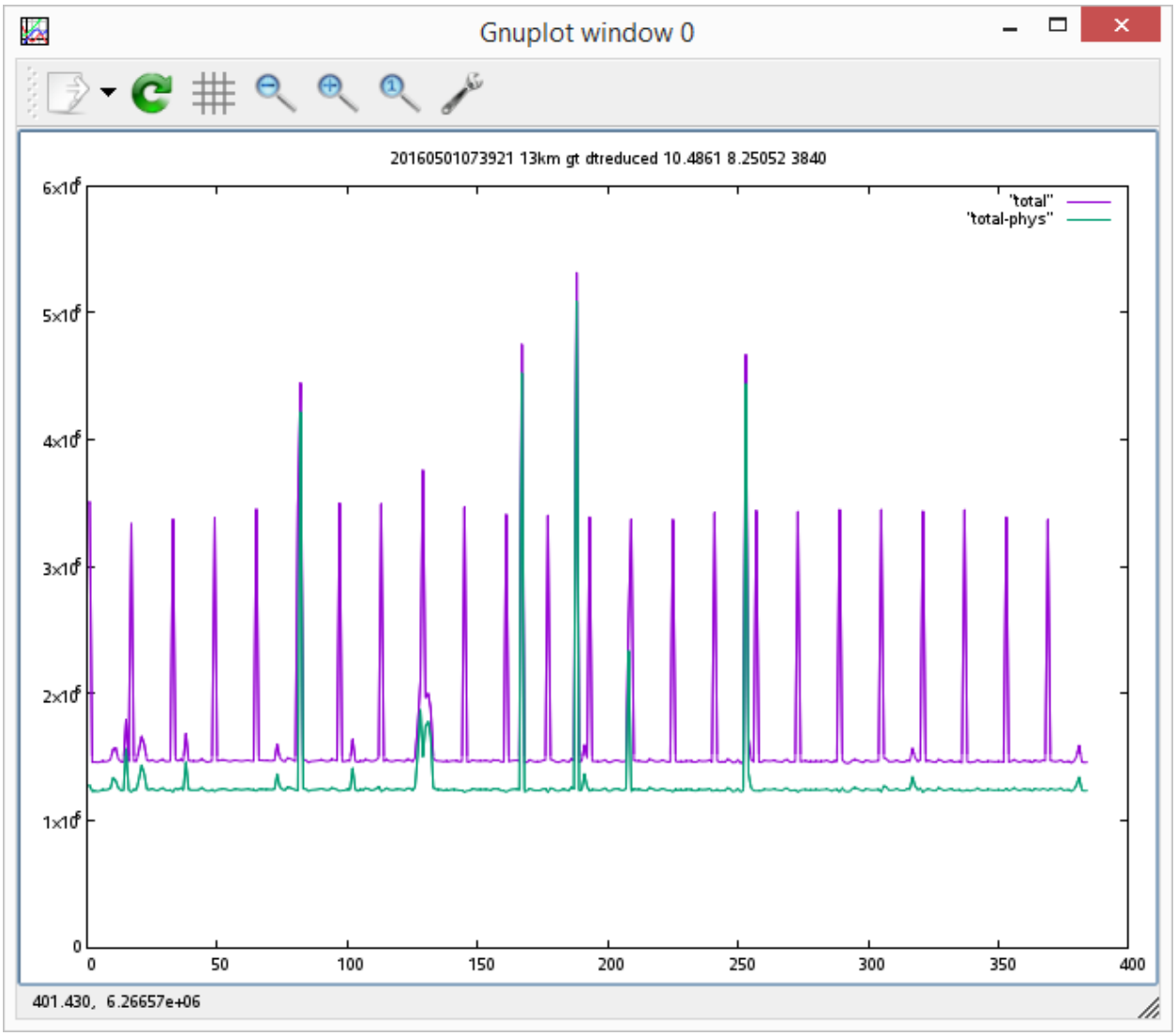
Mpas_15km_gt (1st) 2048 tasks

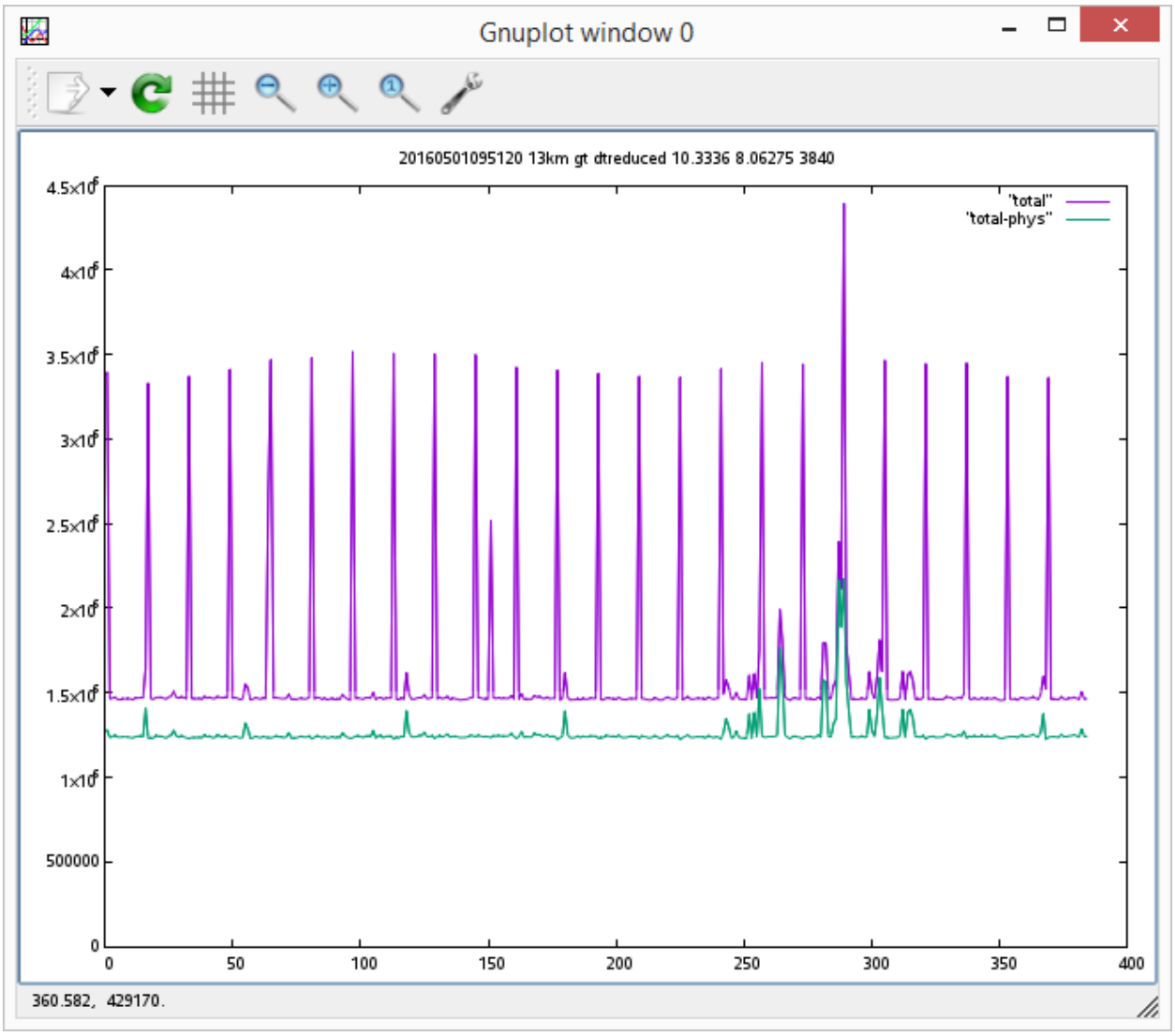


Mpas_15km_gt (2nd) 2048 tasks

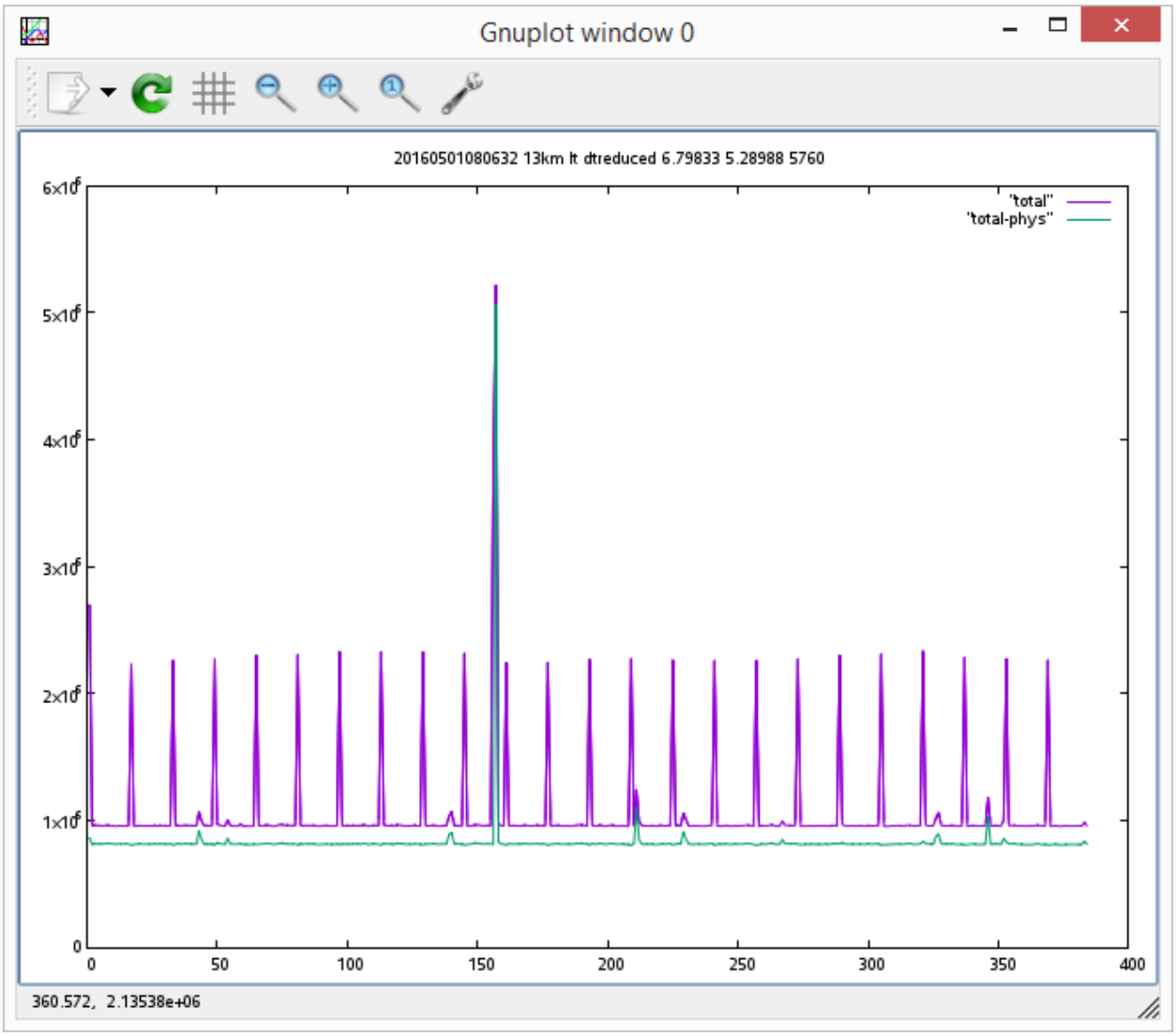


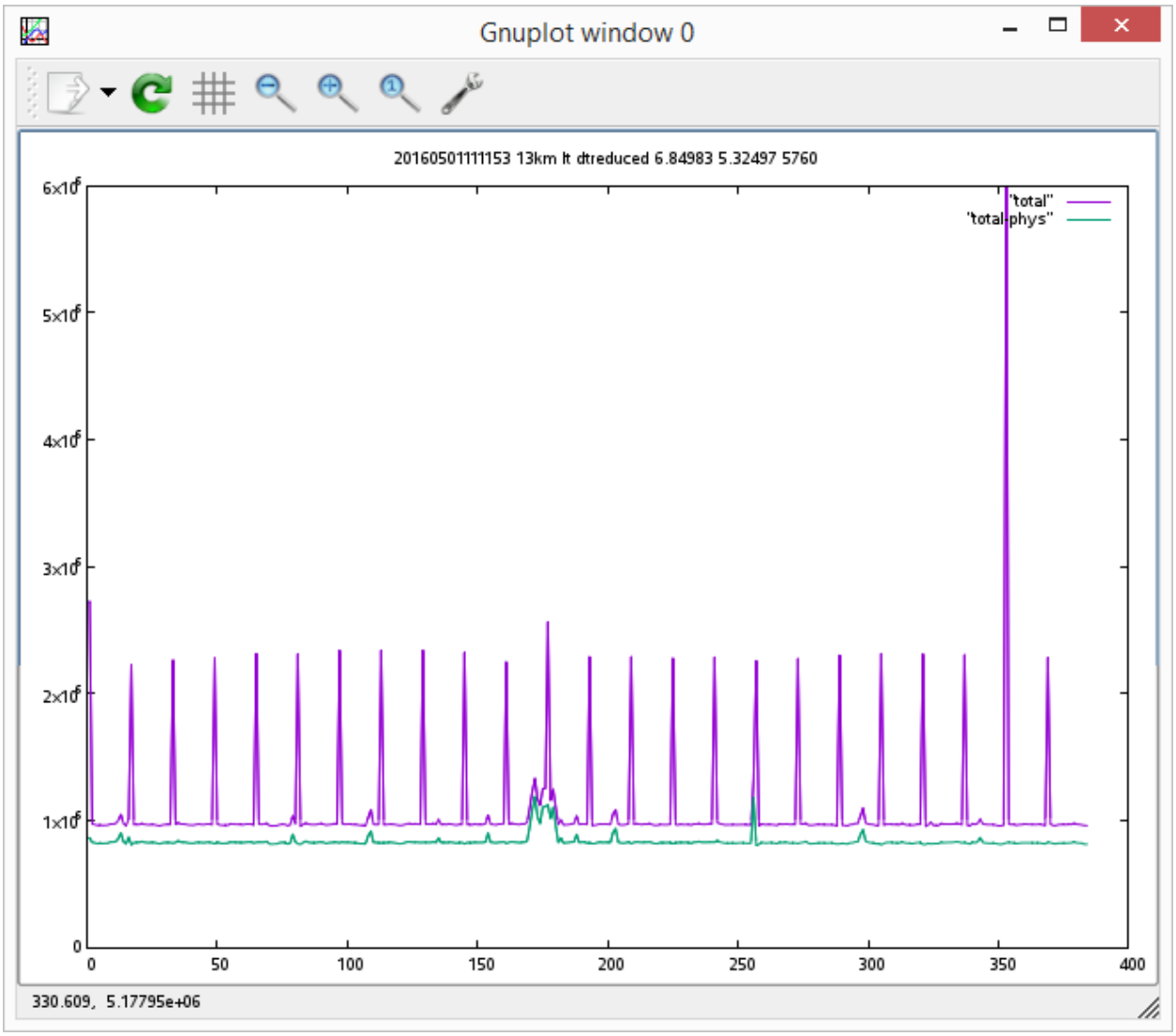
13km gt reduced 3840


Gnuplot window 0
20160501073921 13km gt dtreduced 10.4861 8.25052 3840
'total'
'total-phys'
6x10^6
5x10^6
4x10^6
3x10^6
2x10^6
1x10^6
0
0
50
100
150
200
250
300
350
400
401.430, 6.26657e+06



13km dtreduced 5760


Gnuplot window 0
20160501080632 13km lt dtreduced 6.79833 5.28988 5760
'total'
'total-phys'
6x10^6
5x10^6
4x10^6
3x10^6
2x10^6
1x10^6
0
0
50
100
150
200
250
300
350
400
360.572, 2.13538e+06


Gnuplot window 0
20160501111153 13km lt dtreduced 6.84983 5.32497 5760
"total"
"total-phys"
6x10^6
5x10^6
4x10^6
3x10^6
2x10^6
1x10^6
0
0
50
100
150
200
250
300
350
400
330.609, 5.17795e+06