Intro

In this scrip, we just try to test the calcualtion of residual（残差）. This version uses 4 parameters: m, zeta, psi and H. The ranges of parameters come from fv1_range_confirming.
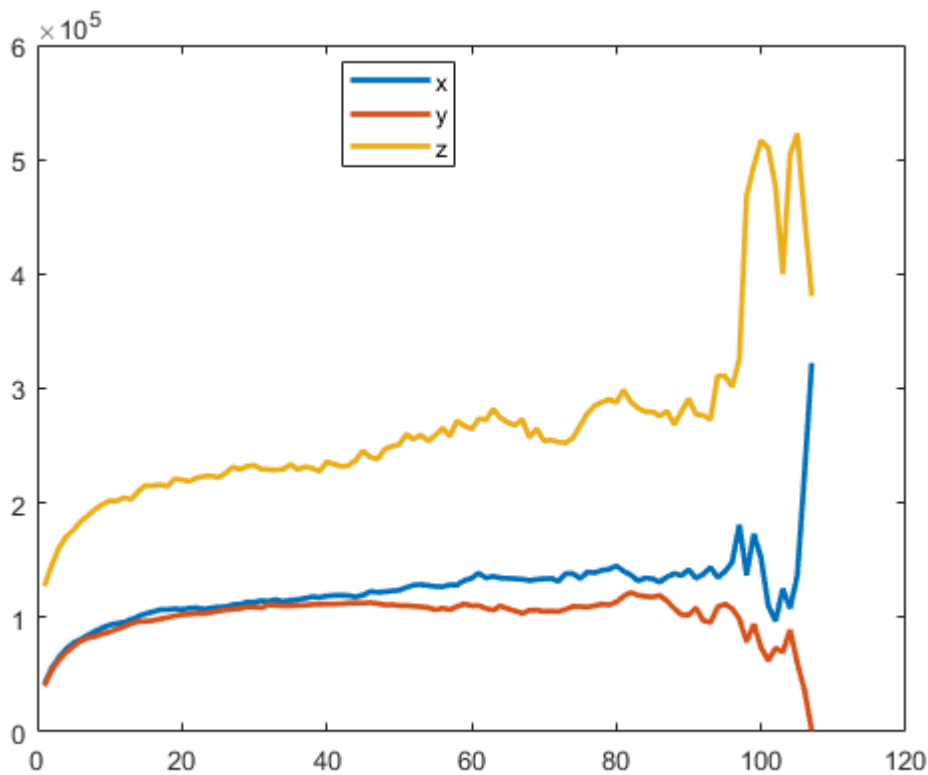
With using Bisection method can not get the correct parameter, we try to add the sampling frequency, and it becomes grid search method.

Import data and previewing

```
data_name='p47_5s'
```

```
data_name =
 'p47_5s'
```

```
load(['C:\Users\dell\Desktop\zq\MSDData4Quan_20210905\MSD_',data_name,'_All.mat'])
plot(MSD_p47_5s_All.MSD_PP,'LineWidth',2)
legend('x','y','z','Location',"best");
```


cut down the declining part, we delete all data after the maximum one.

```
Reserved_lengths=zeros(3,1);
experiment_interval=5
```

```
experiment_interval = 5
```

X part

```
%experiment_MSDX=eval(['MSD_',data_name,'_All']).MSD_PP(:,1);
%max_experiment_MSDX=max(experiment_MSDX);
Reserved_lengths(1,1)=find(MSD_p47_5s_All.MSD_PP(:,1)==max(MSD_p47_5s_All.MSD_PP(:,1)));
interceptive_experiment_MSDX=1e-18*MSD_p47_5s_All.MSD_PP(1:Reserved_lengths(1,1),1);
```

Y part

```
%Reserved_lengths(2,1)=find(eval(['MSD_',data_name,'_All']).MSD_PP(:,2)==max(eval(['MSD_',data_
%interceptive_experiment_MSDY=eval(['MSD_',data_name,'_All']).MSD_PP(1:Reserved_lengths(2,1),2)
```

Z part

```
%Reserved_lengths(3,1)=find(eval(['MSD_',data_name,'_All']).MSD_PP(:,3)==max(eval(['MSD_',data_
%interceptive_experiment_MSDZ=eval(['MSD_',data_name,'_All']).MSD_PP(1:Reserved_lengths,3);
```

Data Importing

import Time interval

```
delta=0.1;
```

import Total_experiment_number

```
Total_experiment_number=1000;
```

data import

```
Reserved_length=Reserved_lengths(1,1);
interceptive_experiment_MSD=interceptive_experiment_MSDX;
```

Initilizing parameter ranges

initialize H range

```
%H_min=0.52
%H_max=1.0
H=0.75
```

```
H = 0.7500
```

initialize m range

```
m_min=2.08929613085404e-09
```

```
m_min = 2.0893e-09
```

```
m_max=9.12010839355909e-09
```

```
m_max = 9.1201e-09
```

initialize psi range

```
psi_min=5.49280271653059e-08
```

```
psi_min = 5.4928e-08
```

```
psi_max=1.65722700866999e-06
```

```
psi_max = 1.6572e-06
```

initialize zeta range

```
zeta_min=1.97659458086867e-08
```

```
zeta_min = 1.9766e-08
```

```
zeta_max=7.72240903048428e-08
```

```
zeta_max = 7.7224e-08
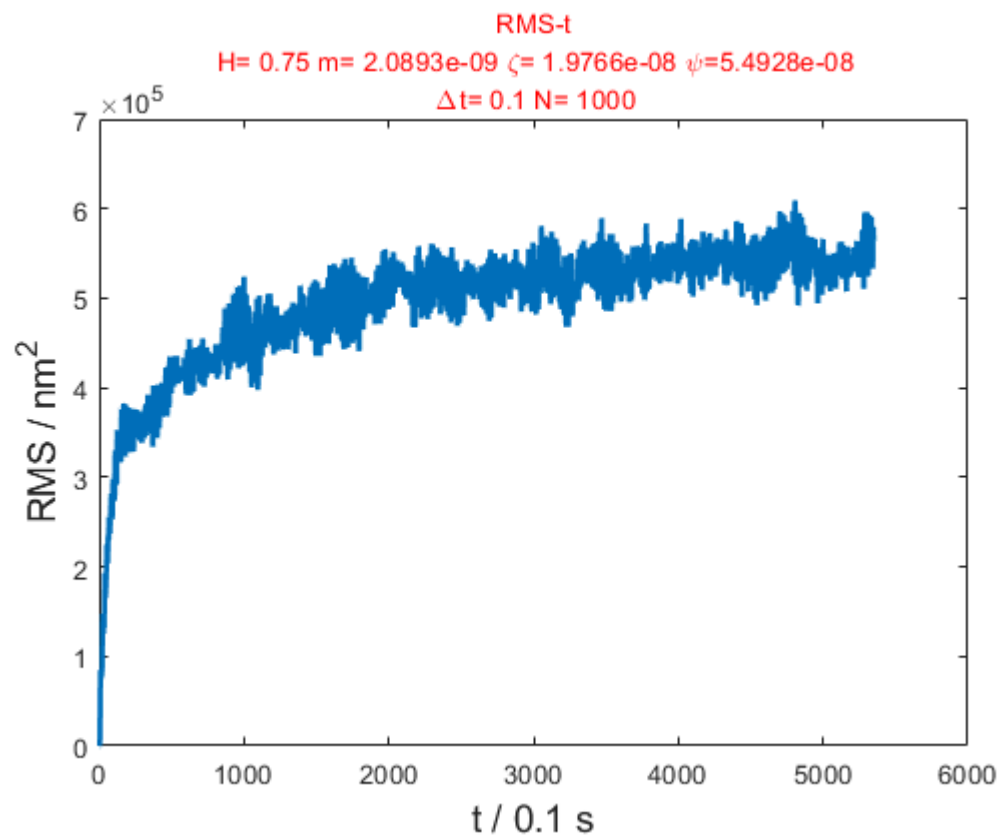```

## Initilaize grid searching

```
sampling_frequency=5;
sample_m=zeros(sampling_frequency,1);
sample_psi=zeros(sampling_frequency,1);
sample_zeta=zeros(sampling_frequency,1);
for i=1:sampling_frequency
    sample_m(i)=exp(log(m_min)+(log(m_max)-log(m_min))*(i-1)/sampling_frequency);
    sample_psi(i)=exp(log(psi_min)+(log(psi_max)-log(psi_min))*(i-1)/sampling_frequency);
    sample_zeta(i)=exp(log(zeta_min)+(log(zeta_max)-log(zeta_min))*(i-1)/sampling_frequency);
end
residual_compare=zeros(sampling_frequency,sampling_frequency,sampling_frequency);
for i_m=1:sampling_frequency
    m=sample_m(i_m);
    for i_psi=1:sampling_frequency
        psi=sample_psi(i_psi,1);
        for i_zeta=1:sampling_frequency
            zeta=sample_zeta(i_zeta,1);
            disp(['trying i_m=',num2str(i_m,1),', trying i_\psi=',num2str(i_psi),', trying i_\z
            residual_compare(i_m,i_psi,i_zeta)=function_residual_calculating_fv1(Reserved_lengt
        end
    end
end
```

```
trying i_m=1, trying i_\psi=1, trying i_\zeta=1, total sampling number=5
progress rate  10 %
progress rate  20 %
```
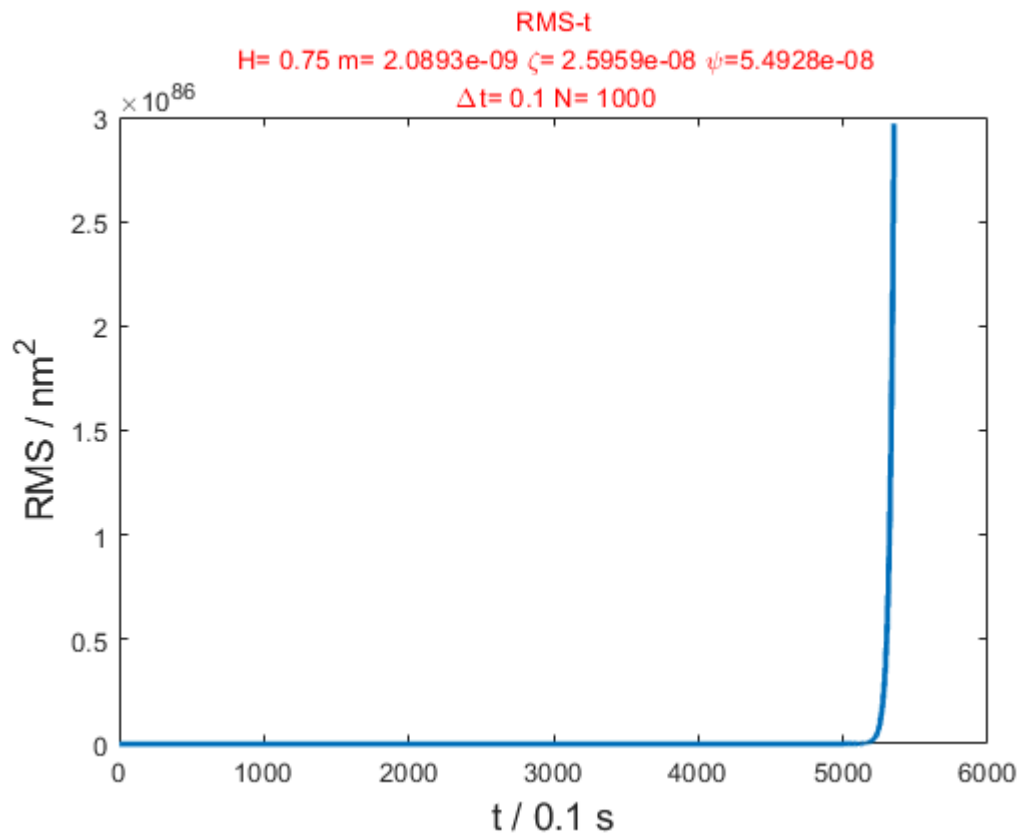
```
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t

H= 0.75 m= 2.0893e-09 ζ= 1.9766e-08 ψ=5.4928e-08

Δt= 0.1 N= 1000

```
trying i_m=1, trying i_\psi=1, trying i_\zeta=2, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
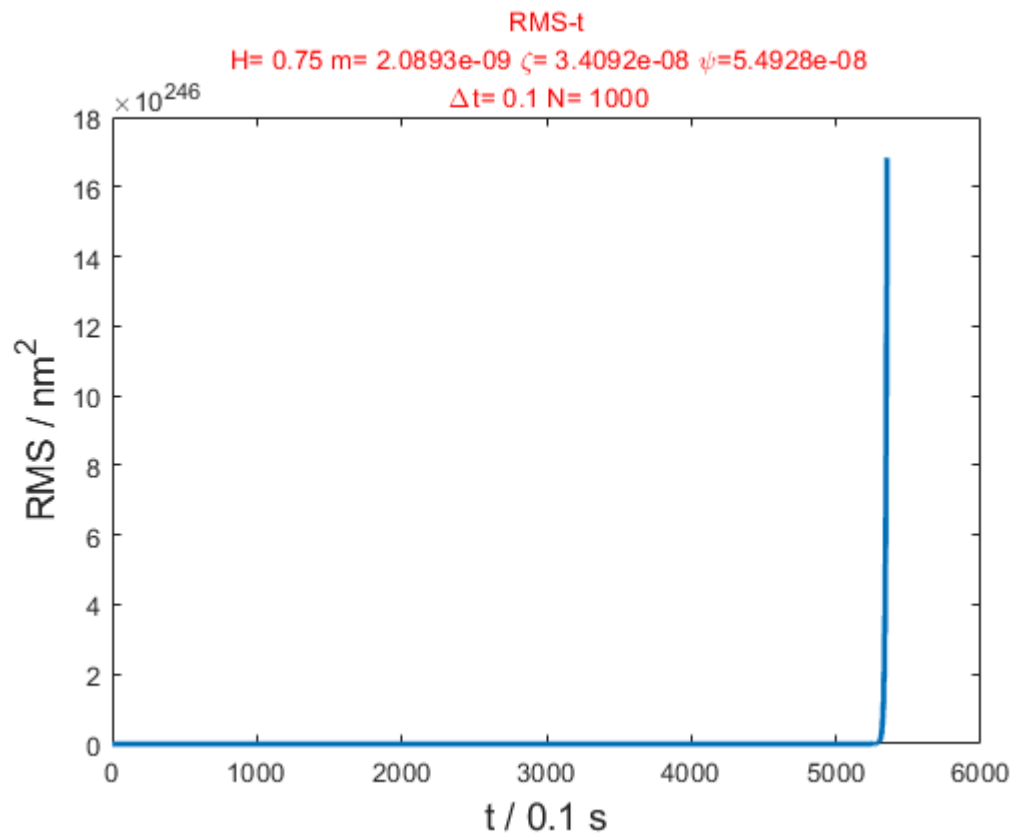
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 2.5959e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=1, trying i_\zeta=3, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
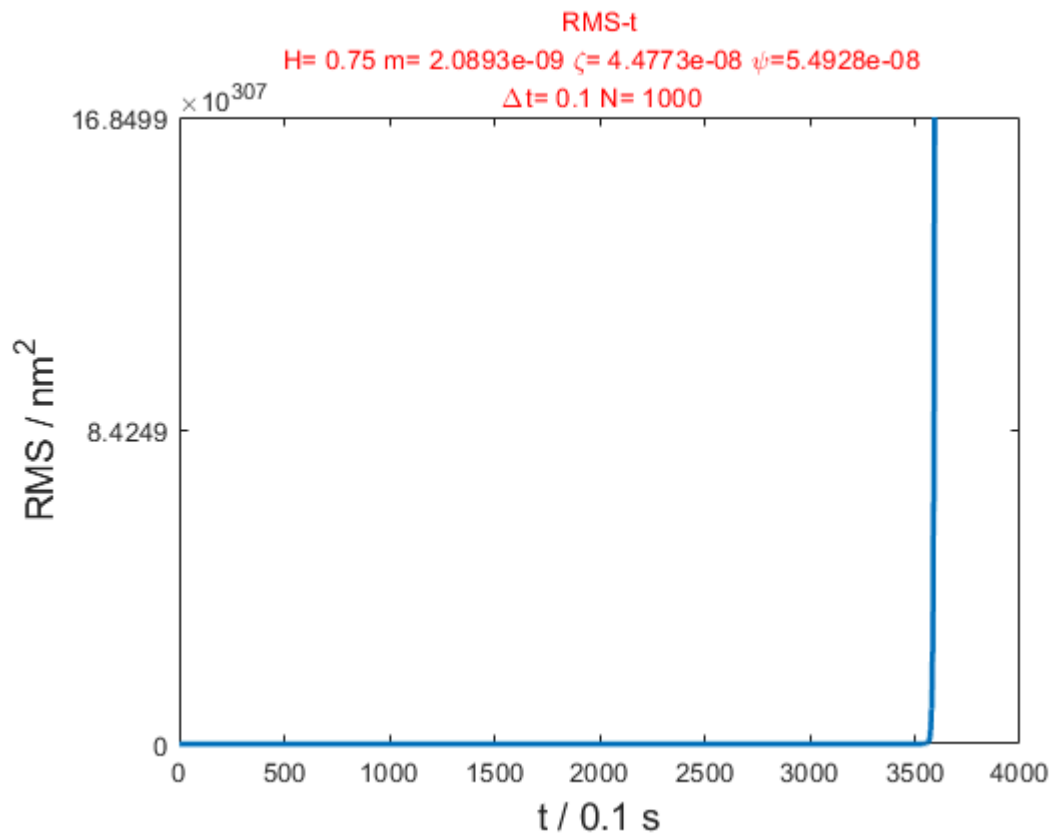
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 3.4092e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=1, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
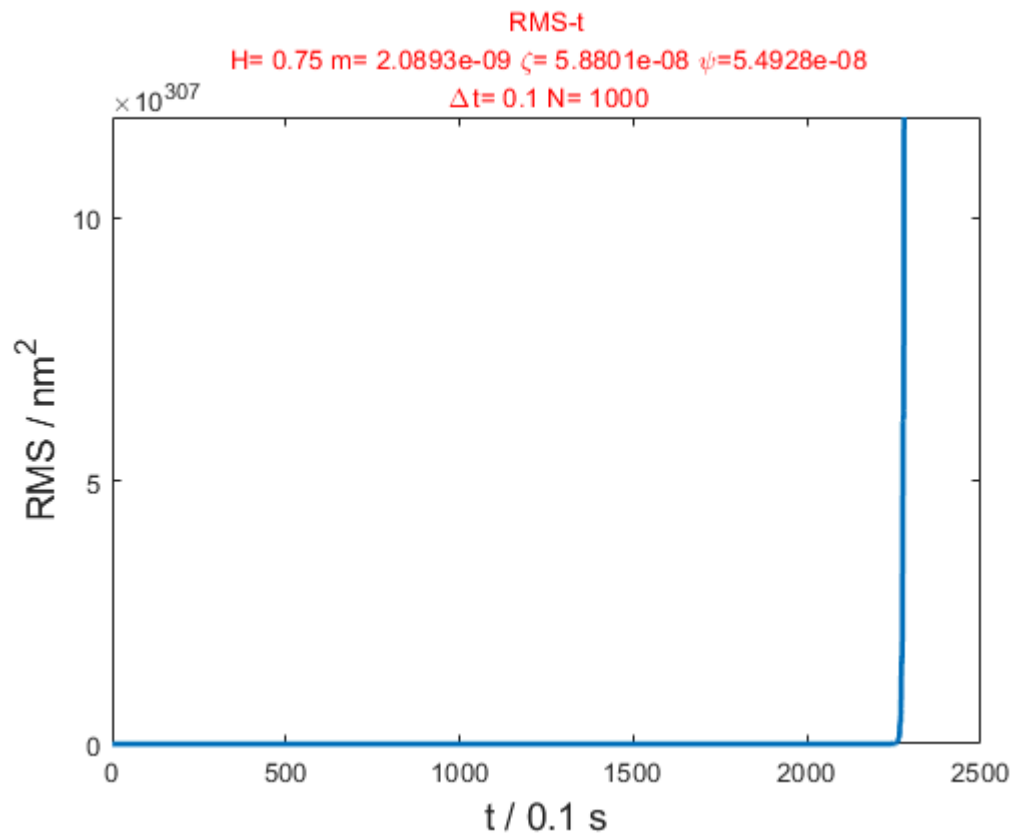
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 4.4773e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=1, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
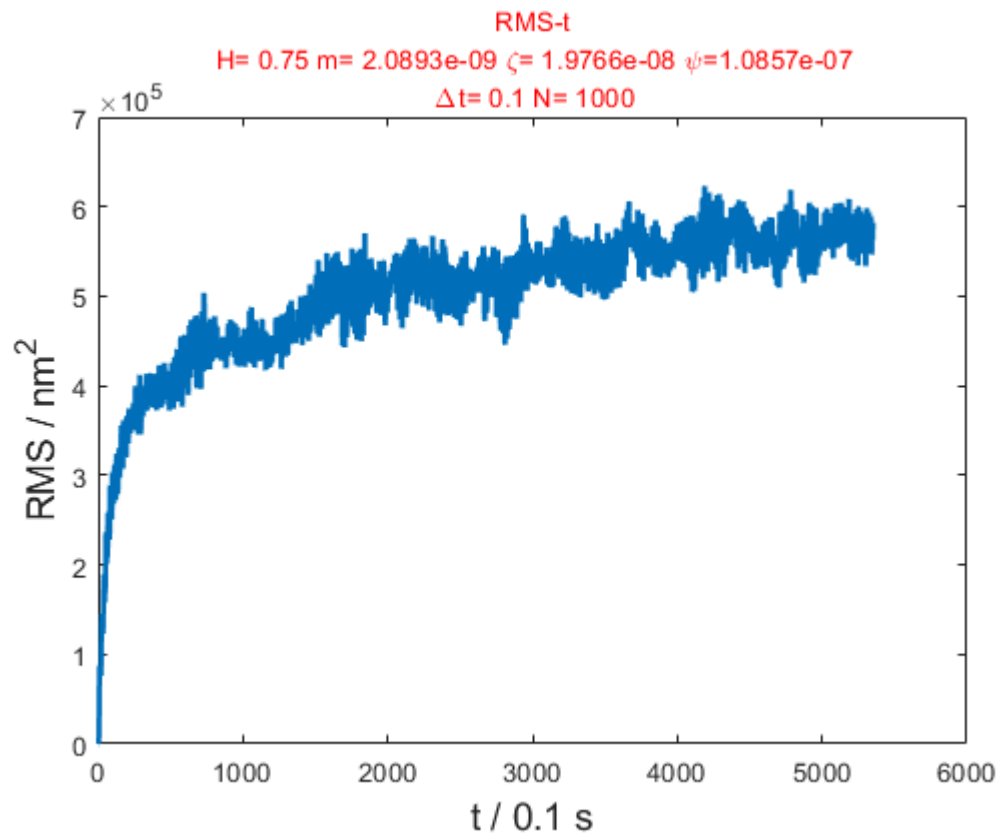
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 5.8801e-08 ψ=5.4928e-08
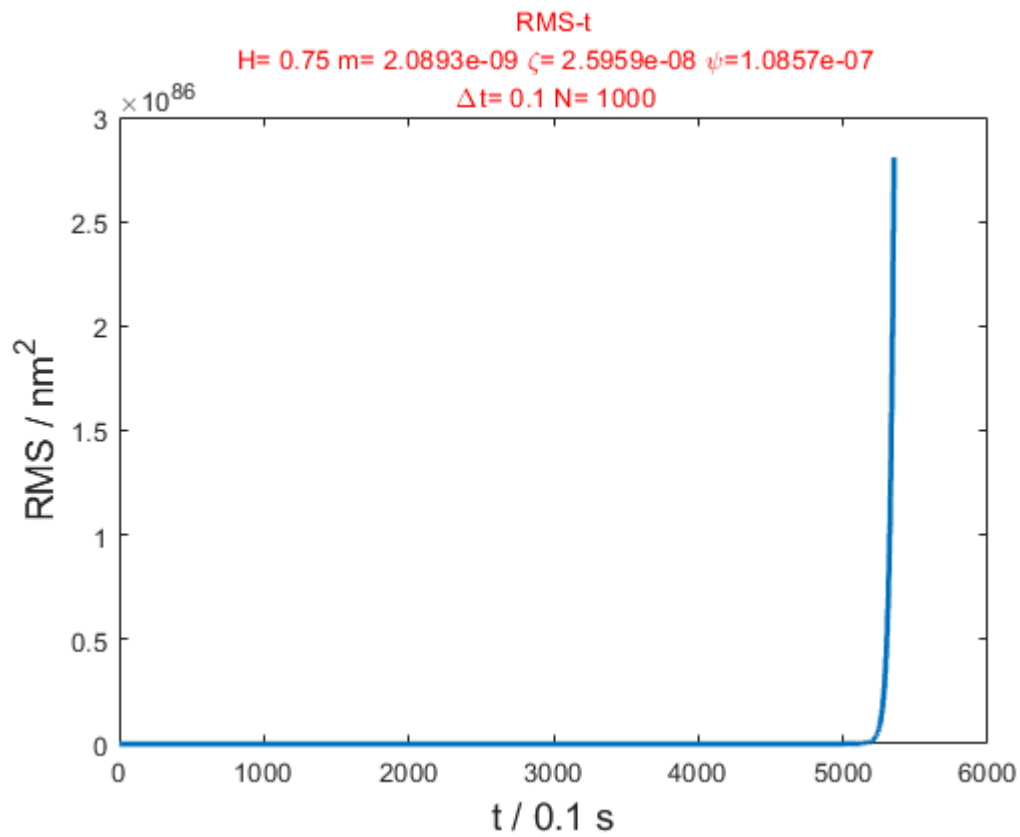Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=2, trying i_\zeta=1, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 1.9766e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=1, trying i_\psi=2, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
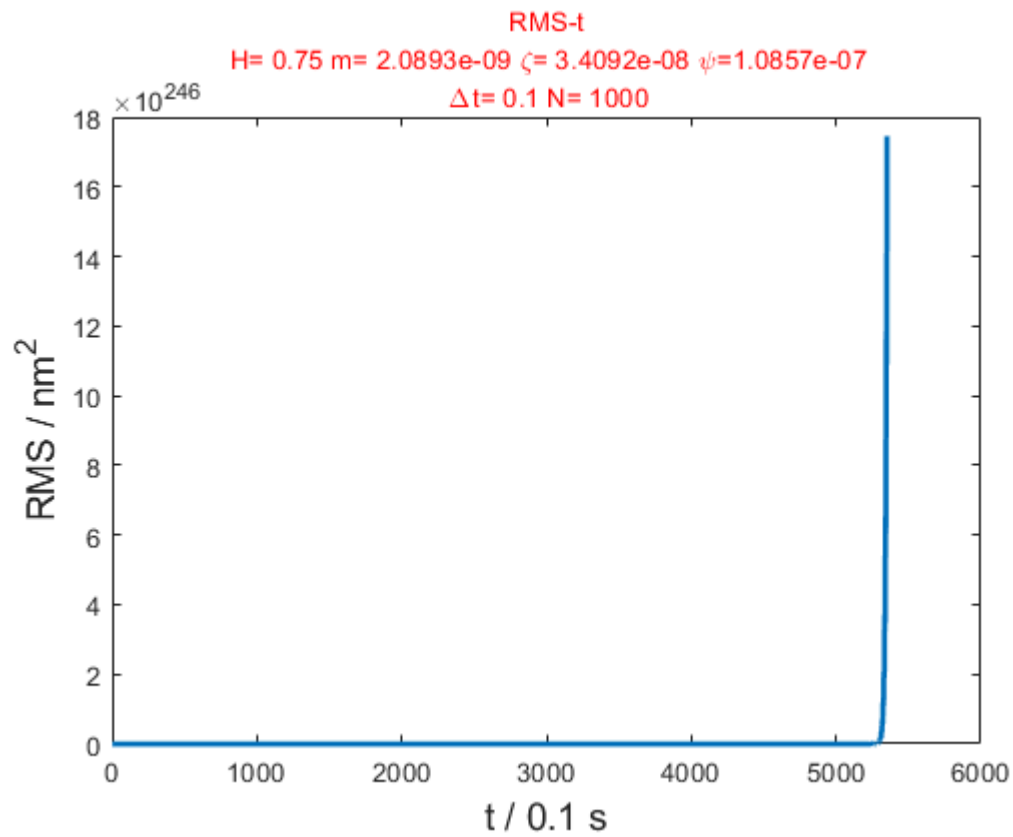
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 2.5959e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=2, trying i_\zeta=3, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
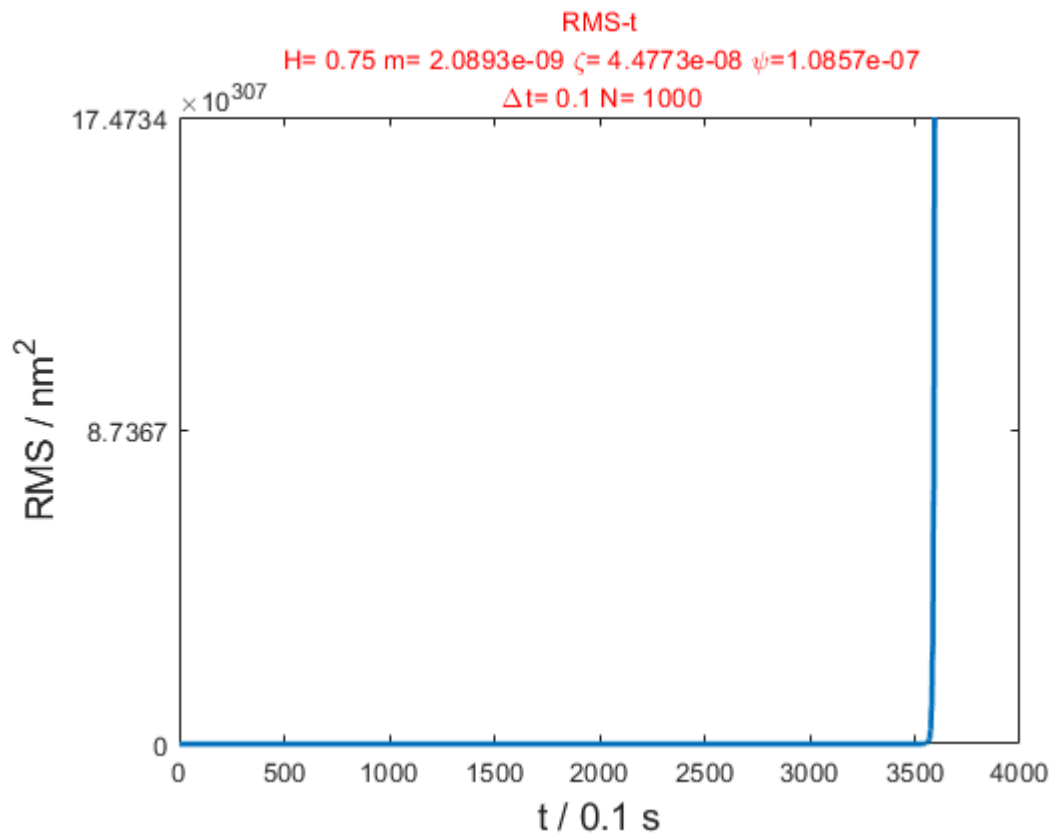
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 3.4092e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=2, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
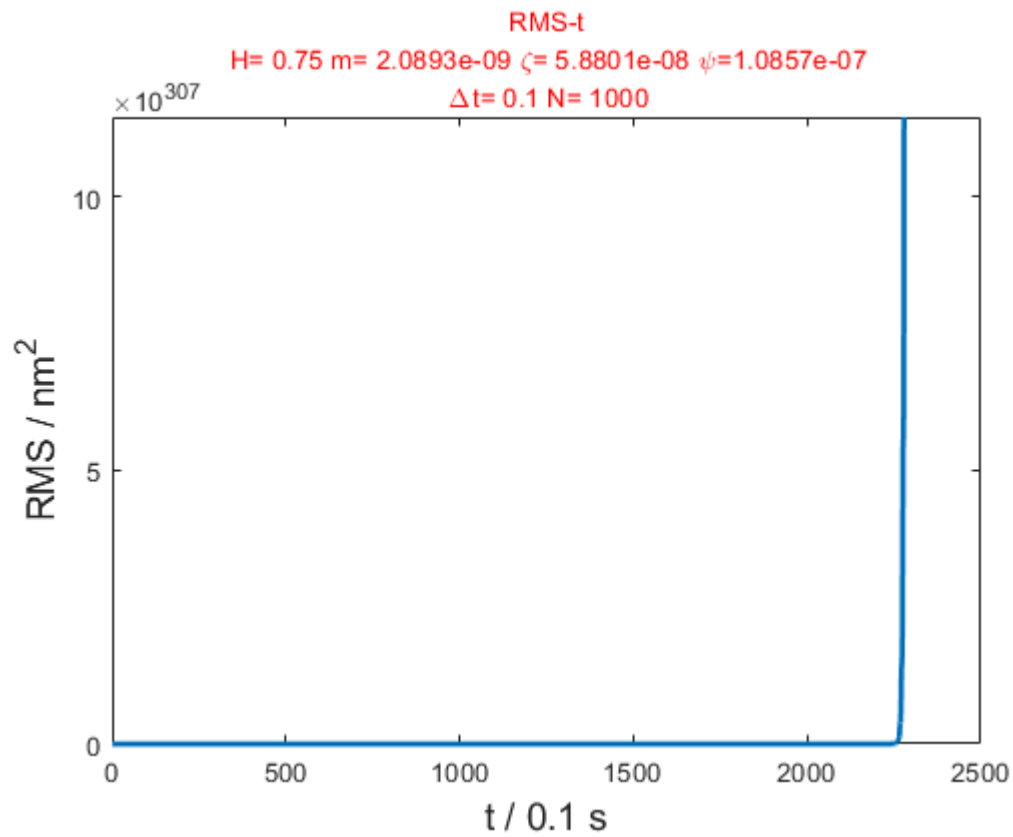
RMS-t

H= 0.75 m= 2.0893e-09 ζ= 4.4773e-08 ψ=1.0857e-07

Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=2, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
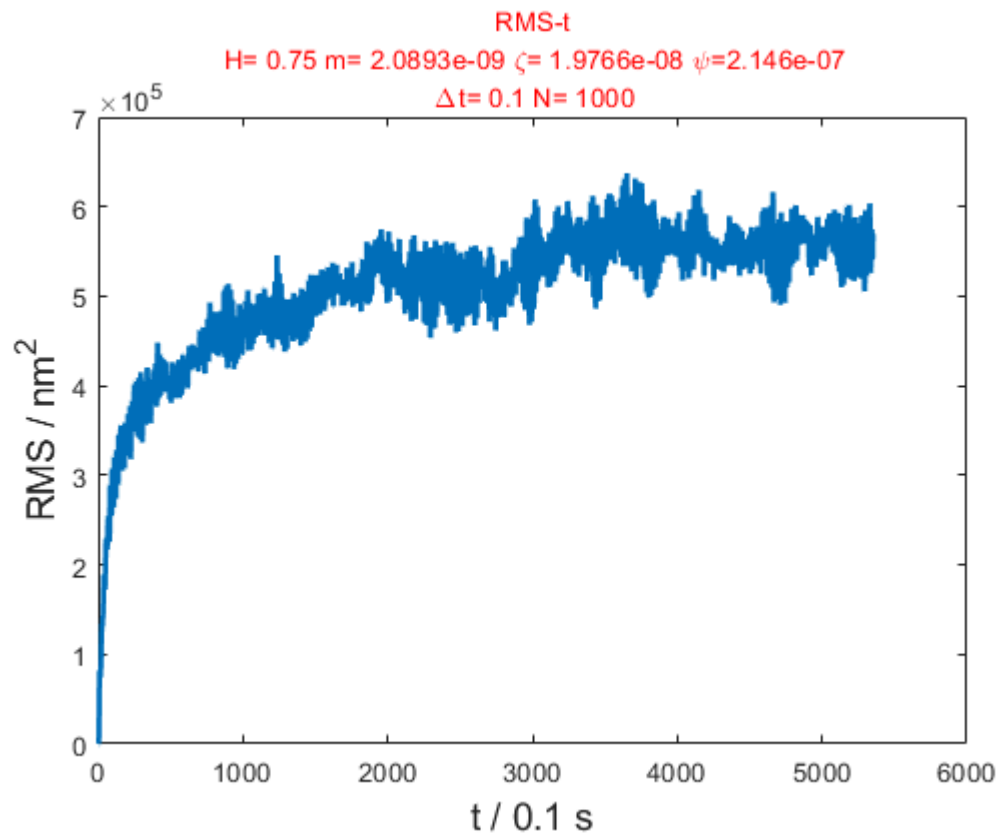
12

RMS-t

H= 0.75 m= 2.0893e-09 ζ= 5.8801e-08 ψ=1.0857e-07

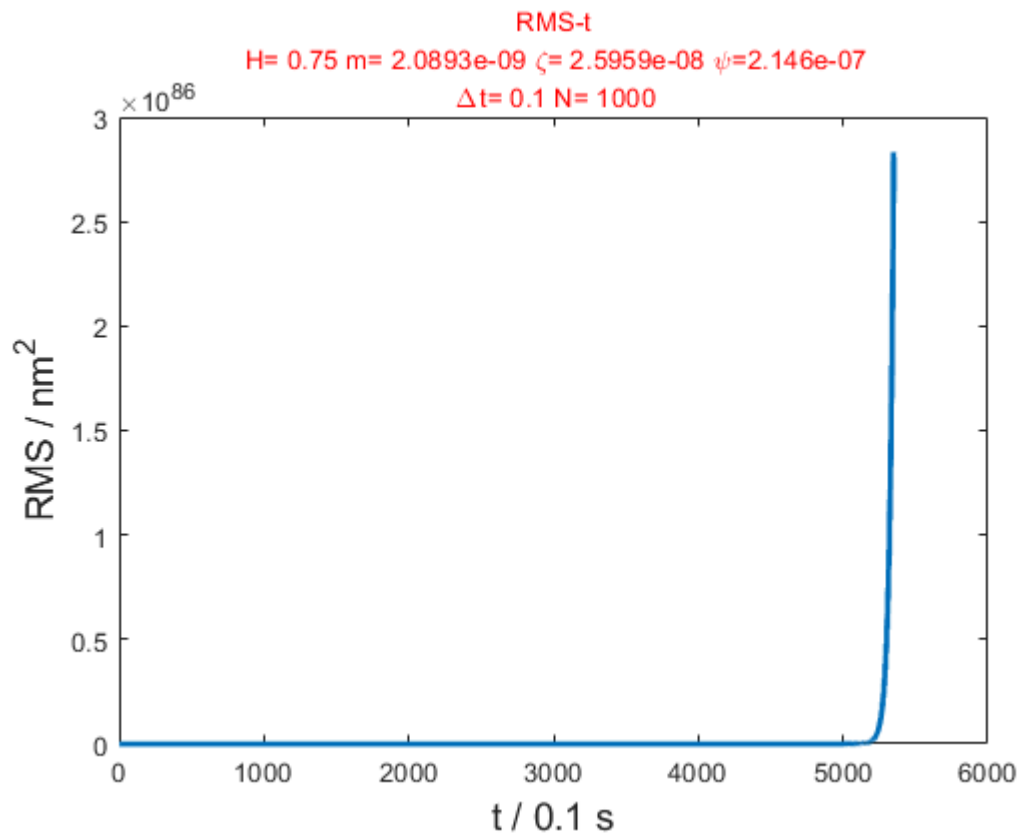Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=3, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 1.9766e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=1, trying i_\psi=3, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
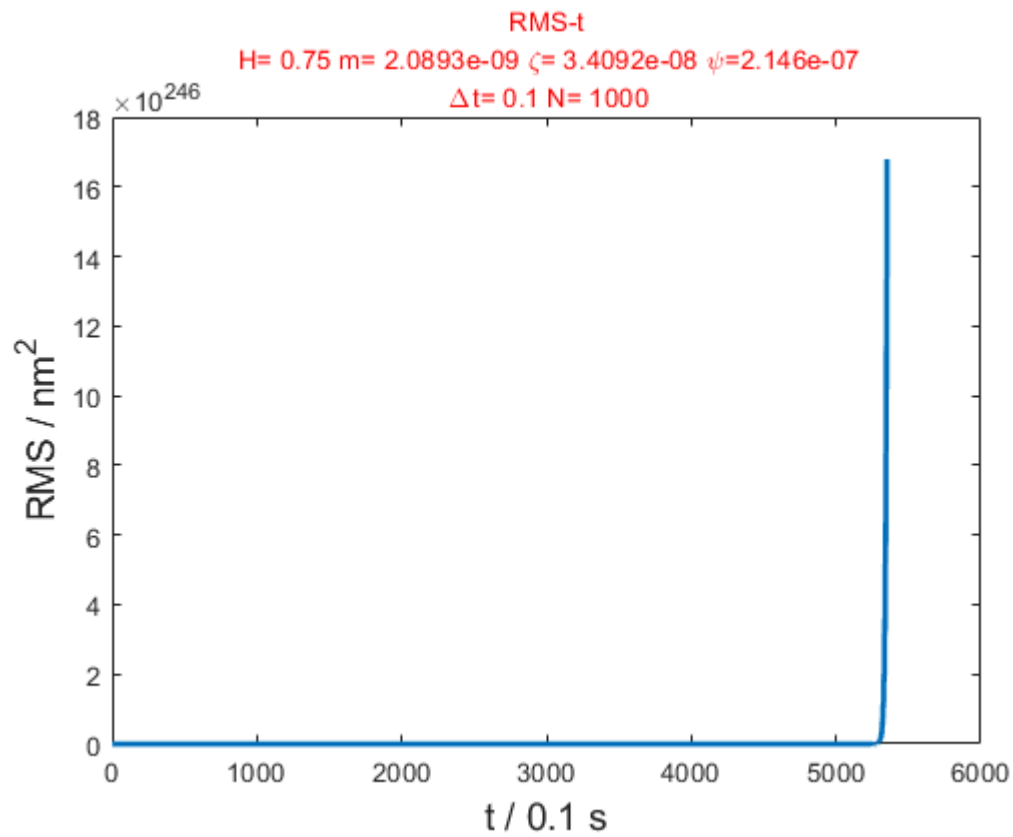
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 2.5959e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=3, trying i_\zeta=3, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
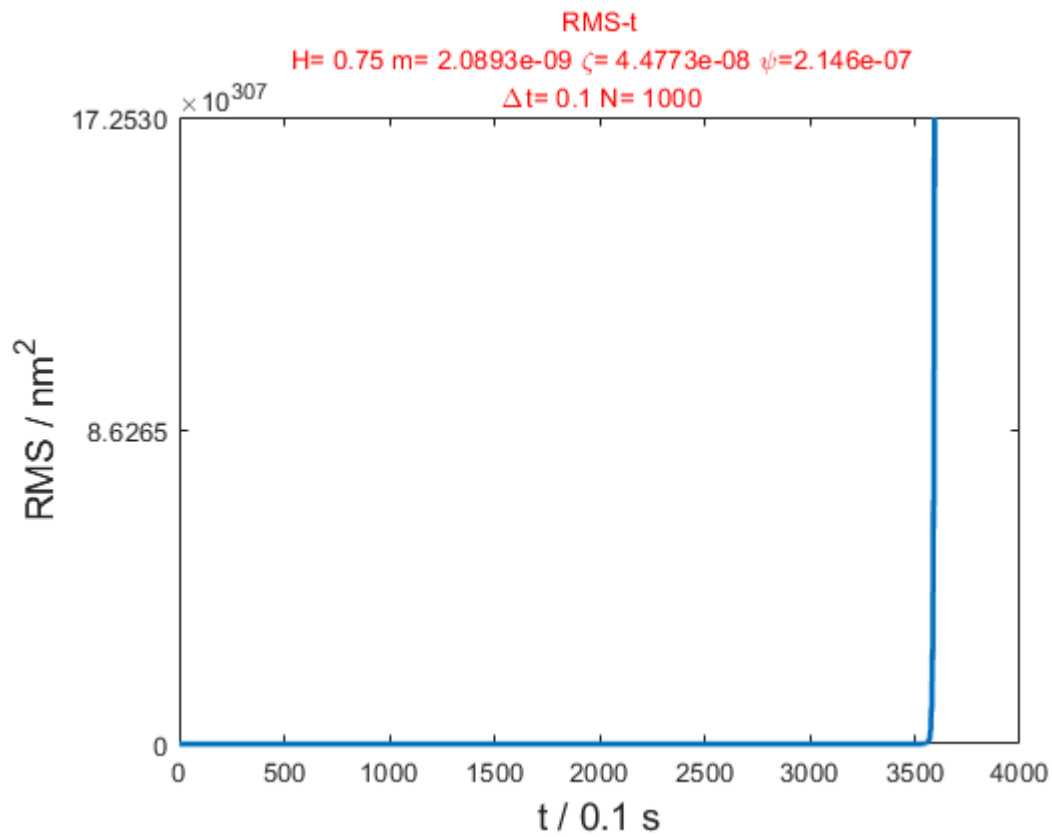
15

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 3.4092e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=3, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
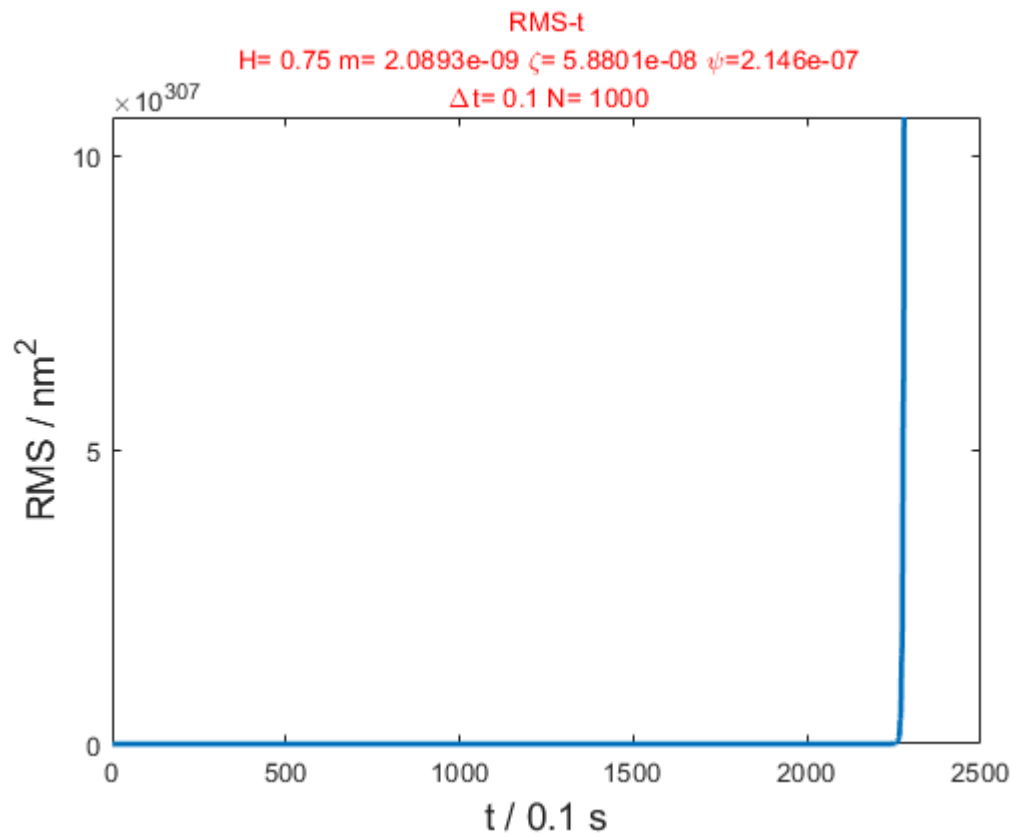
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 4.4773e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=3, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
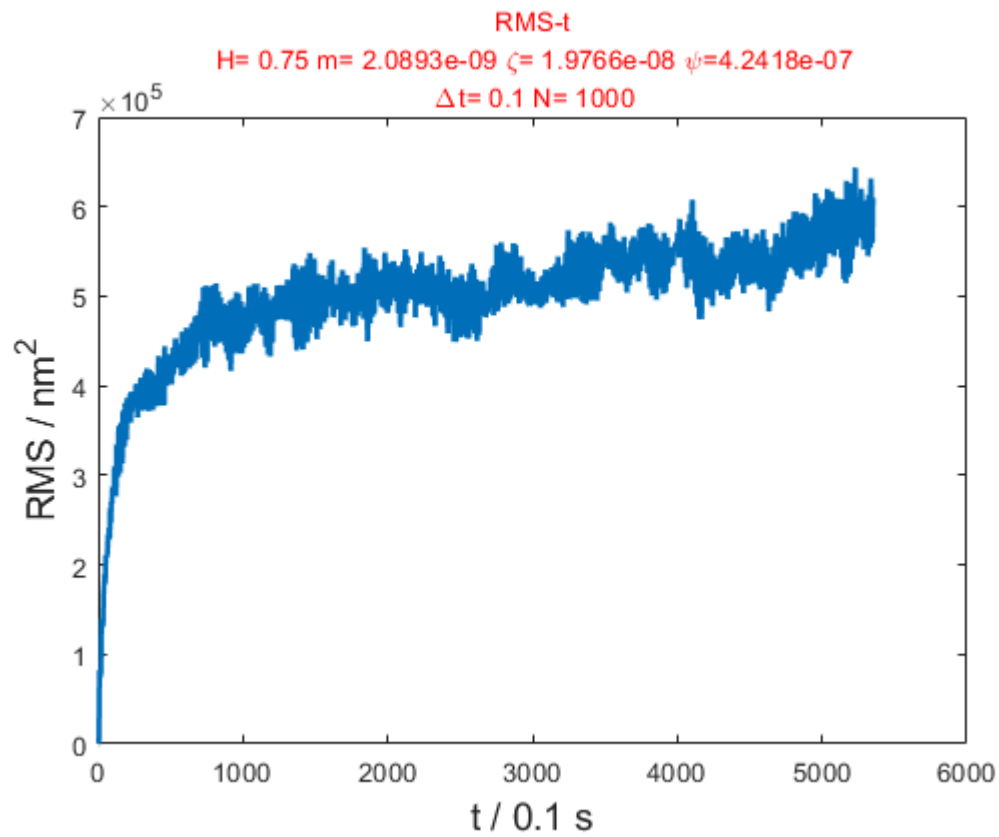
17

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 5.8801e-08 ψ=2.146e-07
Δt= 0.1 N= 1000
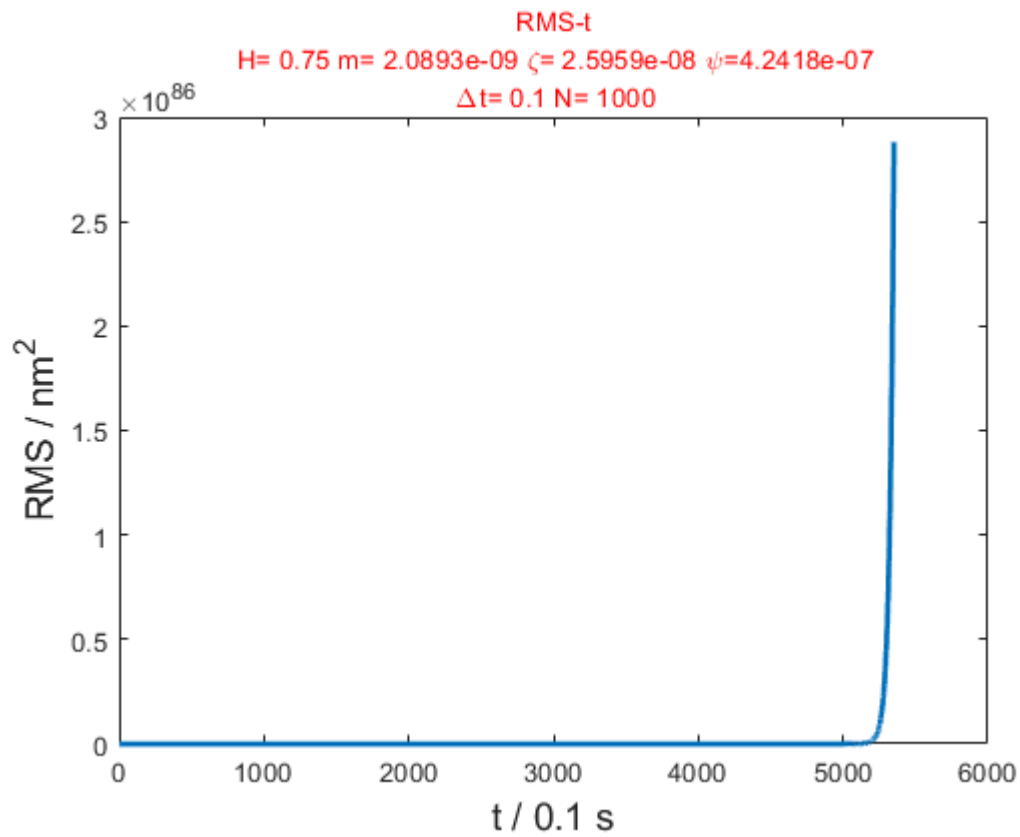
```
explosion!
trying i_m=1, trying i_\psi=4, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 1.9766e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=1, trying i_\psi=4, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
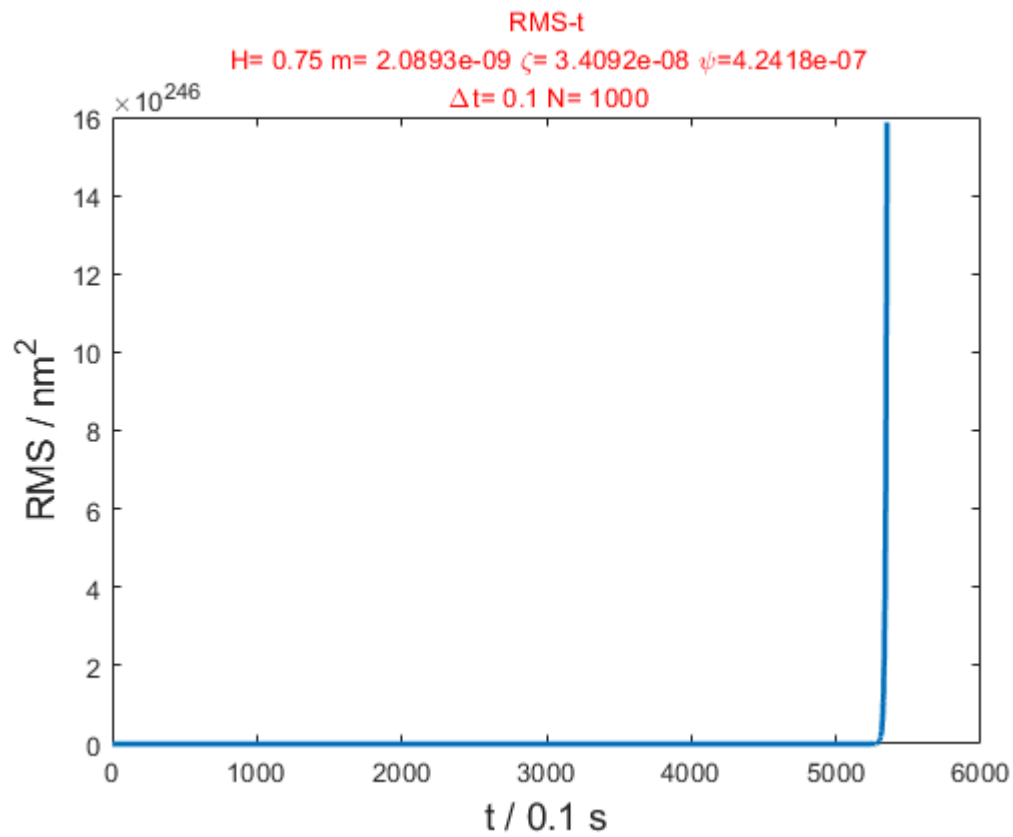
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 2.5959e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=4, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
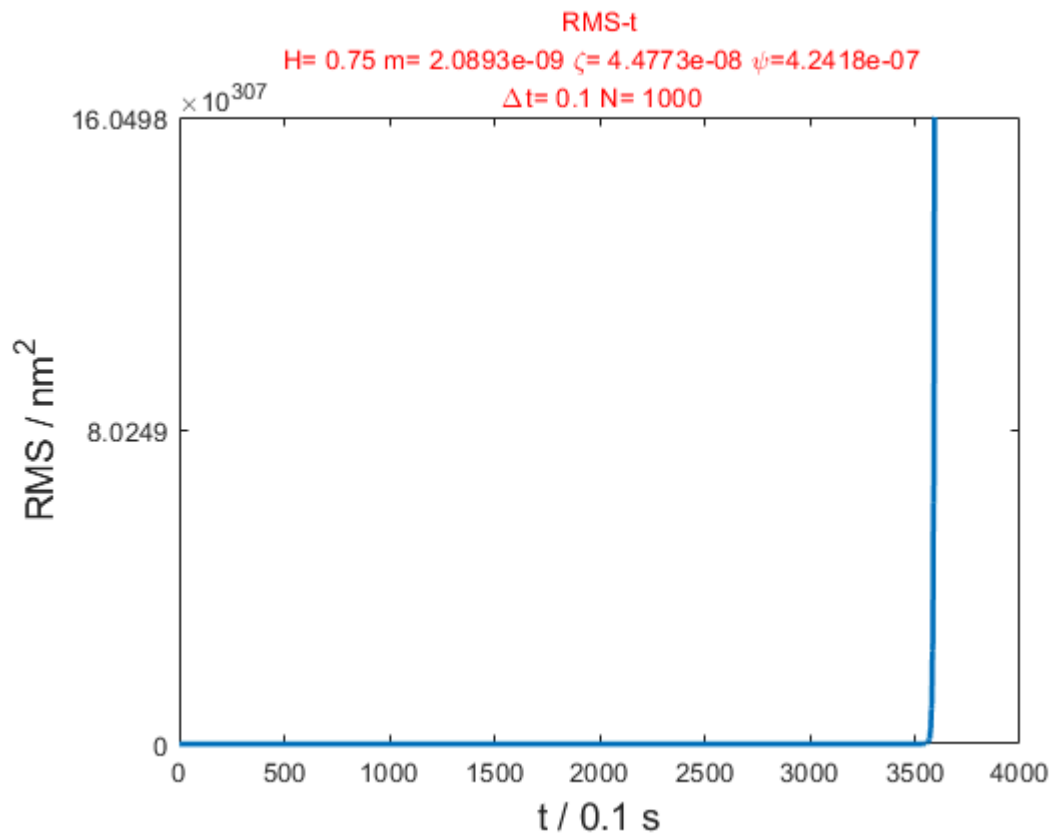
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 3.4092e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=4, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
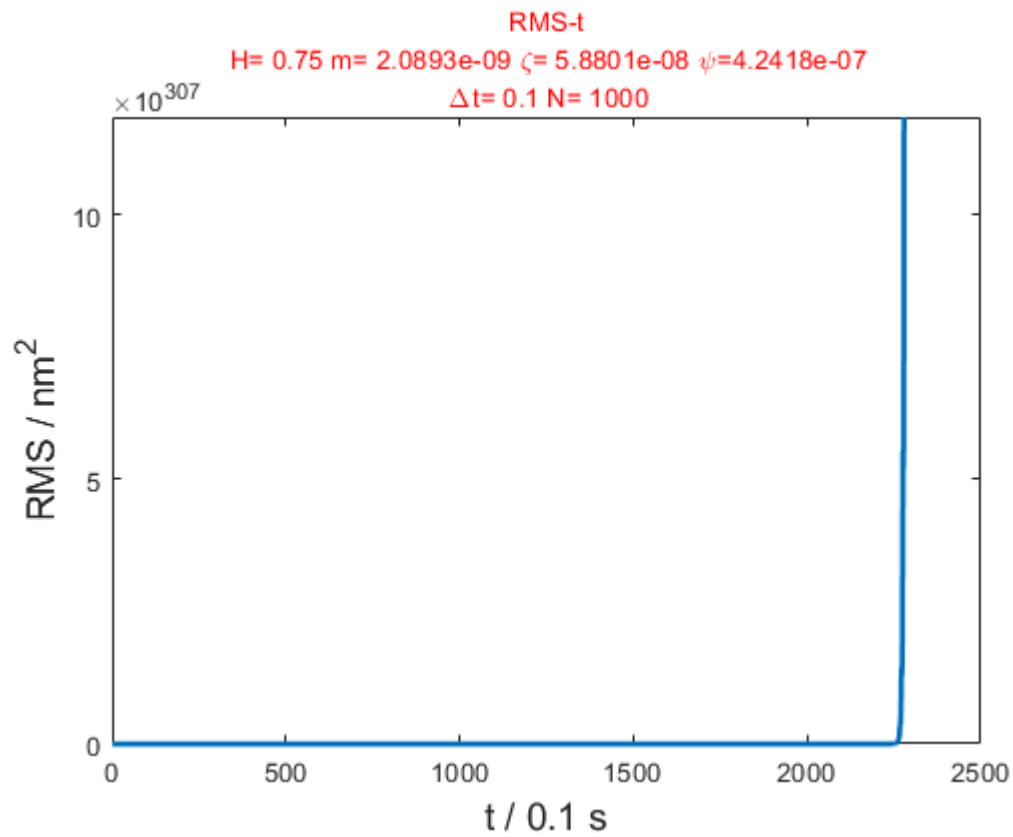
RMS-t

$H= 0.75$ $m= 2.0893e\text{-}09$ $\zeta= 4.4773e\text{-}08$ $\psi=4.2418e\text{-}07$

$\Delta t= 0.1$ $N= 1000$

explosion!

trying i_m=1, trying i_\psi=4, trying i_\zeta=5, total sampling number=5
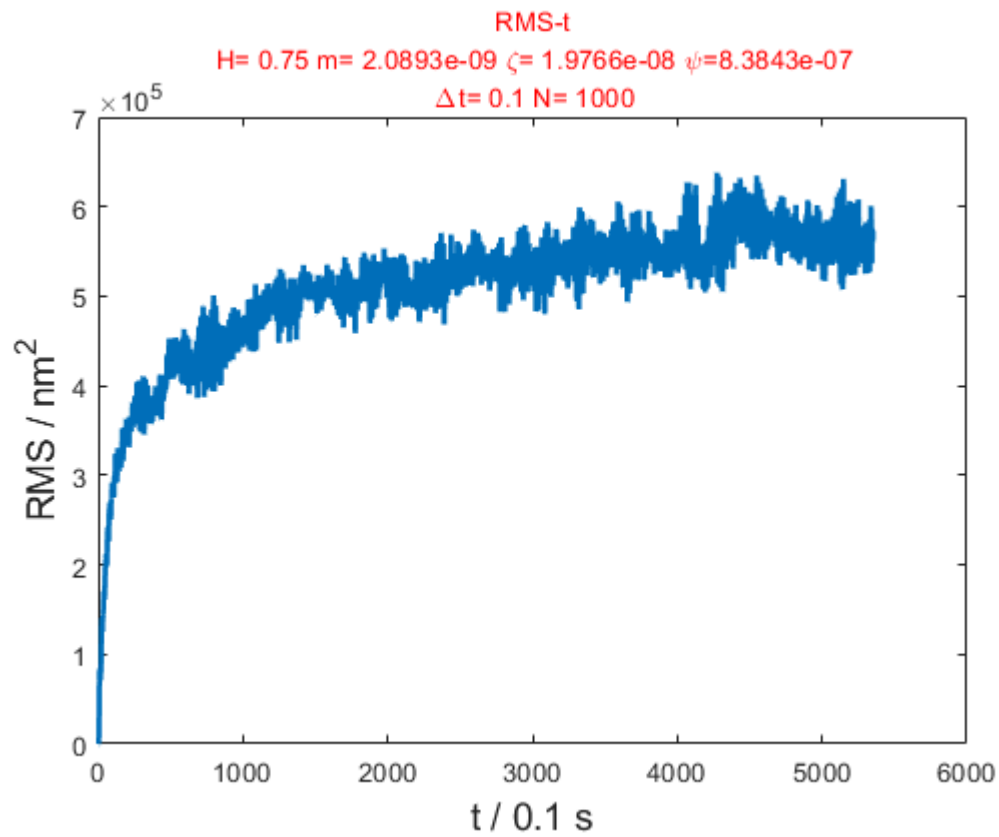
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 5.8801e-08 ψ=4.2418e-07
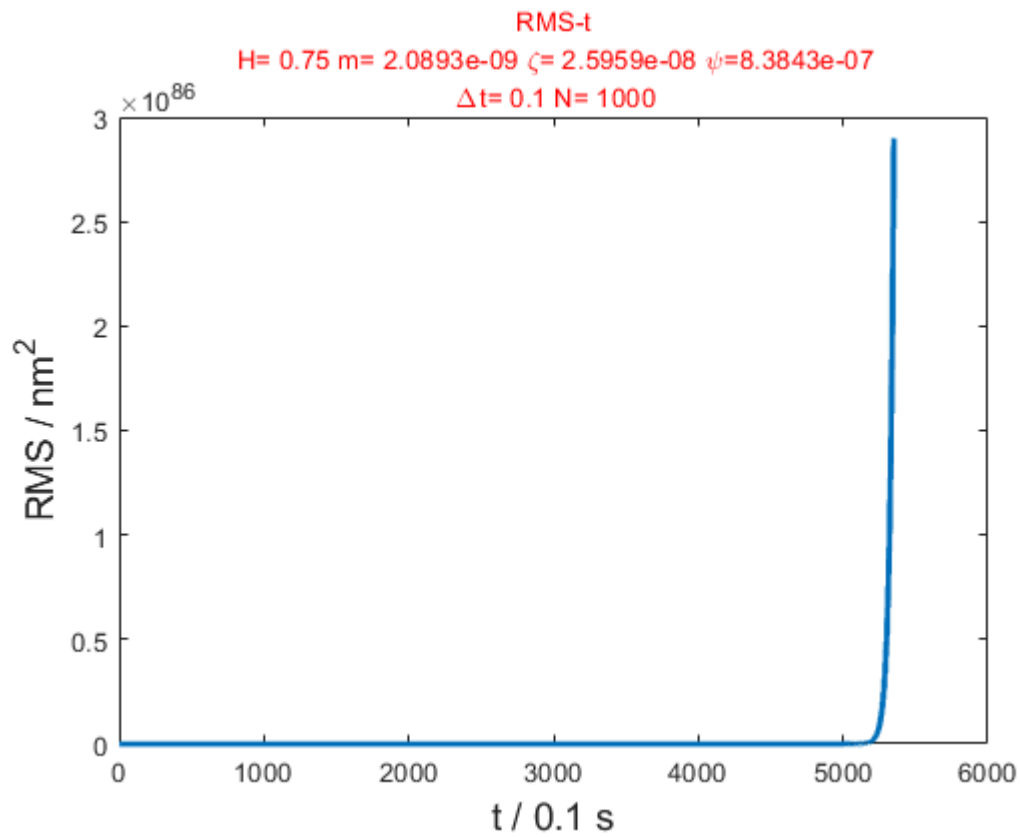Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=5, trying i_\zeta=1, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```

RMS-t
H= 0.75 m= 2.0893e-09 ζ= 1.9766e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
trying i_m=1, trying i_\psi=5, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
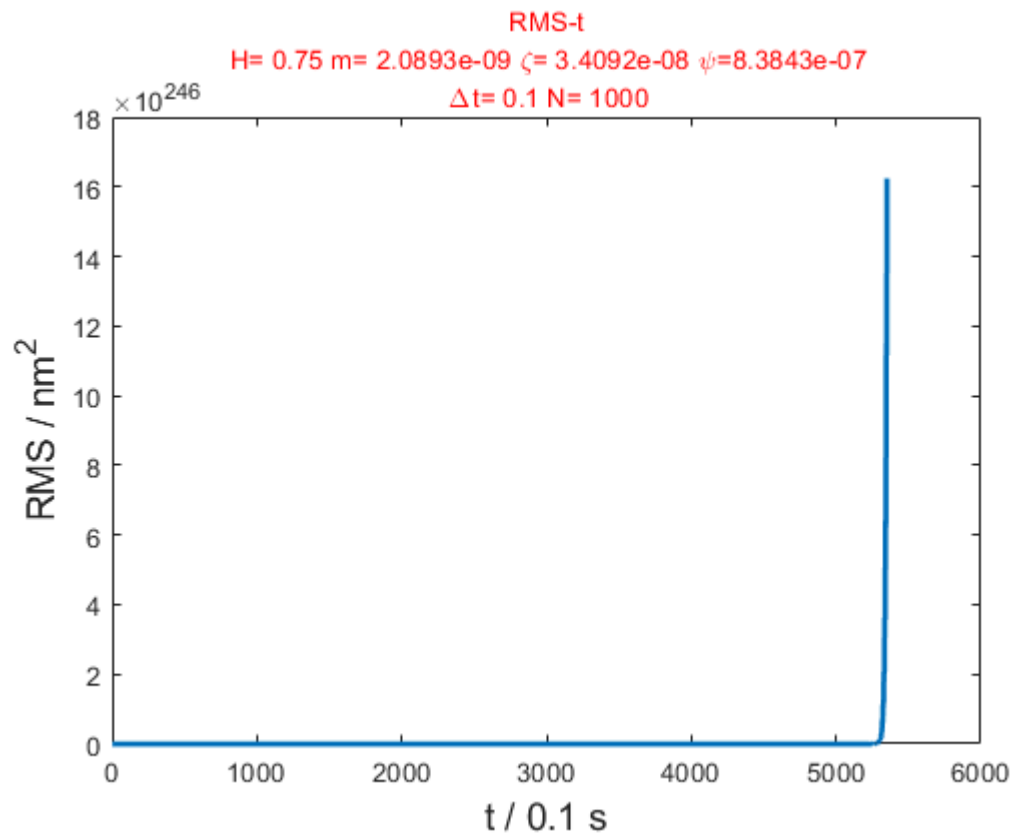
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 2.5959e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=5, trying i_\zeta=3, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
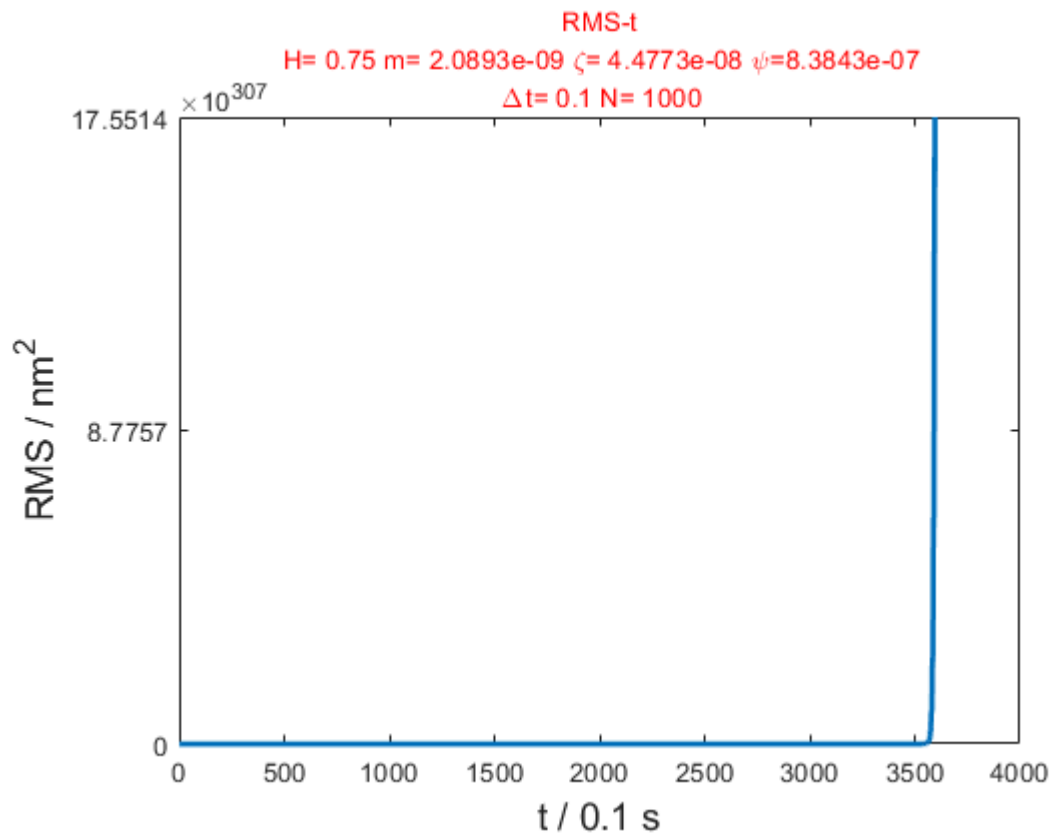
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 3.4092e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=5, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
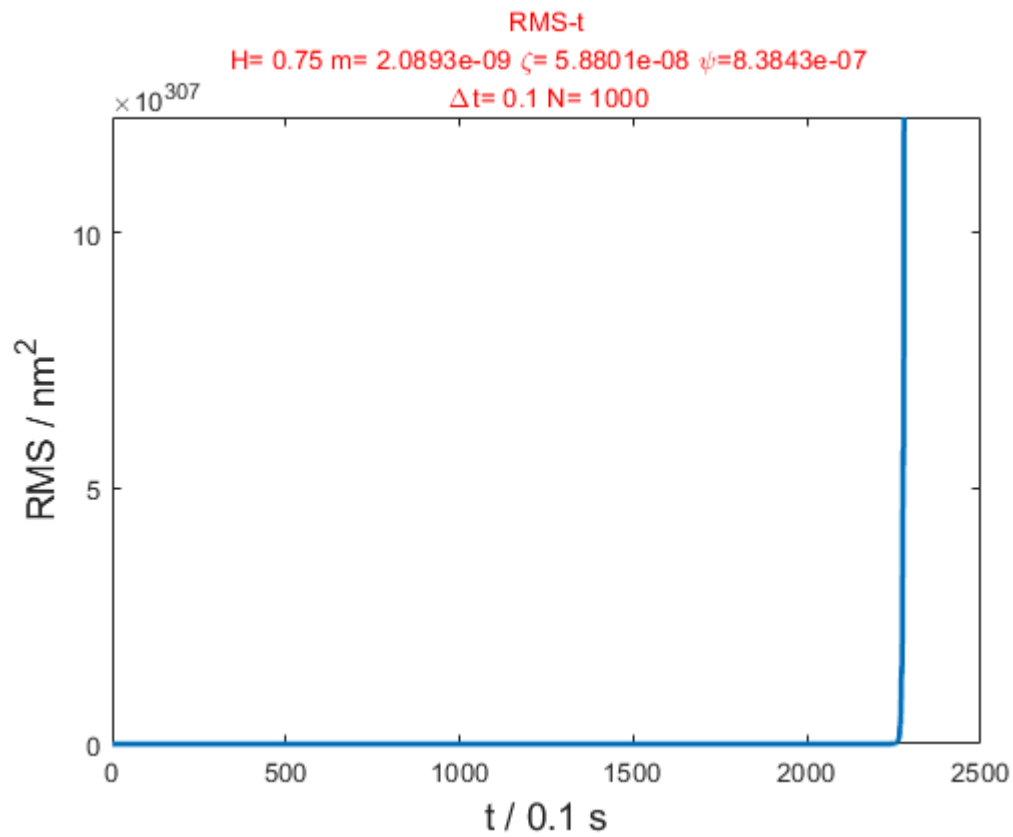
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 4.4773e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=1, trying i_\psi=5, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
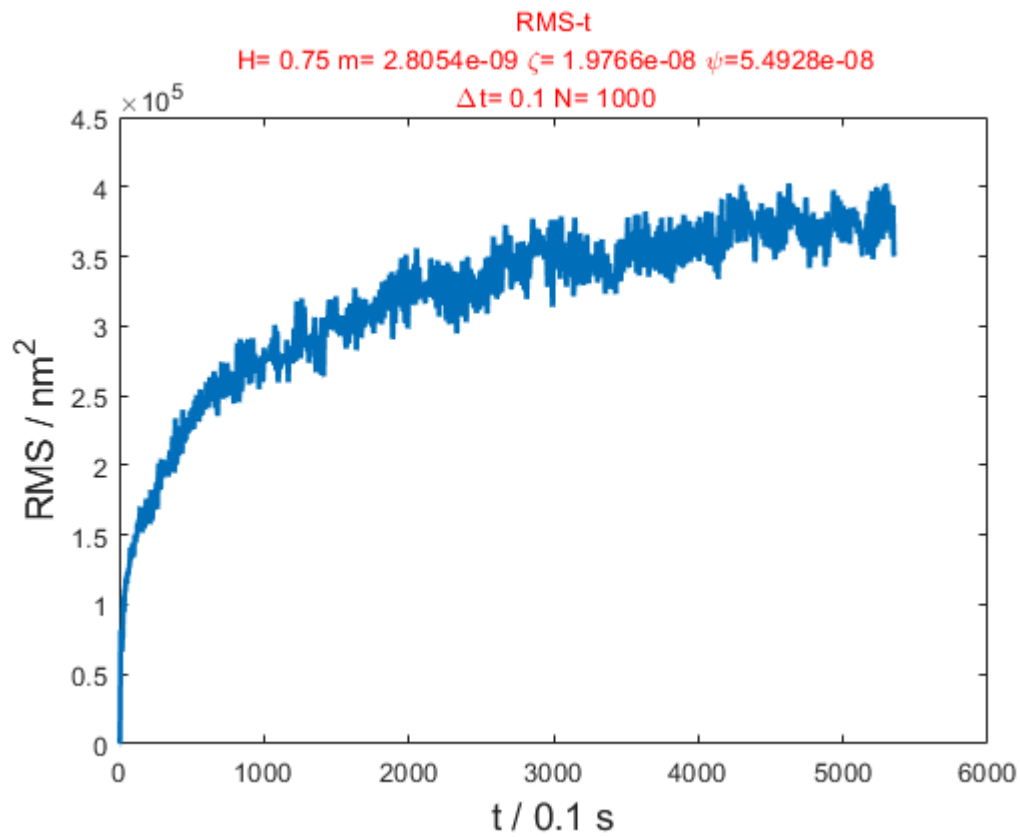
RMS-t
H= 0.75 m= 2.0893e-09 ζ= 5.8801e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000
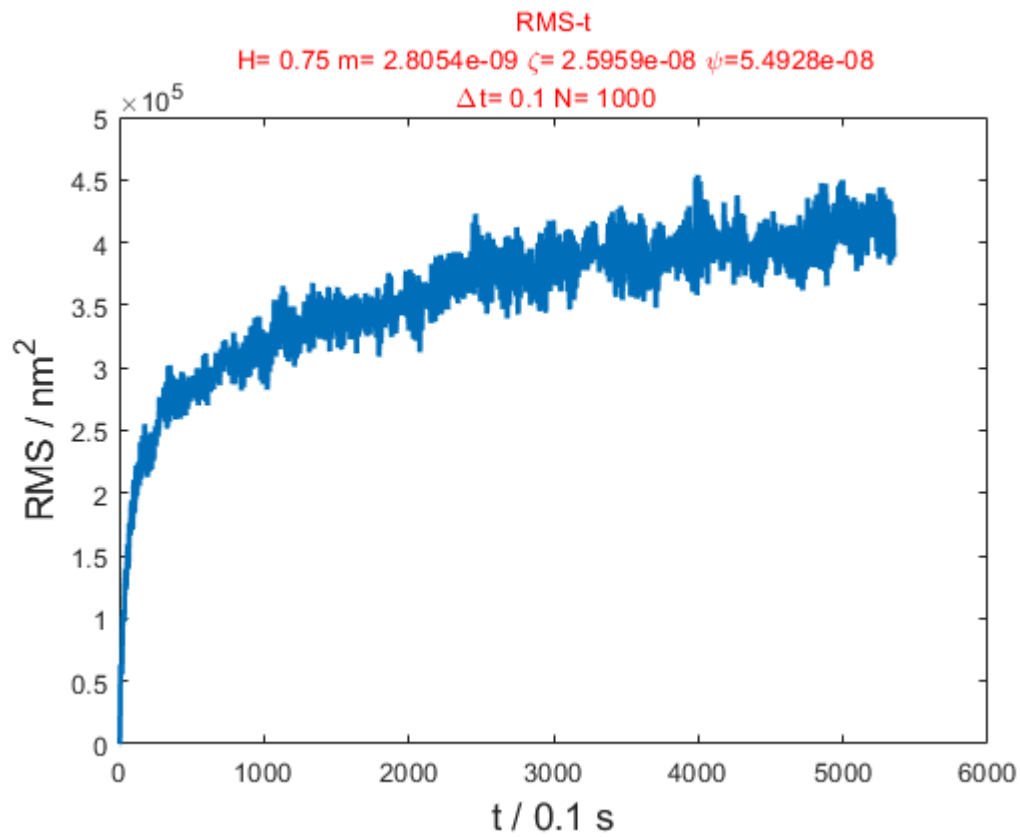
explosion!

trying i_m=2, trying i_\psi=1, trying i_\zeta=1, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 1.9766e-08 ψ=5.4928e-08
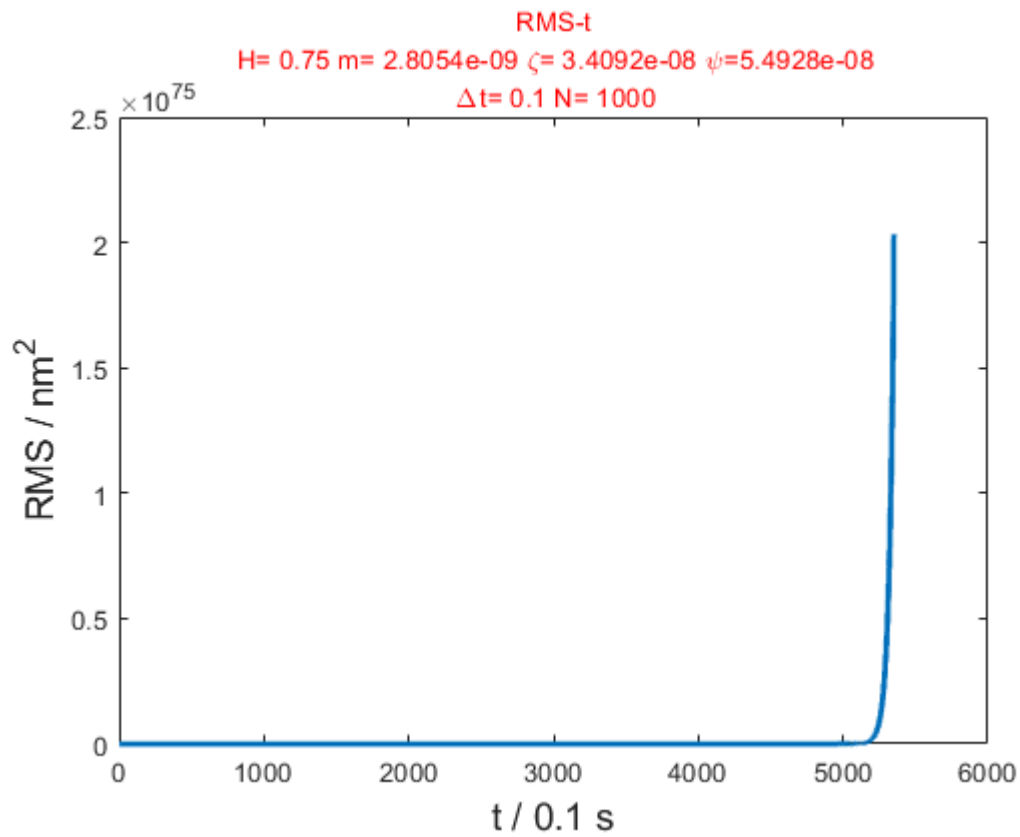**Δt= 0.1 N= 1000**

```
trying i_m=2, trying i_\psi=1, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 2.5959e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=1, trying i_\zeta=3, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
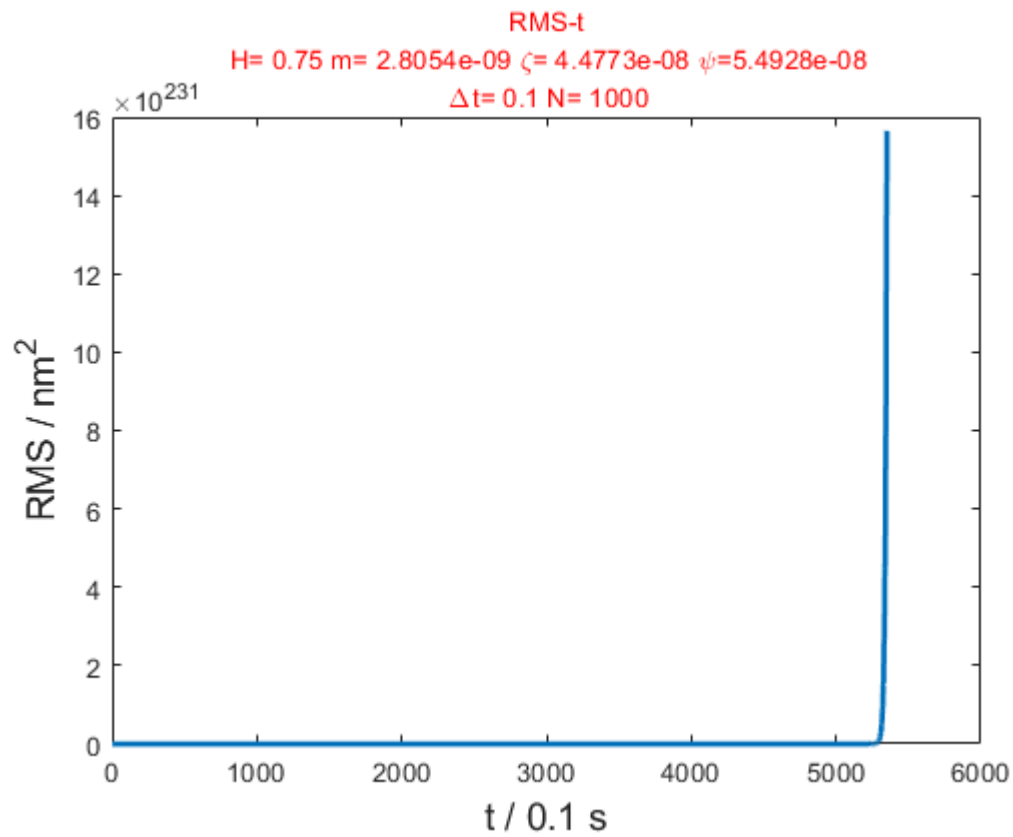
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 3.4092e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=1, trying i_\zeta=4, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
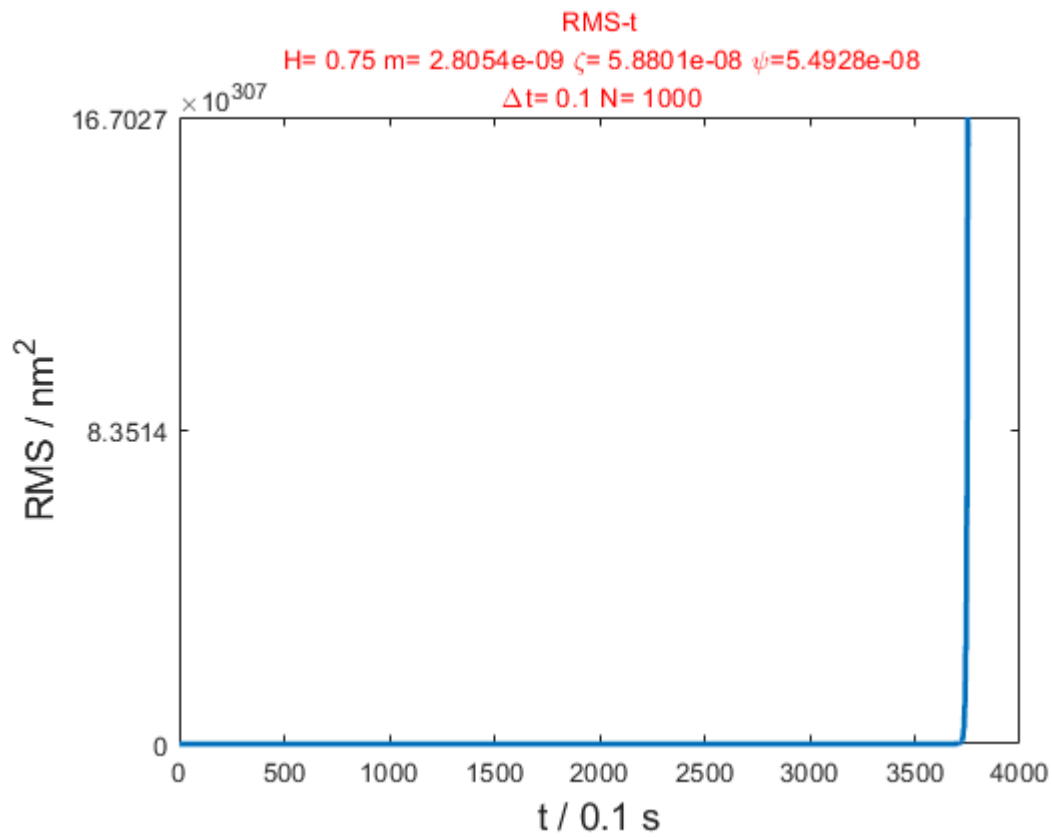
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 4.4773e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=1, trying i_\zeta=5, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
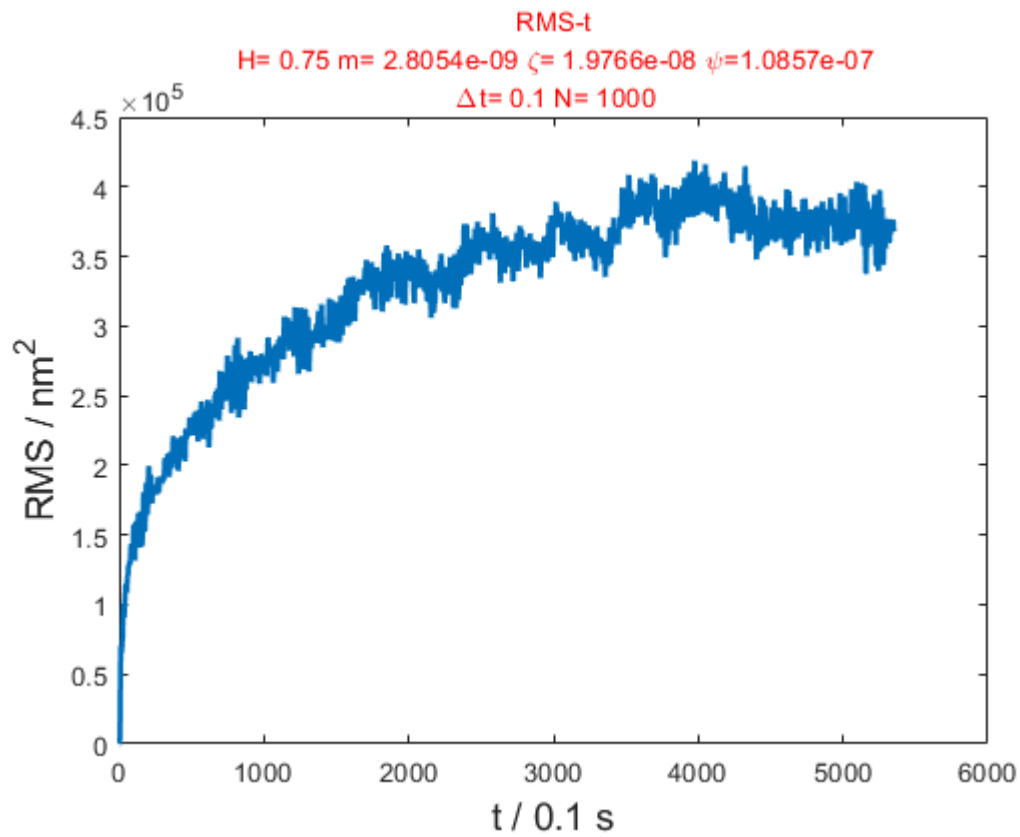
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 5.8801e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000
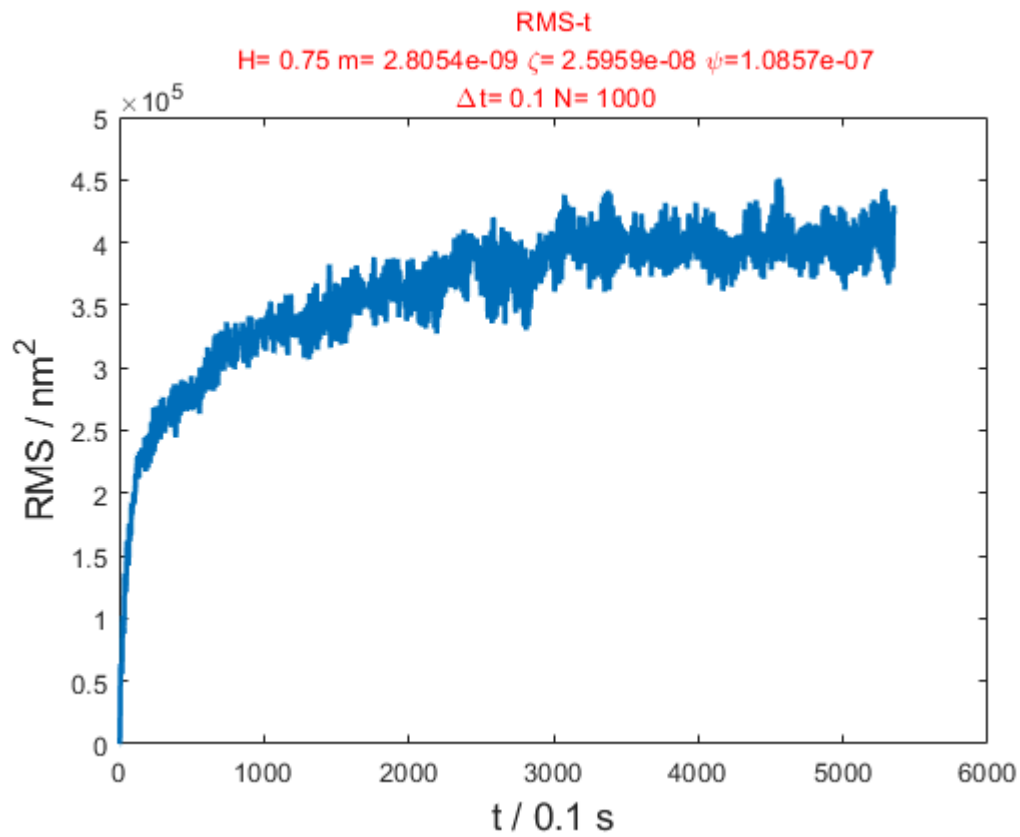
```
explosion!
trying i_m=2, trying i_\psi=2, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 1.9766e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

trying i_m=2, trying i_\psi=2, trying i_\zeta=2, total sampling number=5

```
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
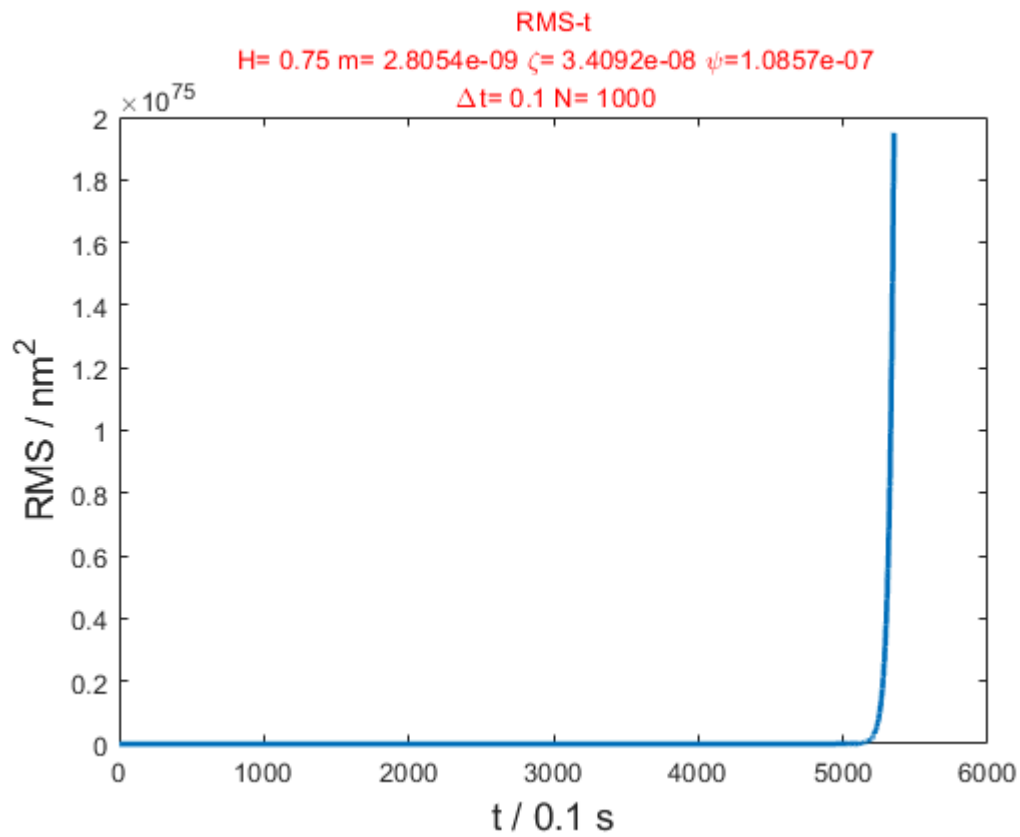
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 2.5959e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=2, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
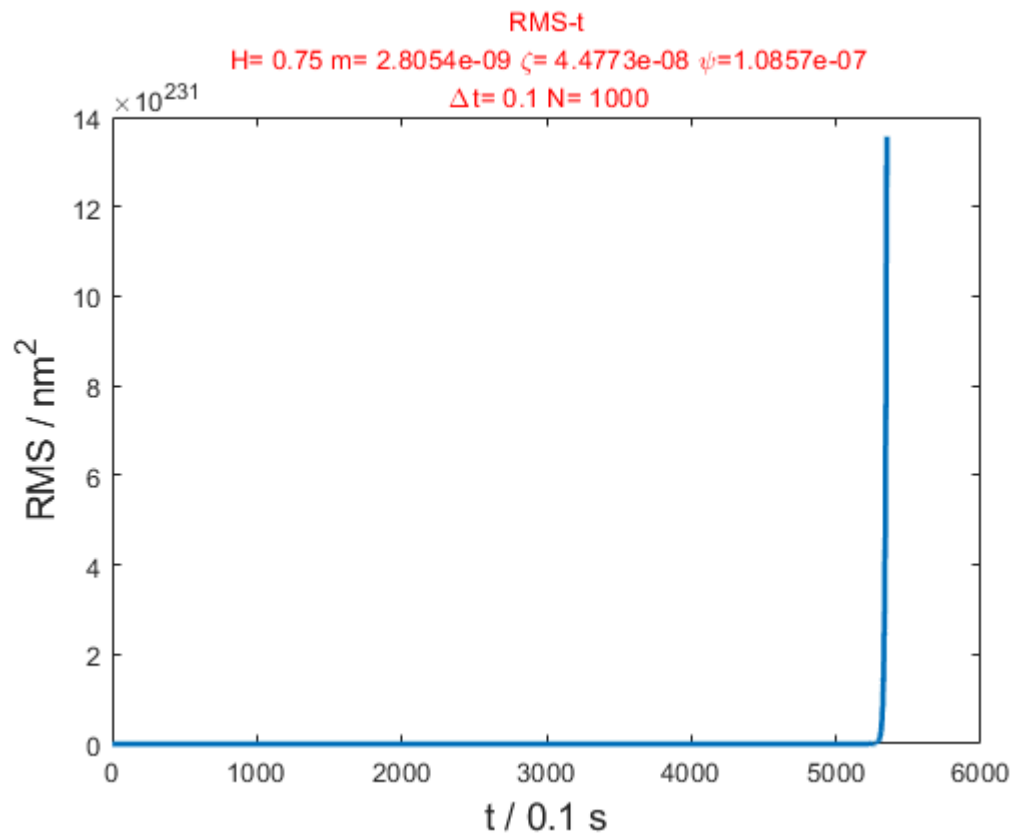
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 3.4092e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=2, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
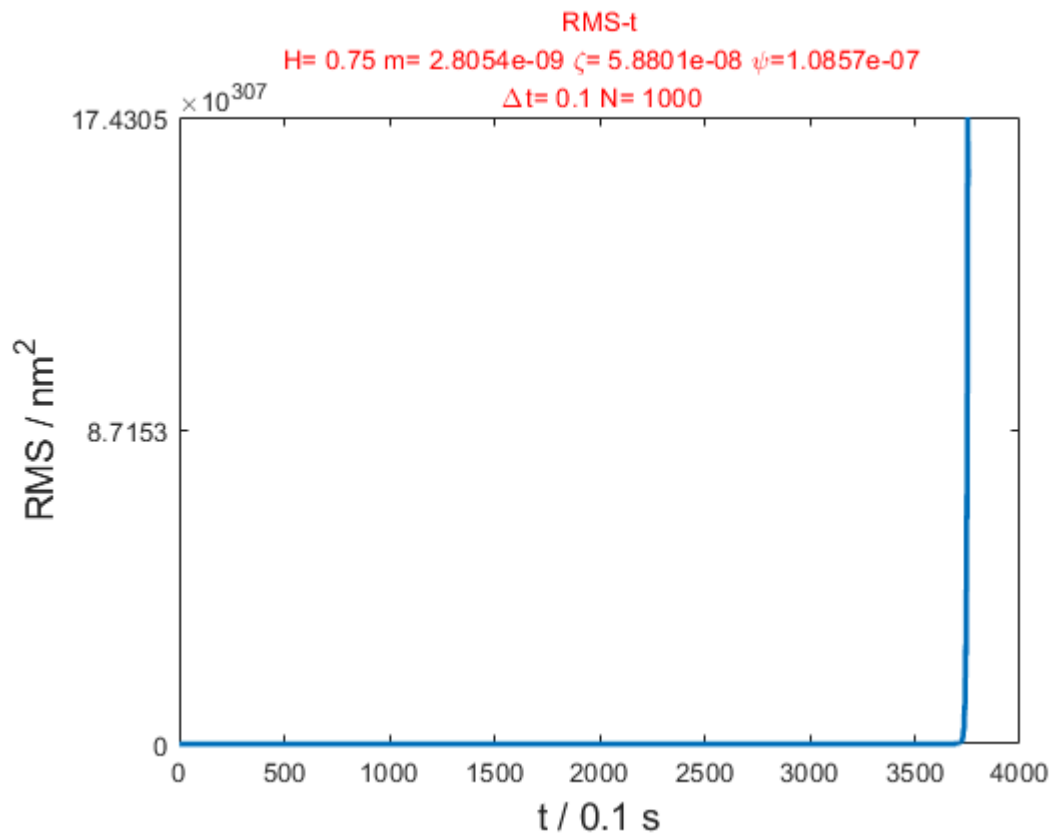
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 4.4773e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=2, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
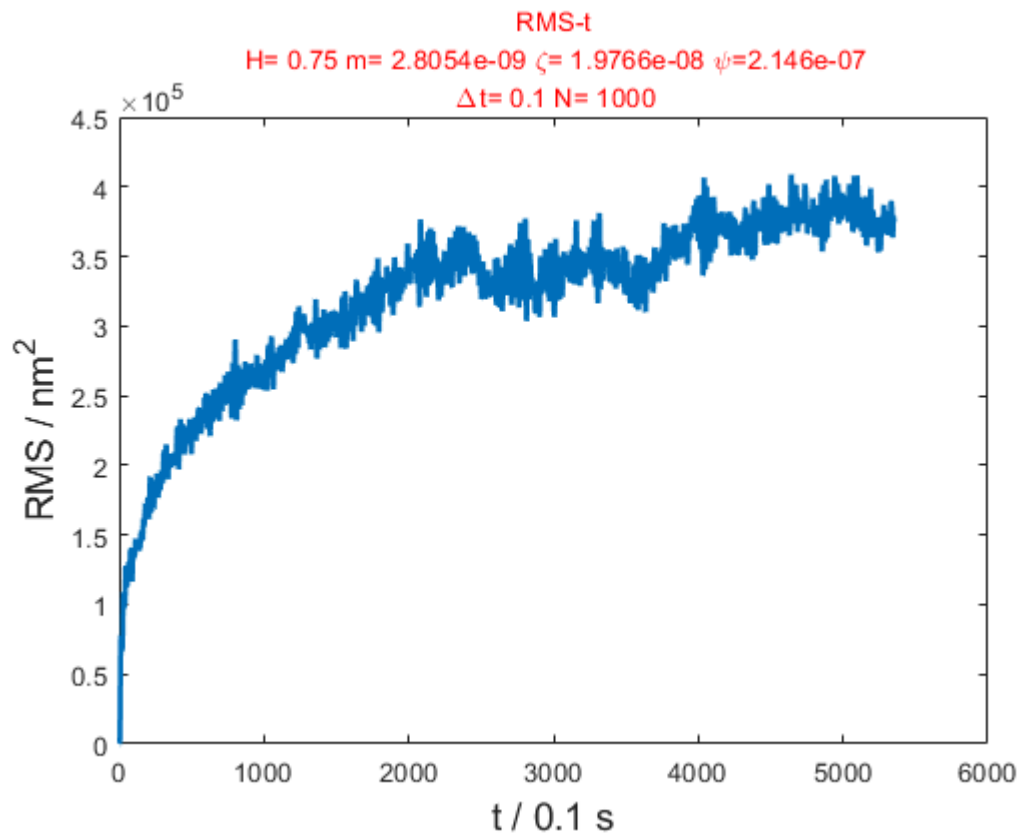
RMS-t

H= 0.75 m= 2.8054e-09 ζ= 5.8801e-08 ψ=1.0857e-07

Δt= 0.1 N= 1000
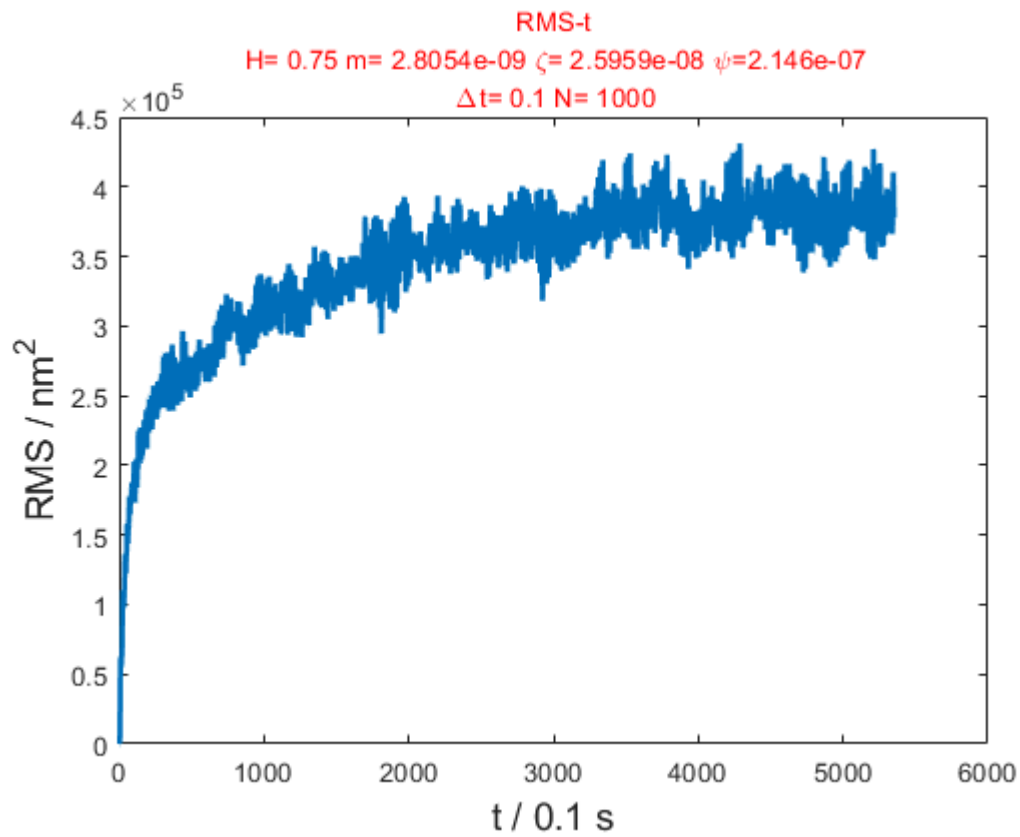
```
explosion!
trying i_m=2, trying i_\psi=3, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 1.9766e-08 ψ=2.146e-07
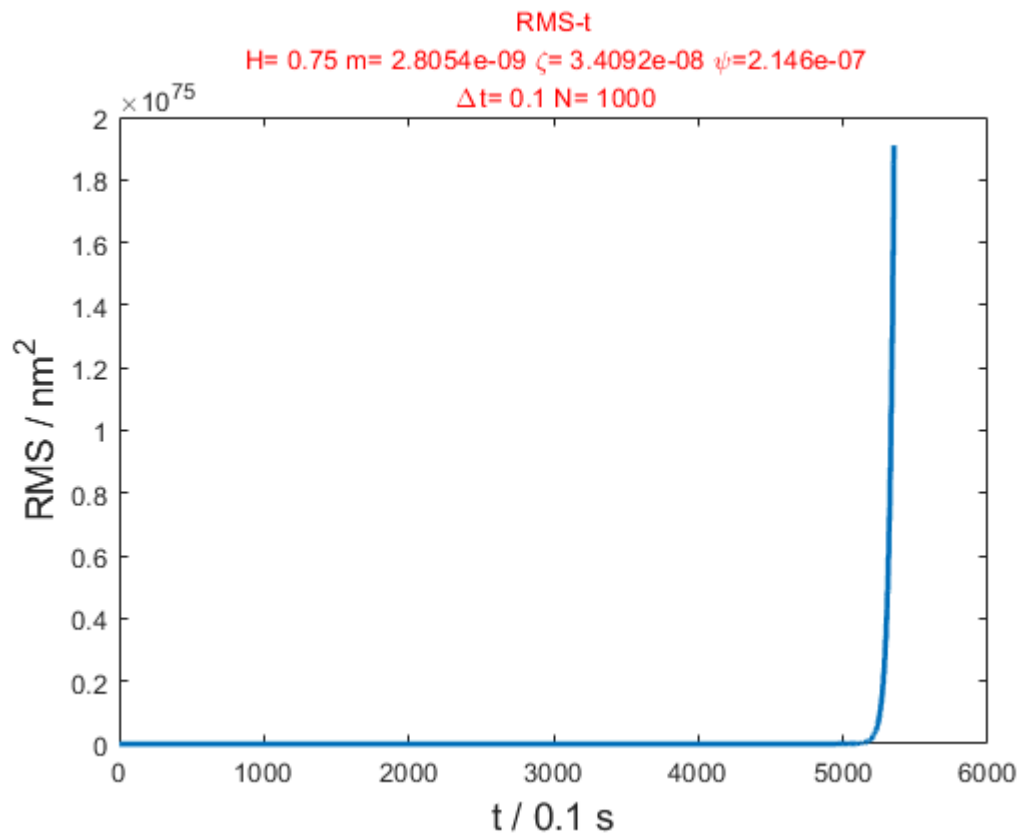Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=3, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 2.5959e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=3, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
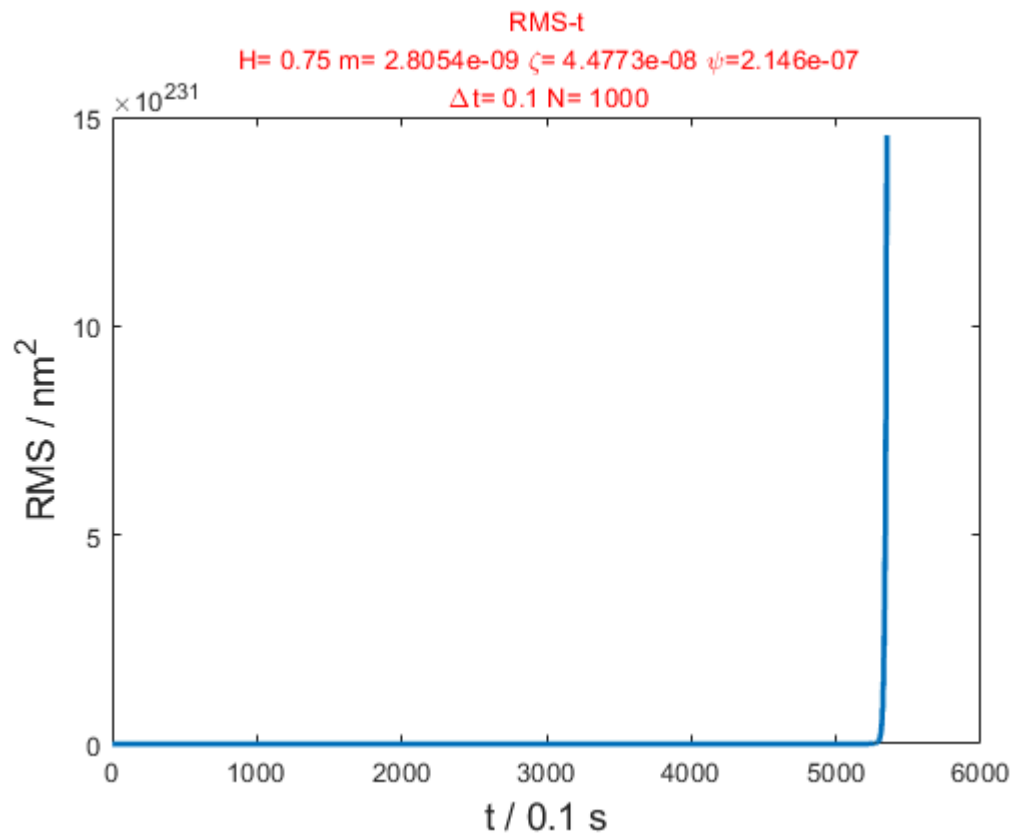
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 3.4092e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=3, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
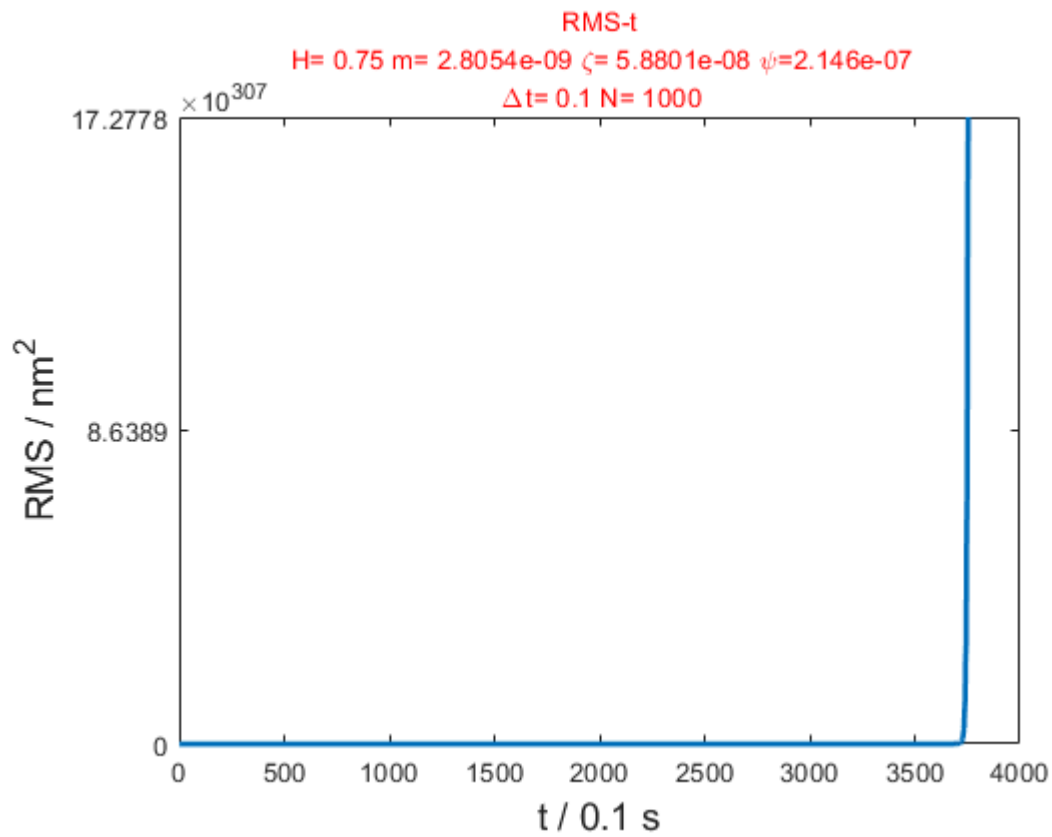
RMS-t

$H= 0.75\ m= 2.8054e\text{-}09\ \zeta= 4.4773e\text{-}08\ \psi=2.146e\text{-}07$

$\Delta t= 0.1\ N= 1000$


```
explosion!
trying i_m=2, trying i_\psi=3, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
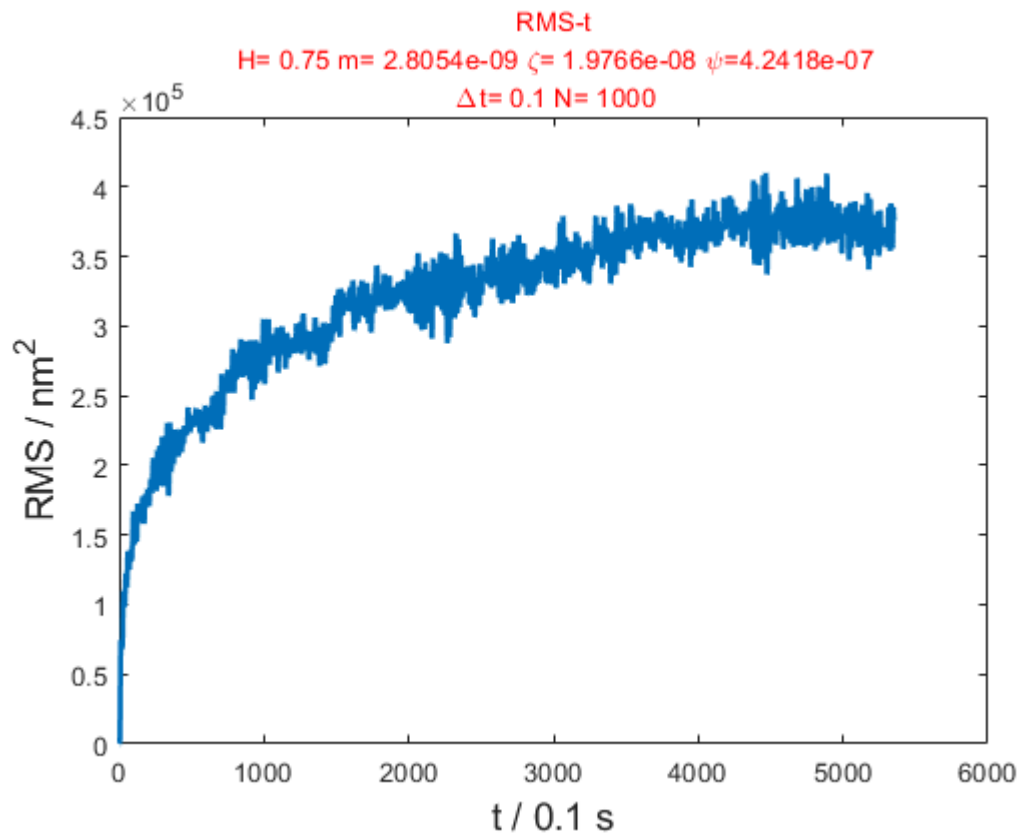
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 5.8801e-08 ψ=2.146e-07
Δt= 0.1 N= 1000
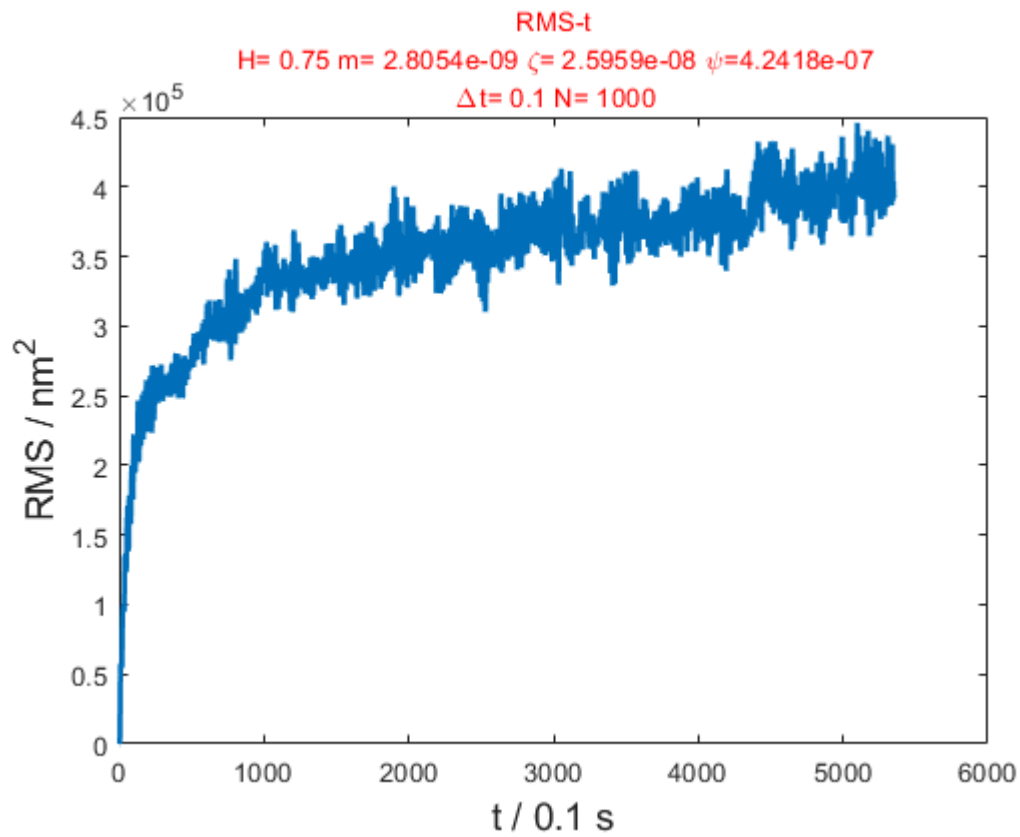
```
explosion!
trying i_m=2, trying i_\psi=4, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t

H= 0.75 m= 2.8054e-09 ζ= 1.9766e-08 ψ=4.2418e-07
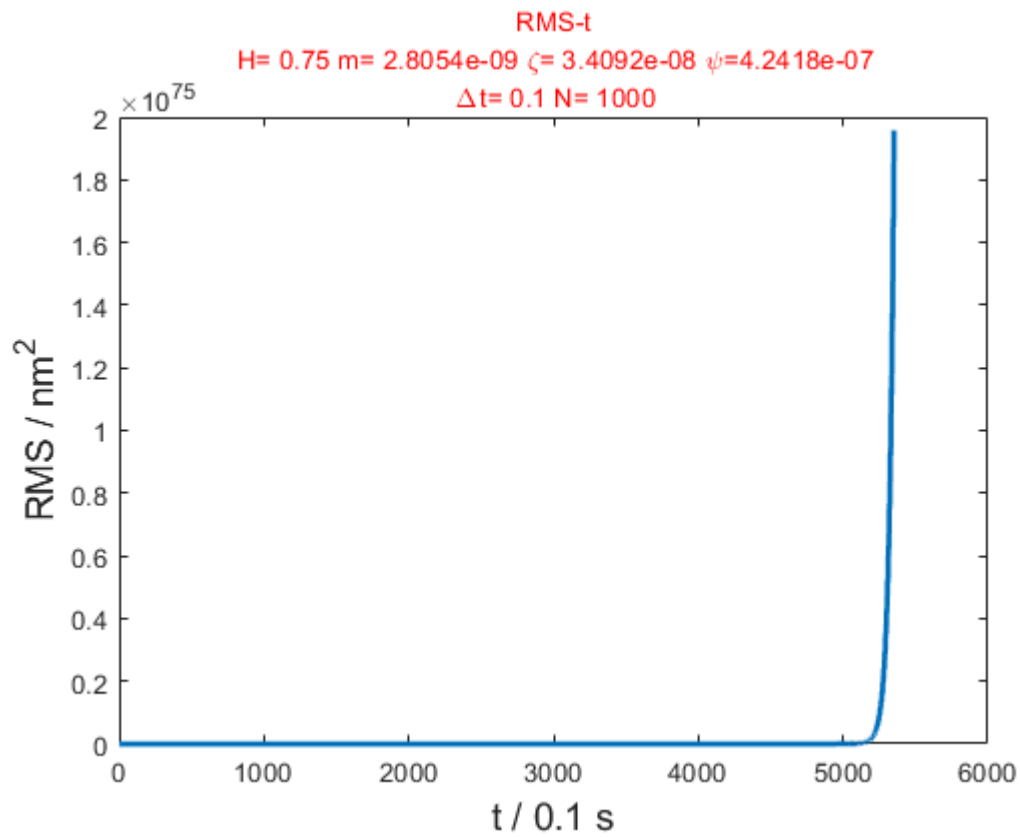
Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=4, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 2.5959e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=4, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
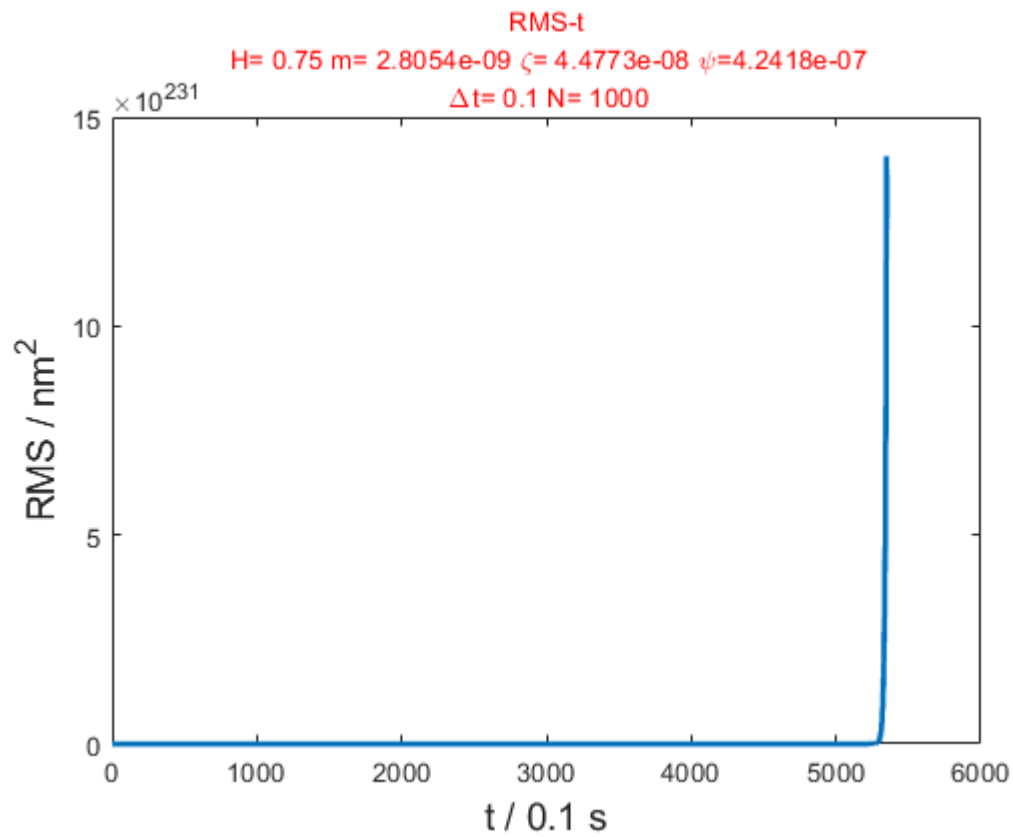
RMS-t

H= 0.75 m= 2.8054e-09 ζ= 3.4092e-08 ψ=4.2418e-07

Δt= 0.1 N= 1000

explosion!

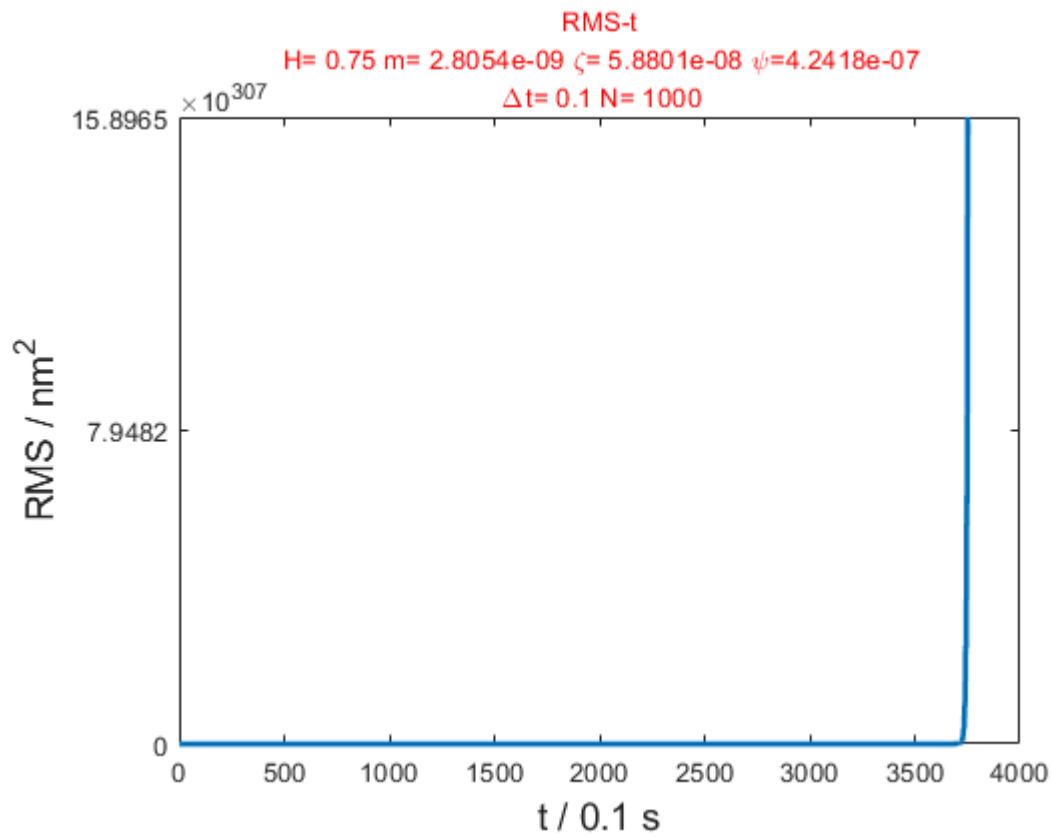trying i_m=2, trying i_\psi=4, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 4.4773e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=4, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
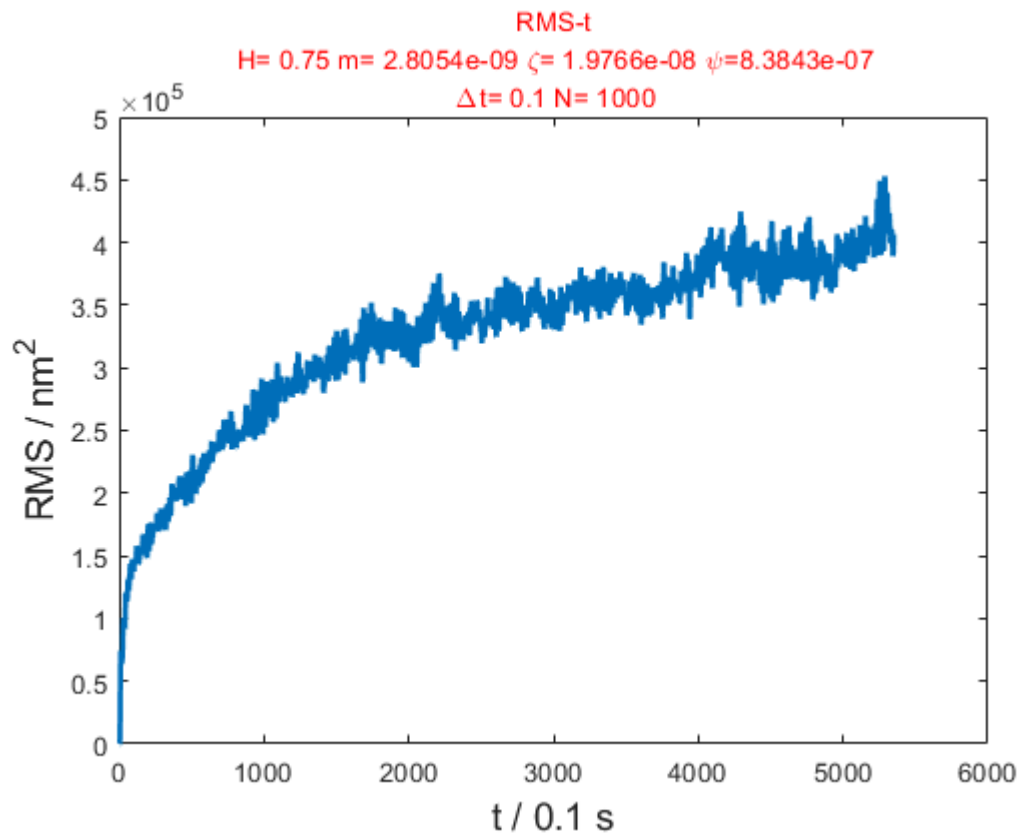
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 5.8801e-08 ψ=4.2418e-07
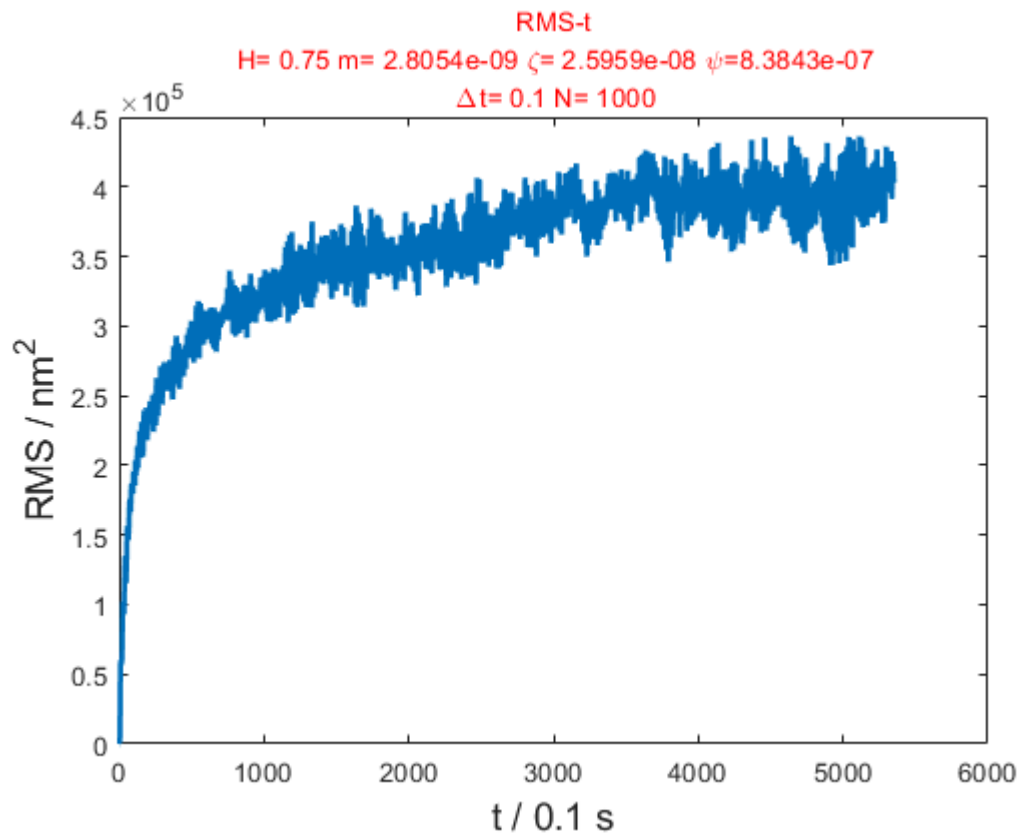Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=5, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 1.9766e-08 ψ=8.3843e-07
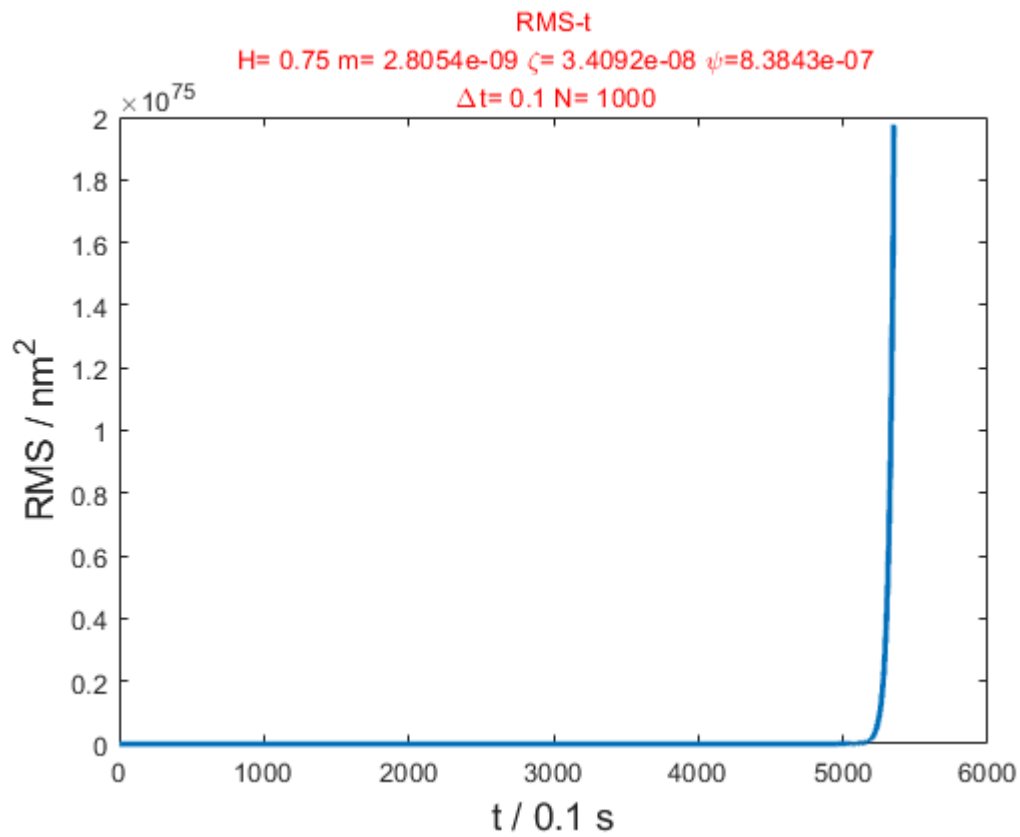Δt= 0.1 N= 1000

```
trying i_m=2, trying i_\psi=5, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 2.5959e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

trying i_m=2, trying i_\psi=5, trying i_\zeta=3, total sampling number=5
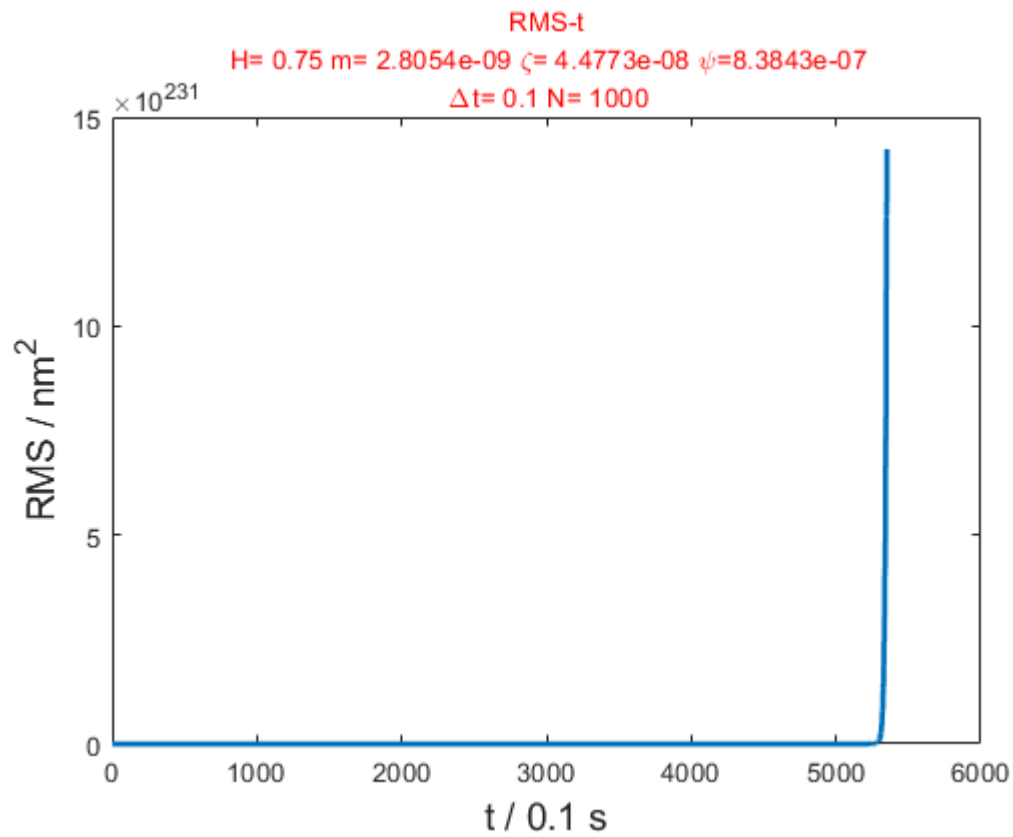
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 3.4092e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

explosion!
trying i_m=2, trying i_\psi=5, trying i_\zeta=4, total sampling number=5
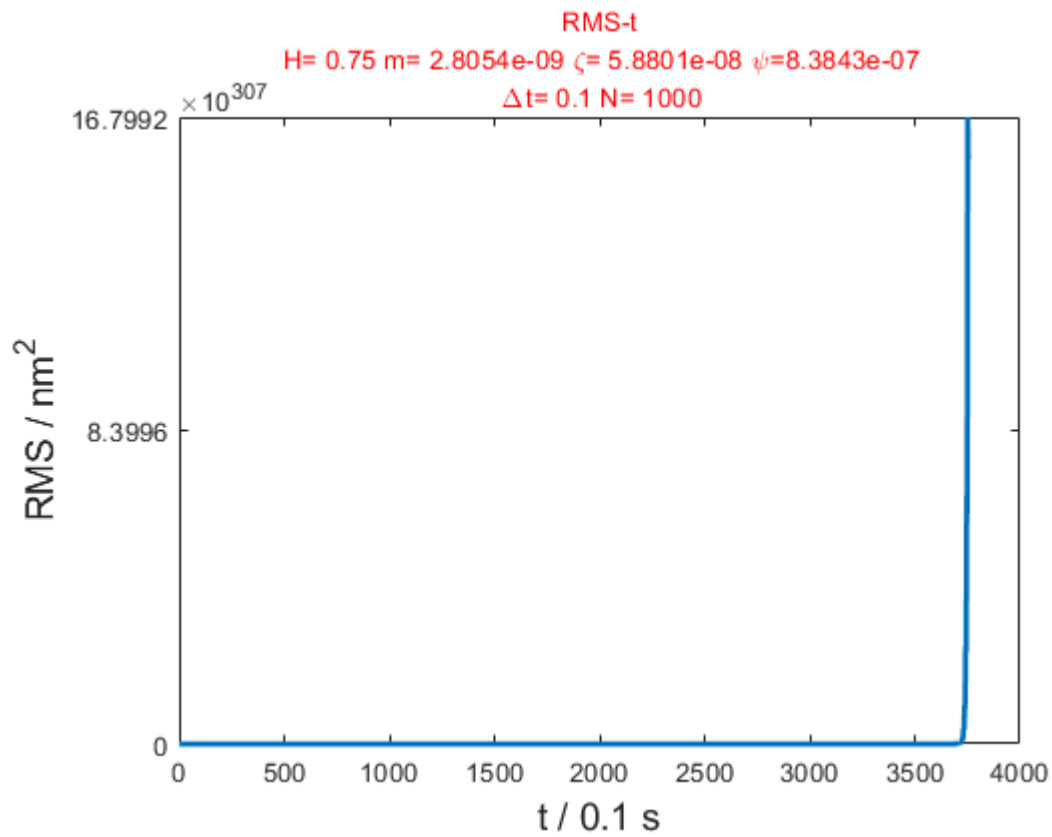progress rate 10 %
progress rate 20 %
progress rate 30 %
progress rate 40 %
progress rate 50 %
progress rate 60 %
progress rate 70 %
progress rate 80 %
progress rate 90 %
progress rate 100 %

RMS-t
H= 0.75 m= 2.8054e-09 ζ= 4.4773e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=2, trying i_\psi=5, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
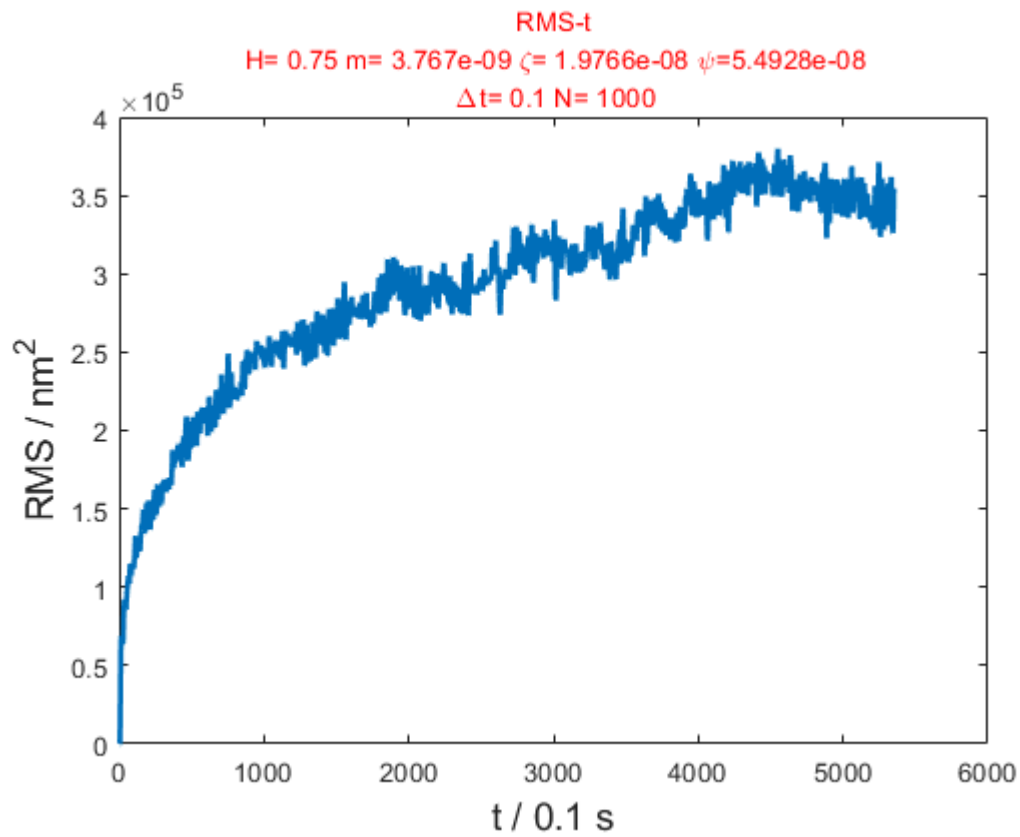
RMS-t
H= 0.75 m= 2.8054e-09 ζ= 5.8801e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000
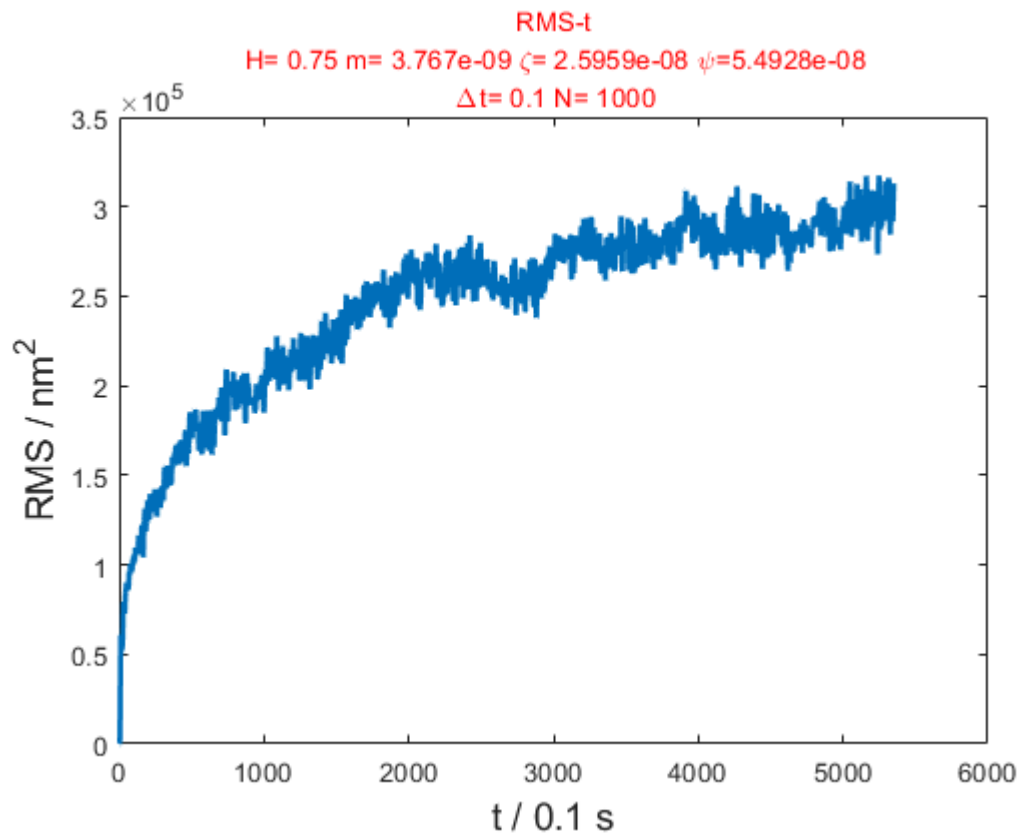
```
explosion!
trying i_m=3, trying i_\psi=1, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 1.9766e-08 ψ=5.4928e-08
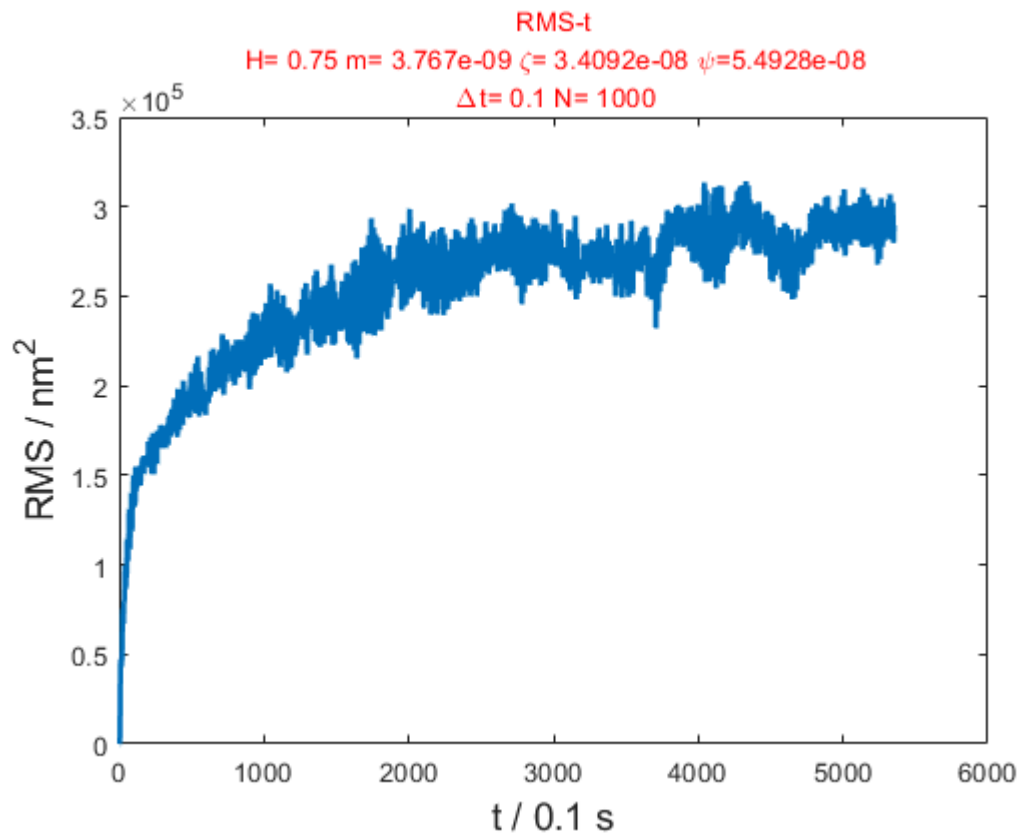Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=1, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 2.5959e-08 ψ=5.4928e-08
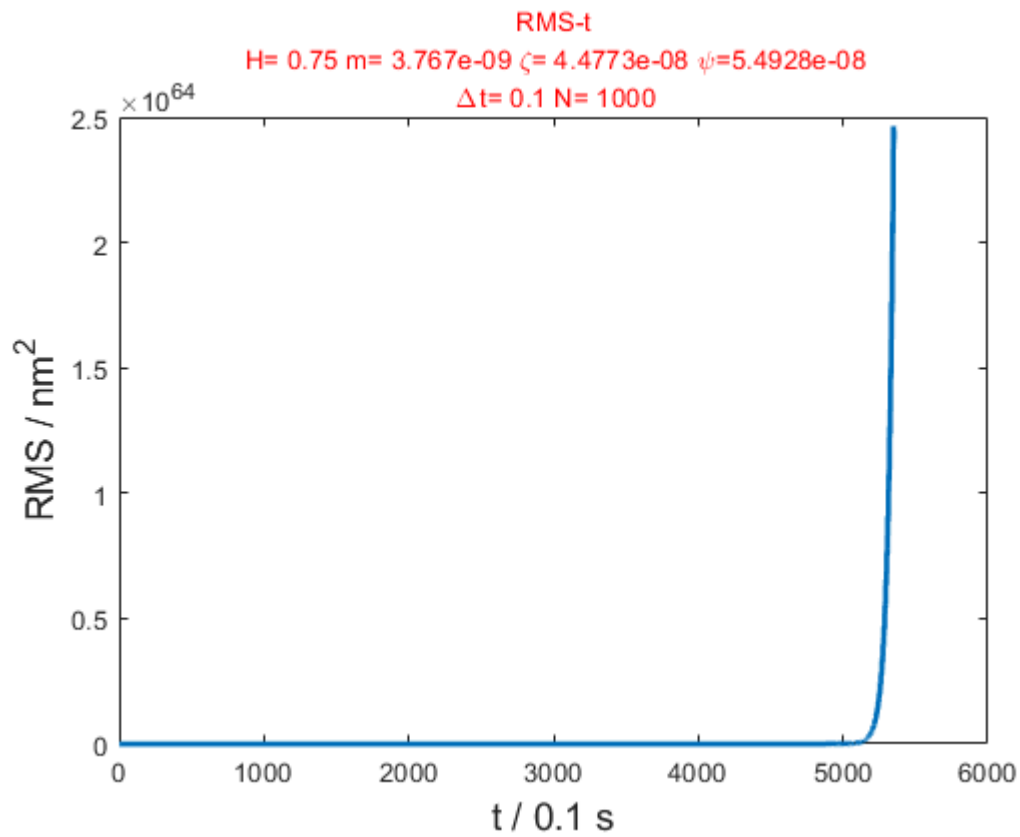Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=1, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 3.4092e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=1, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
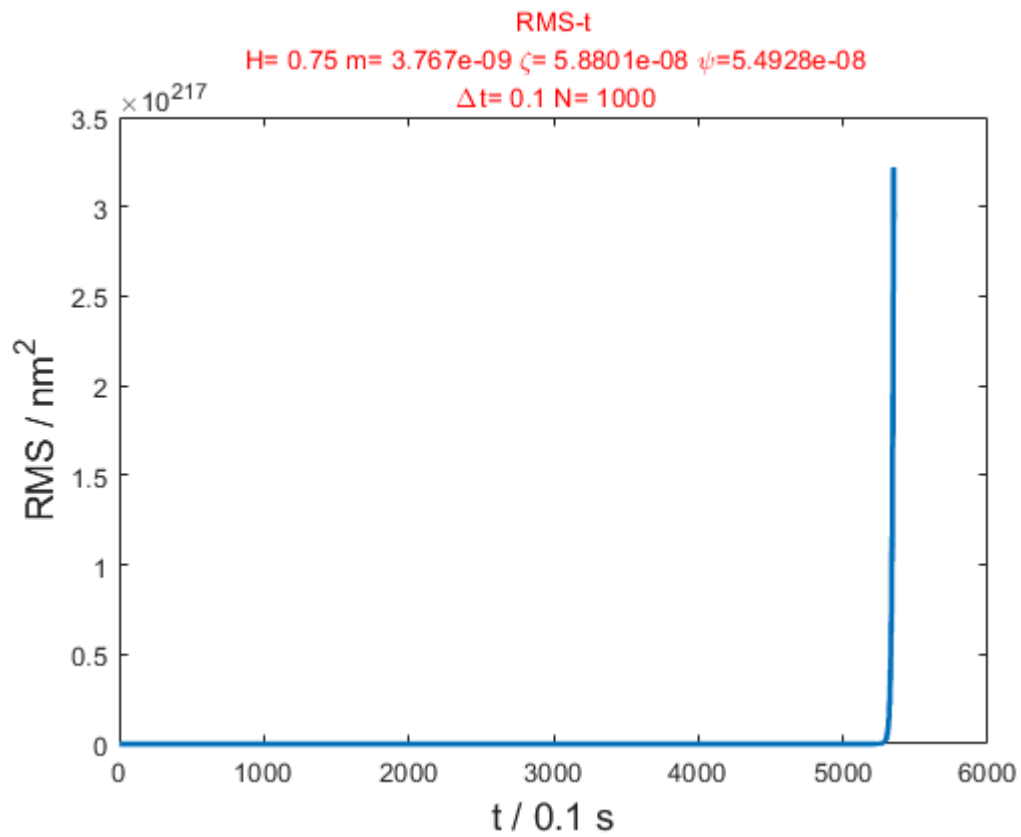
RMS-t

H= 0.75 m= 3.767e-09 ζ= 4.4773e-08 ψ=5.4928e-08

Δt= 0.1 N= 1000

```
explosion!
trying i_m=3, trying i_\psi=1, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
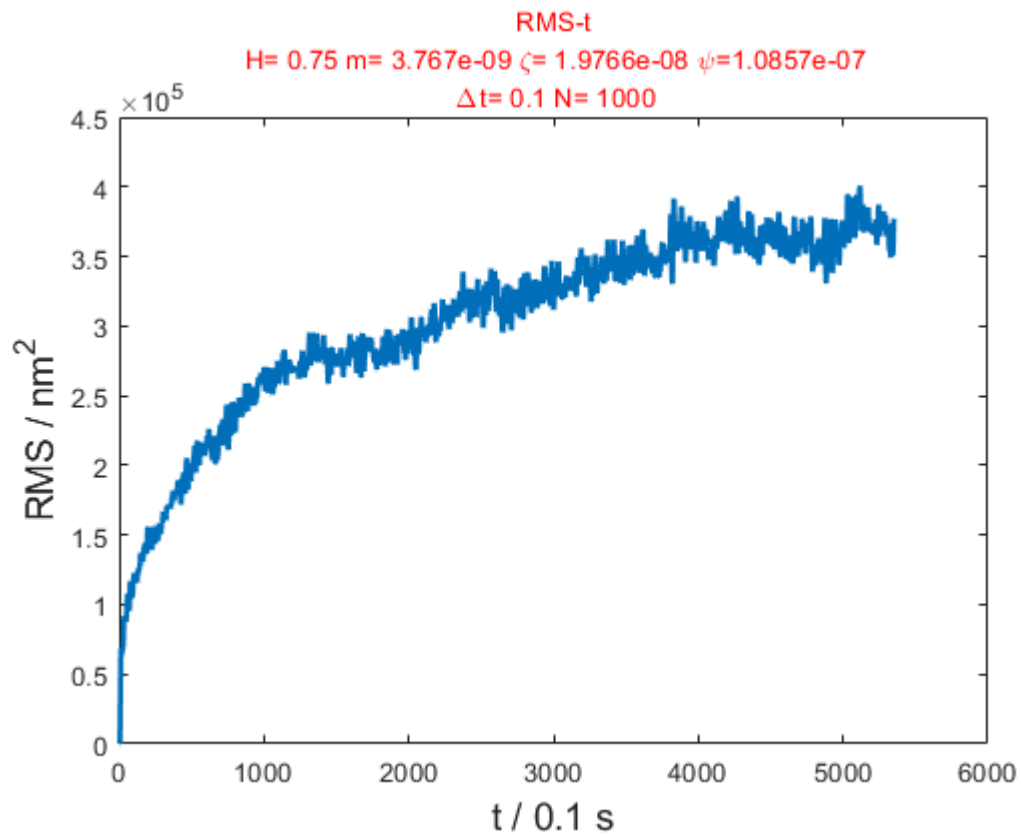
RMS-t
H= 0.75 m= 3.767e-09 ζ= 5.8801e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000
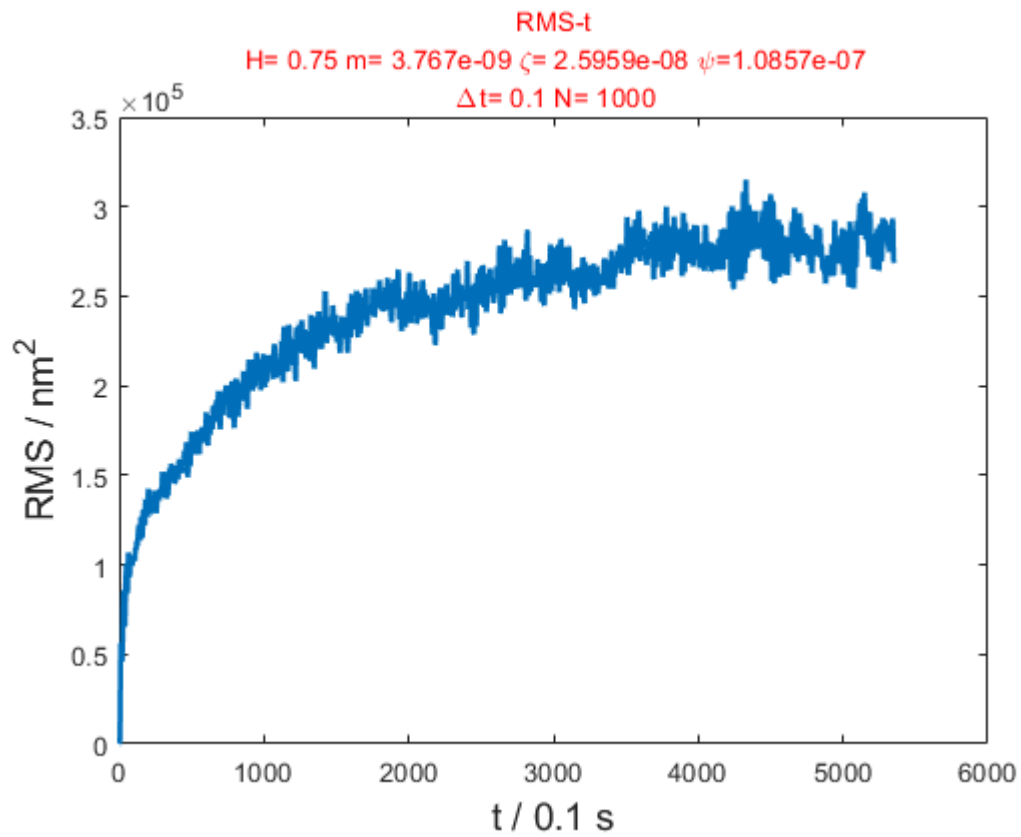
```
explosion!
trying i_m=3, trying i_\psi=2, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 1.9766e-08 ψ=1.0857e-07
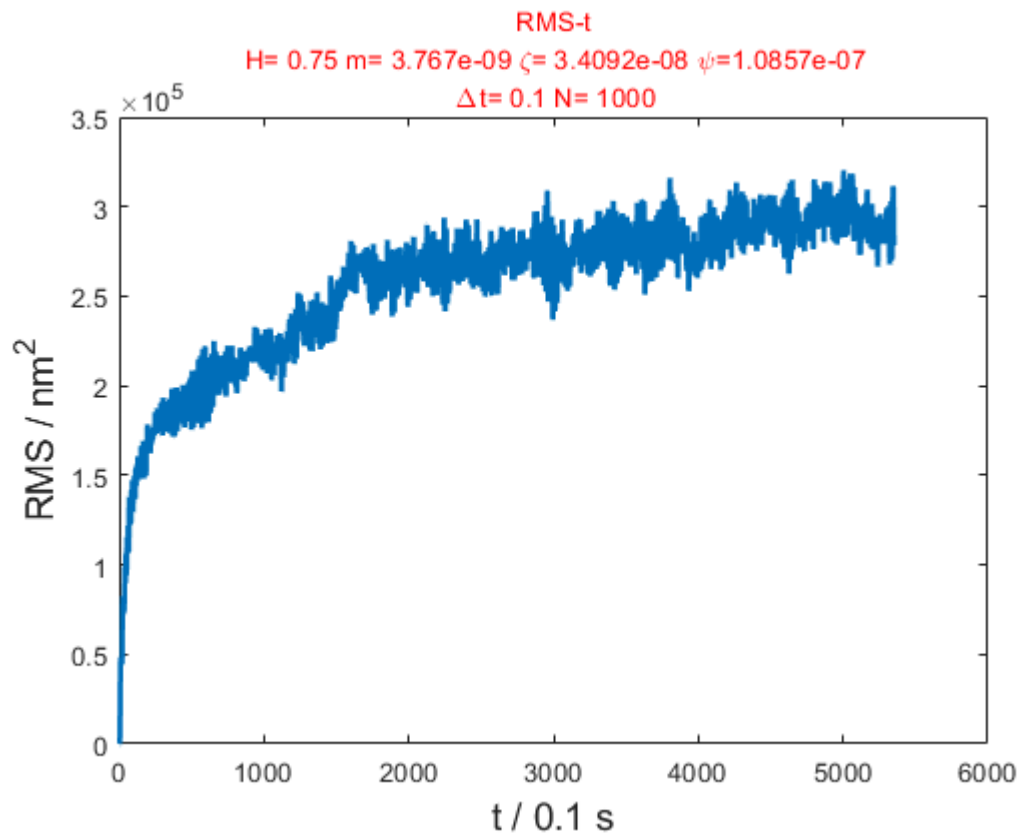Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=2, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 2.5959e-08 ψ=1.0857e-07
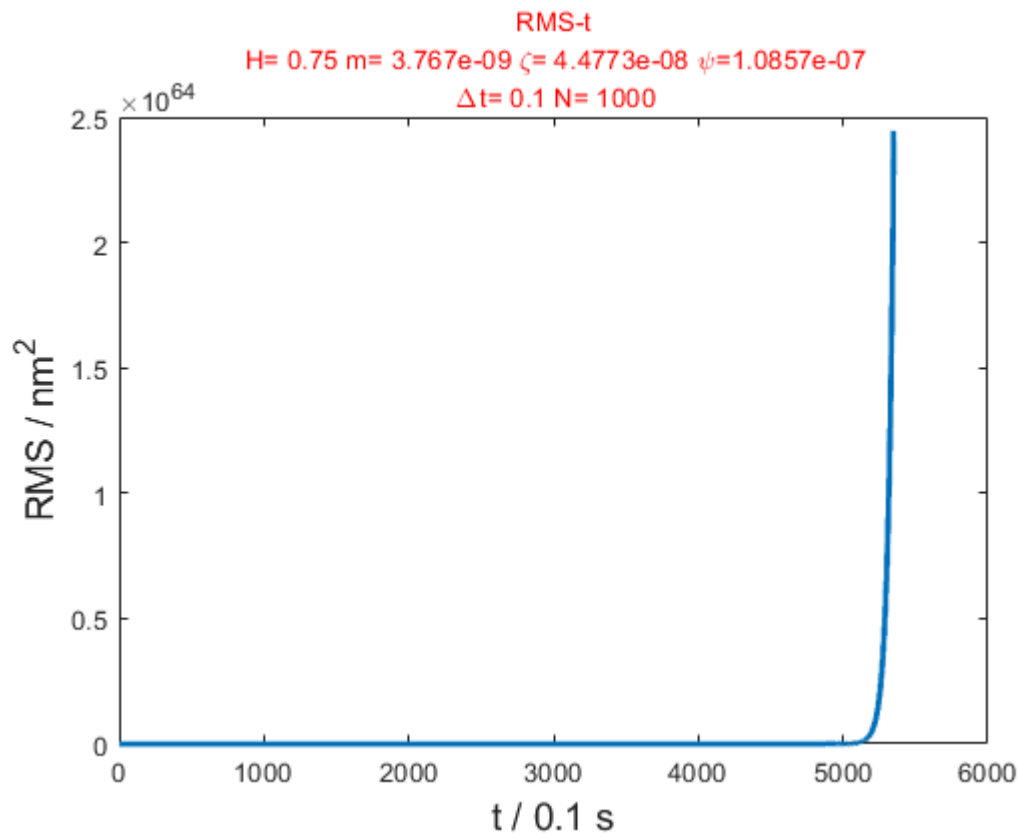Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=2, trying i_\zeta=3, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 3.4092e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

trying i_m=3, trying i_\psi=2, trying i_\zeta=4, total sampling number=5
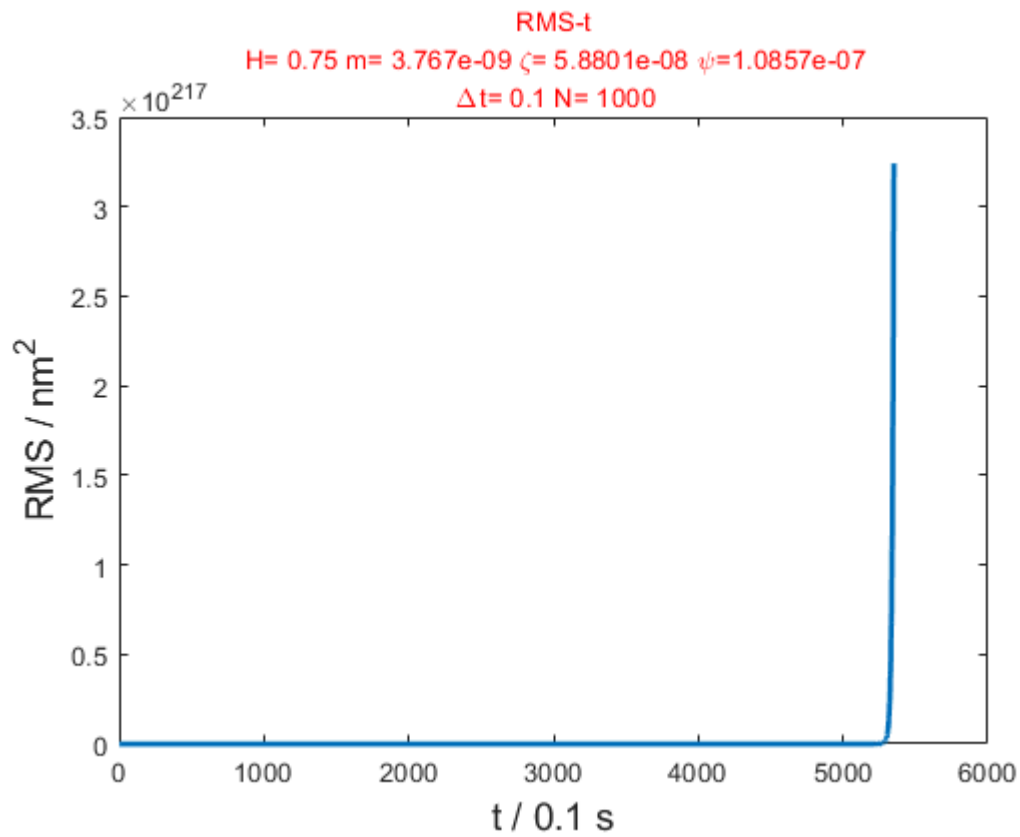
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 3.767e-09 ζ= 4.4773e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=3, trying i_\psi=2, trying i_\zeta=5, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
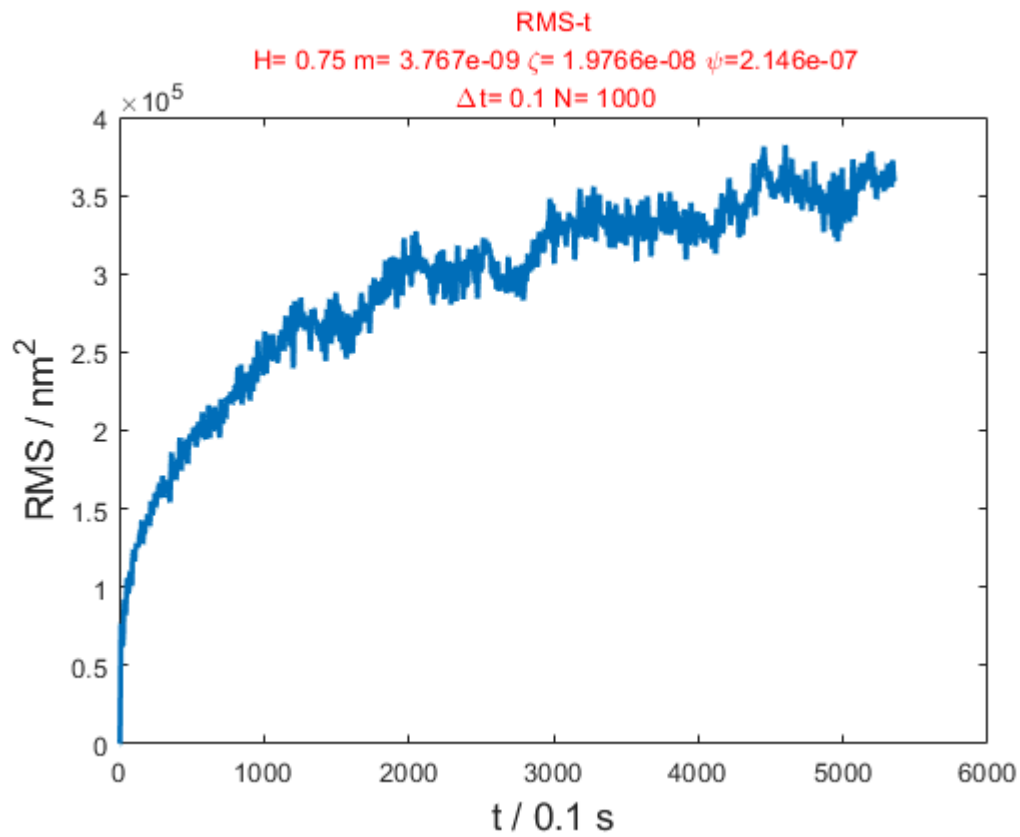
RMS-t
$H= 0.75$ $m= 3.767e\text{-}09$ $\zeta= 5.8801e\text{-}08$ $\psi=1.0857e\text{-}07$
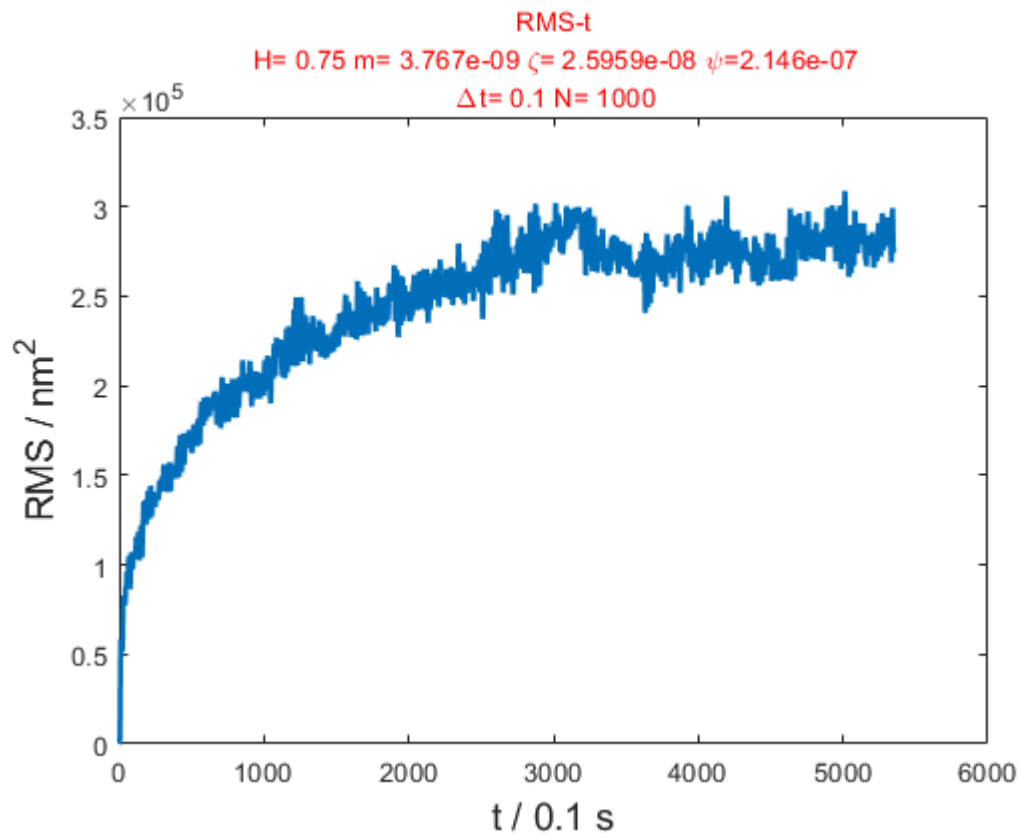### $\Delta t= 0.1$ $N= 1000$


```
explosion!
trying i_m=3, trying i_\psi=3, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 1.9766e-08 ψ=2.146e-07
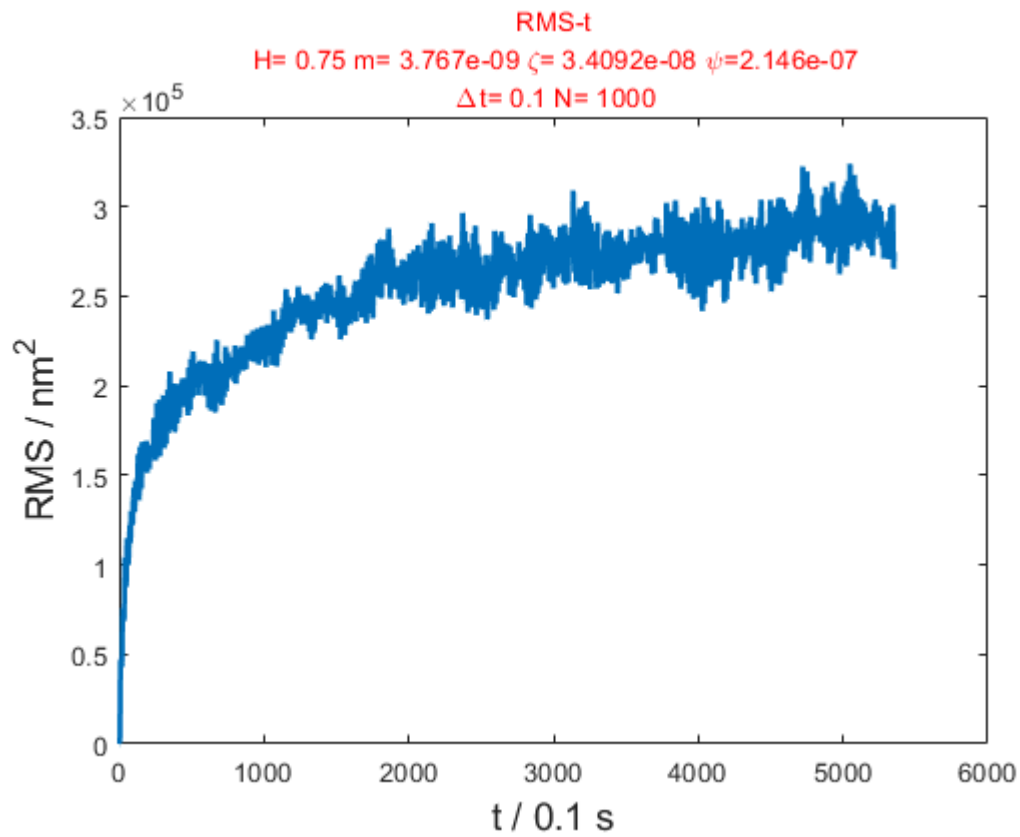Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=3, trying i_\zeta=2, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 2.5959e-08 ψ=2.146e-07
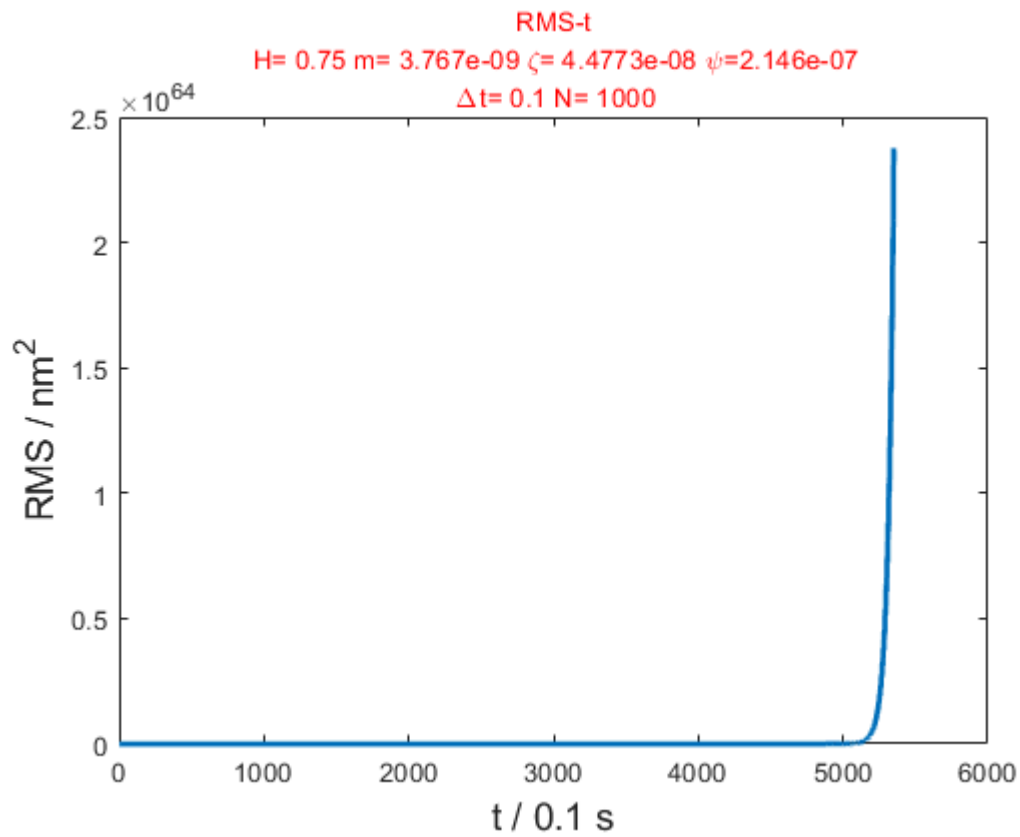Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=3, trying i_\zeta=3, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 3.4092e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=3, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
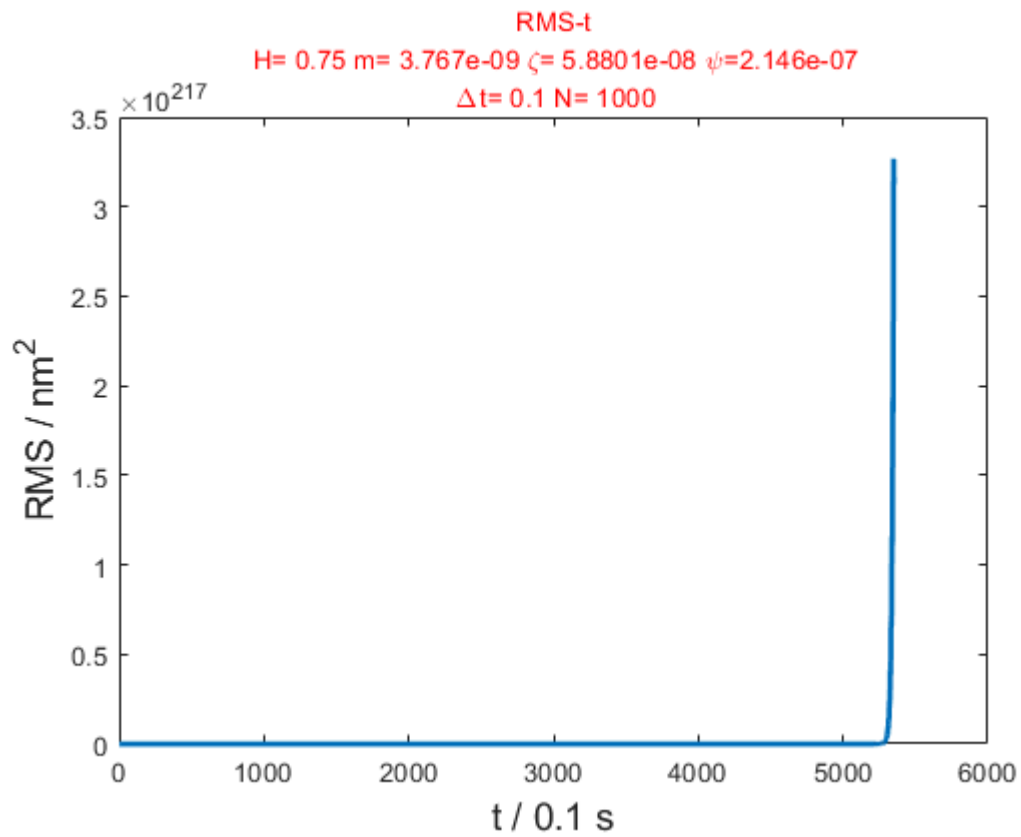
RMS-t
H= 0.75 m= 3.767e-09 ζ= 4.4773e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=3, trying i_\psi=3, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
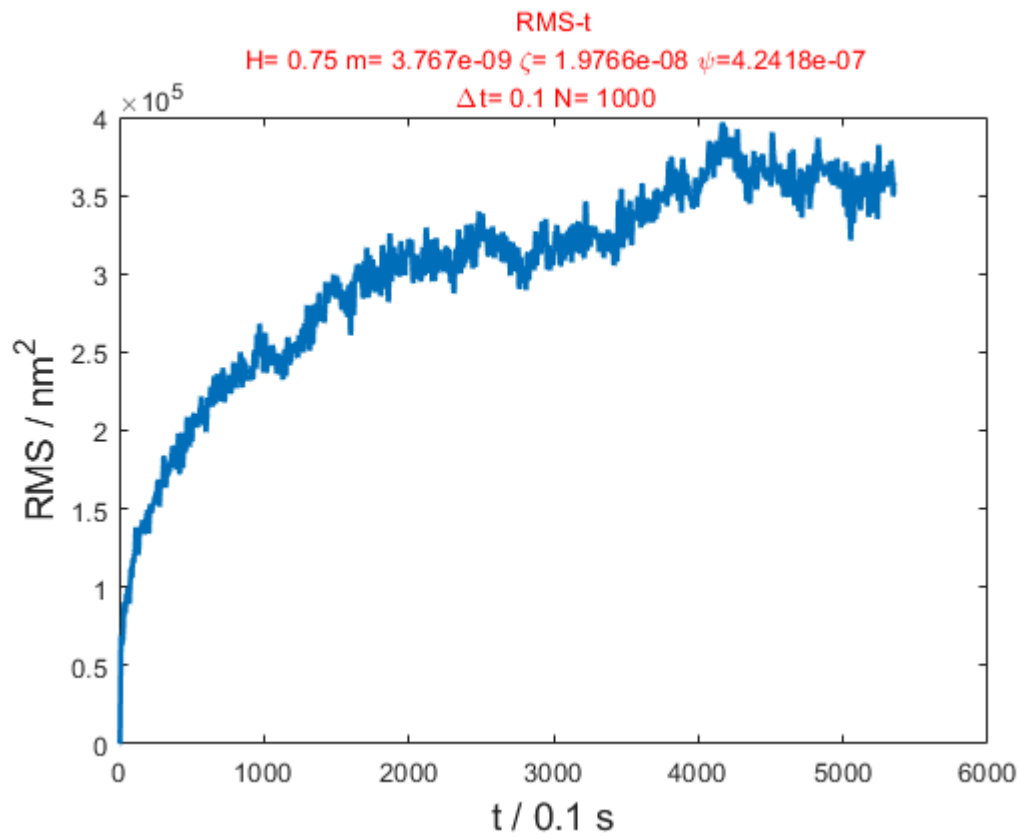
RMS-t

H= 0.75 m= 3.767e-09 ζ= 5.8801e-08 ψ=2.146e-07

Δt= 0.1 N= 1000

```
explosion!
trying i_m=3, trying i_\psi=4, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
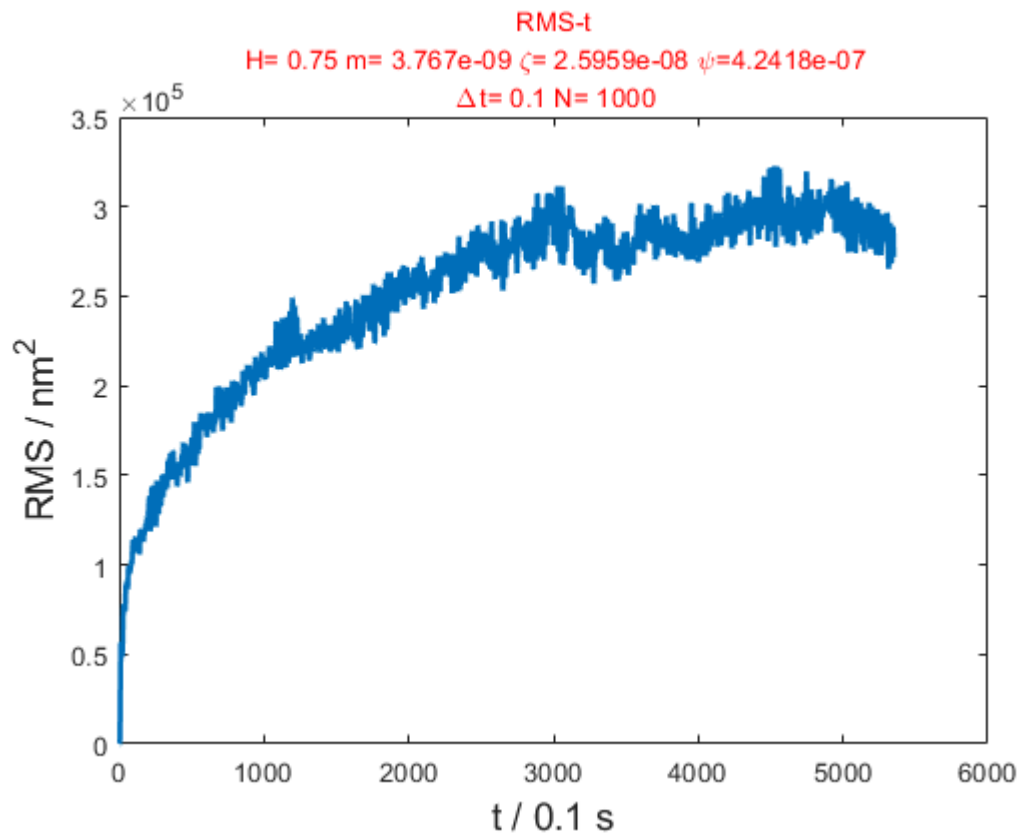H= 0.75 m= 3.767e-09 ζ= 1.9766e-08 ψ=4.2418e-07
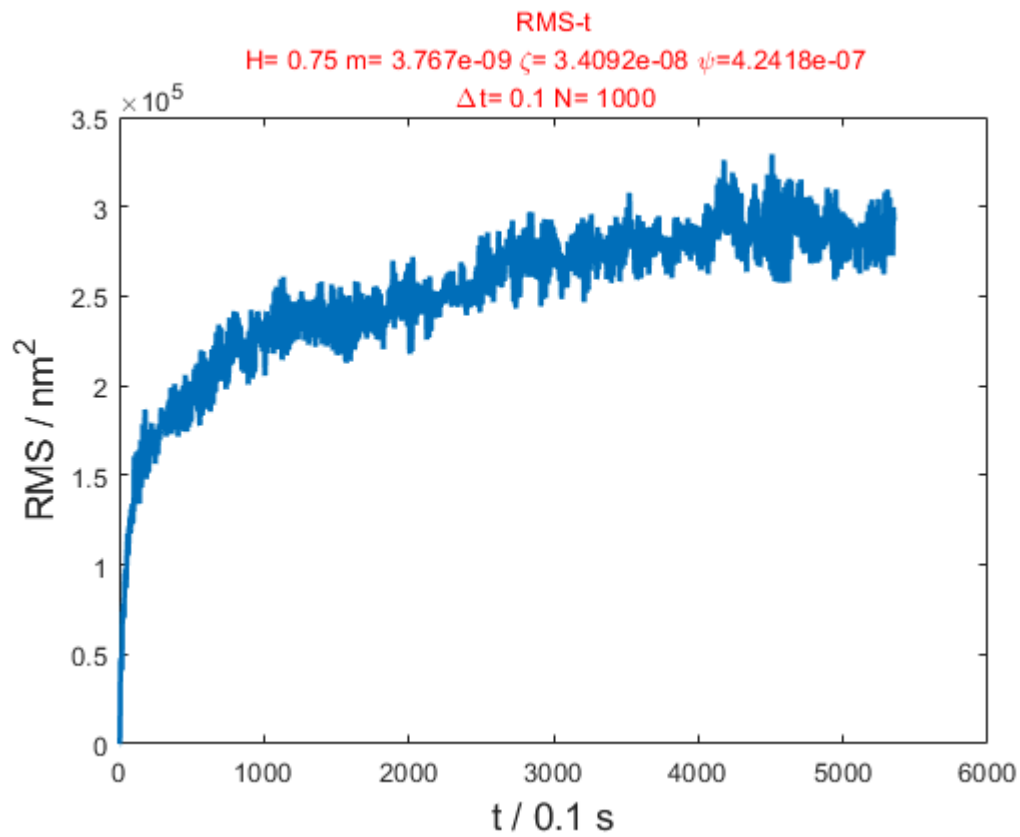Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=4, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t

H= 0.75 m= 3.767e-09 ζ= 2.5959e-08 ψ=4.2418e-07

Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=4, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
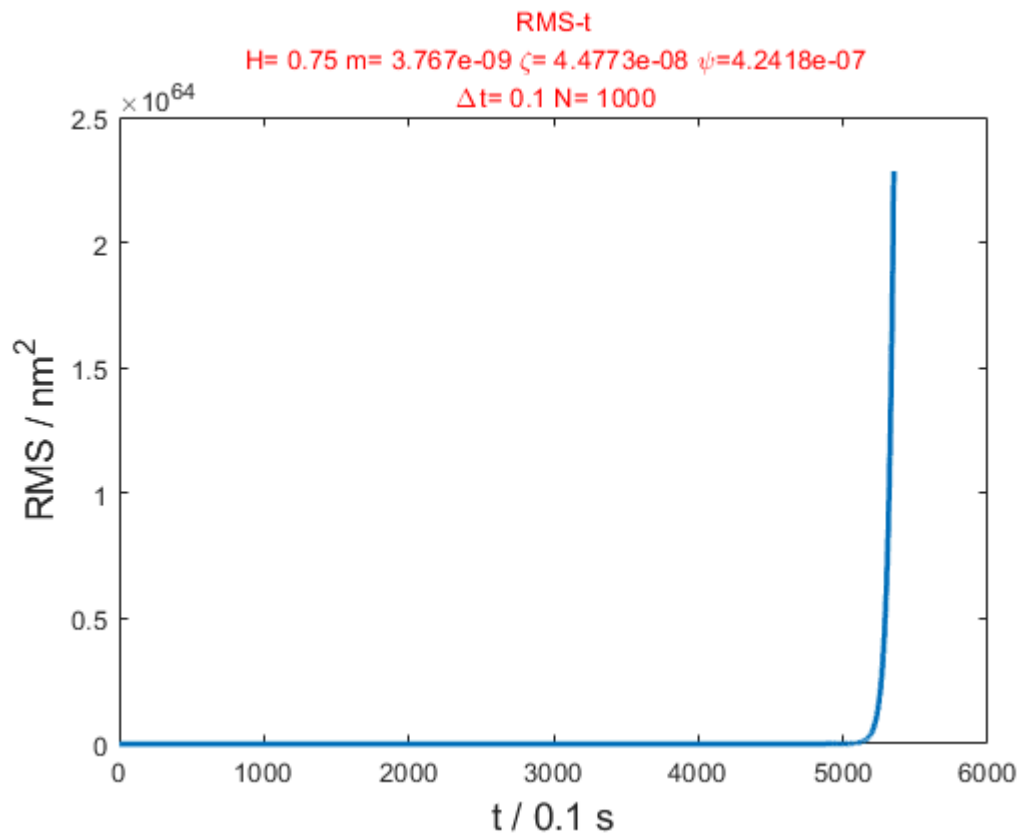
RMS-t
H= 0.75 m= 3.767e-09 ζ= 3.4092e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=4, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
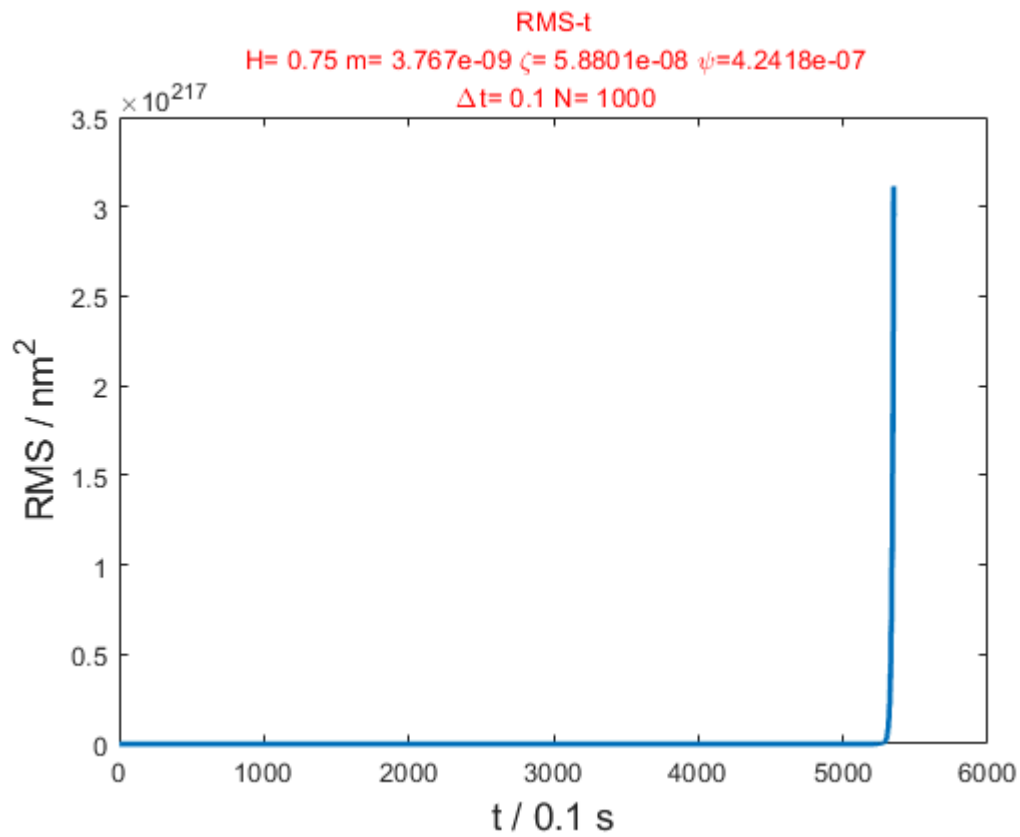
RMS-t
H= 0.75 m= 3.767e-09 ζ= 4.4773e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=3, trying i_\psi=4, trying i_\zeta=5, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```
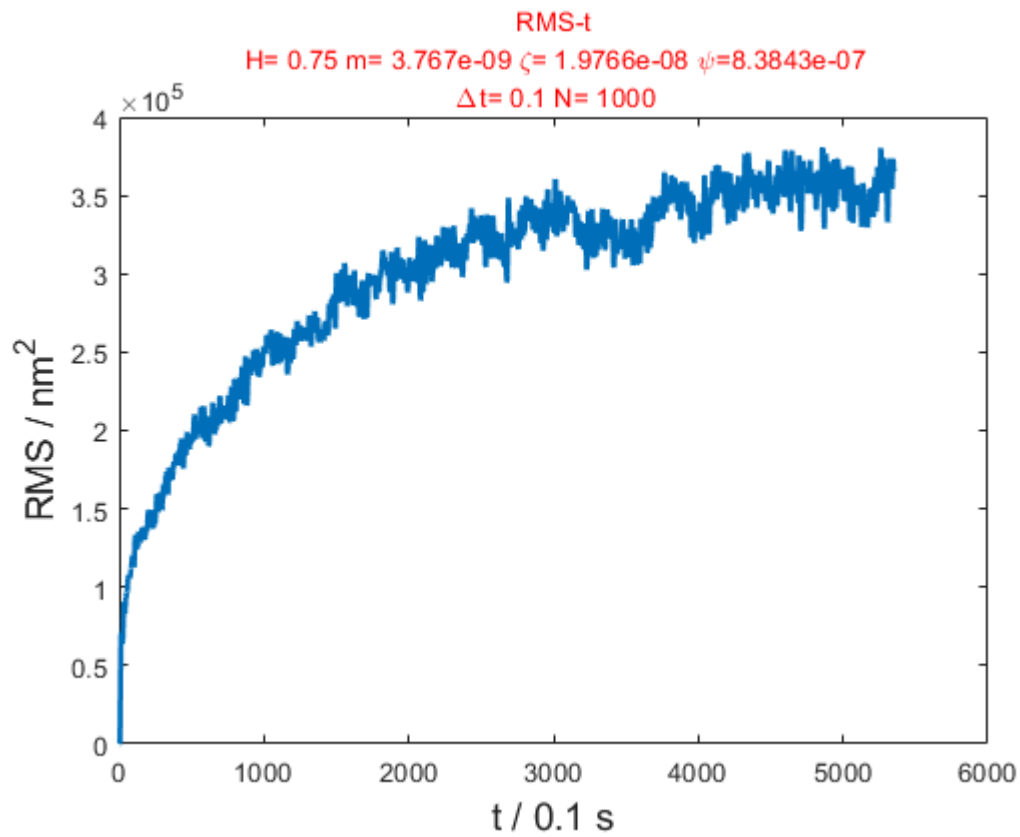
RMS-t

H= 0.75 m= 3.767e-09 ζ= 5.8801e-08 ψ=4.2418e-07

Δt= 0.1 N= 1000


```
explosion!
trying i_m=3, trying i_\psi=5, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
$H= 0.75$ $m= 3.767\text{e-}09$ $\zeta= 1.9766\text{e-}08$ $\psi=8.3843\text{e-}07$
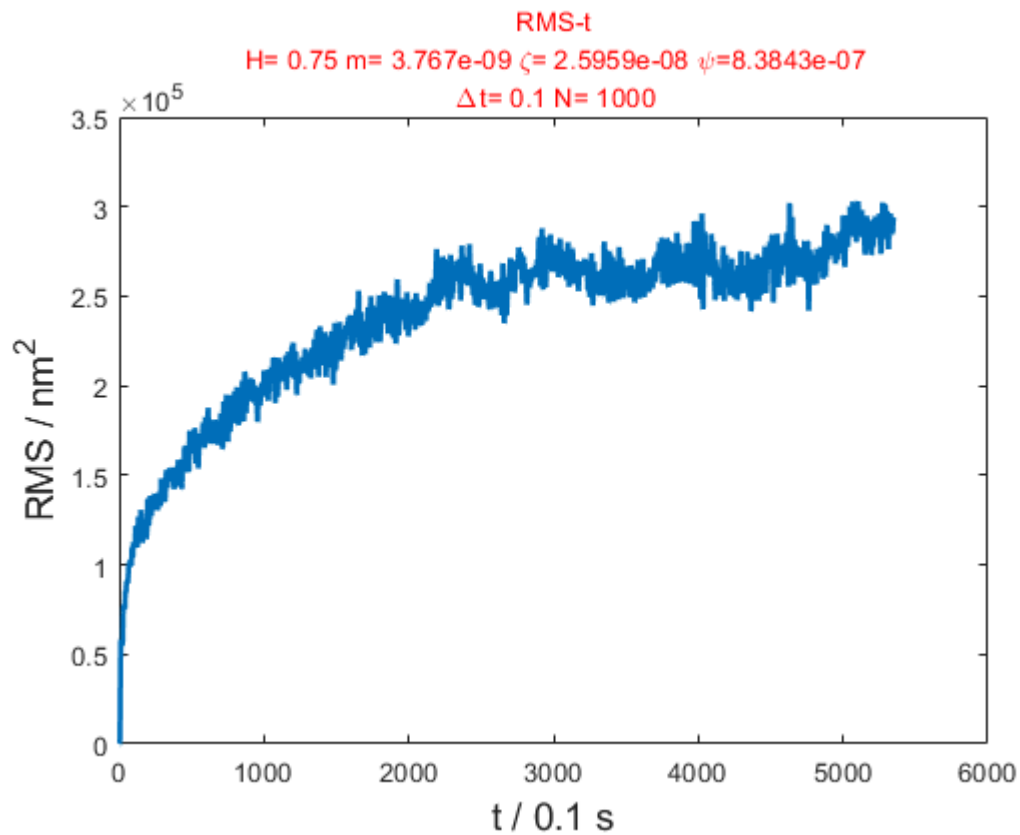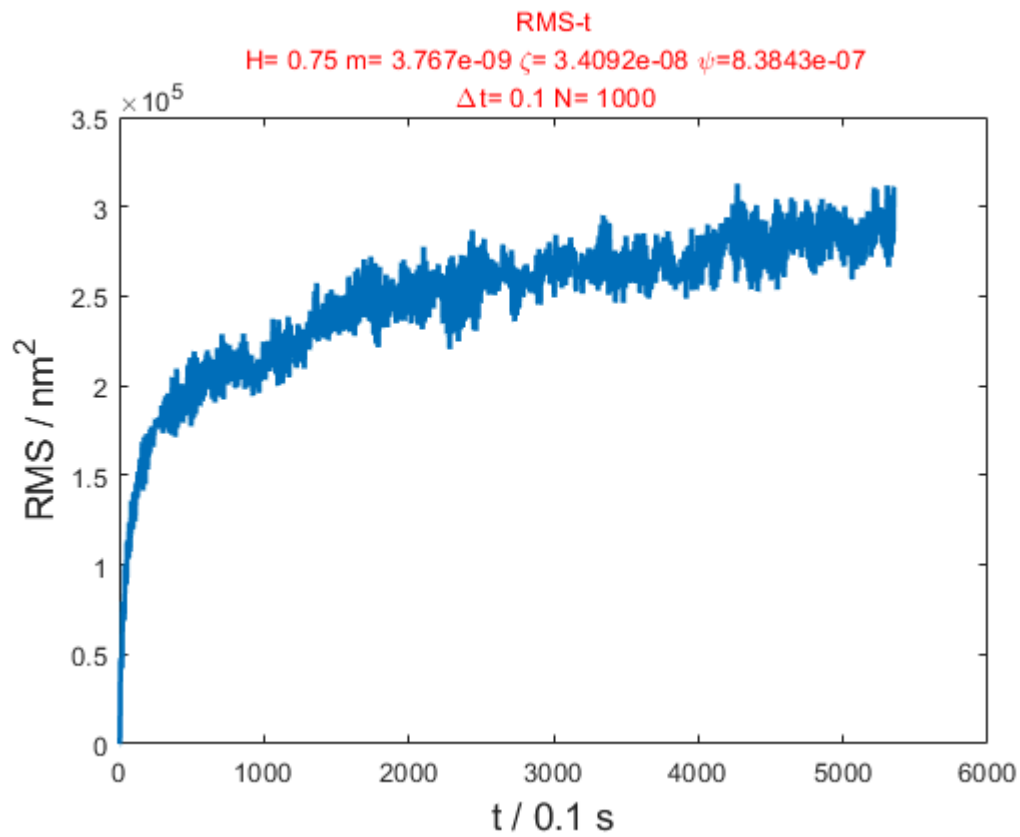$\Delta t= 0.1$ $N= 1000$

```
trying i_m=3, trying i_\psi=5, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 2.5959e-08 ψ=8.3843e-07
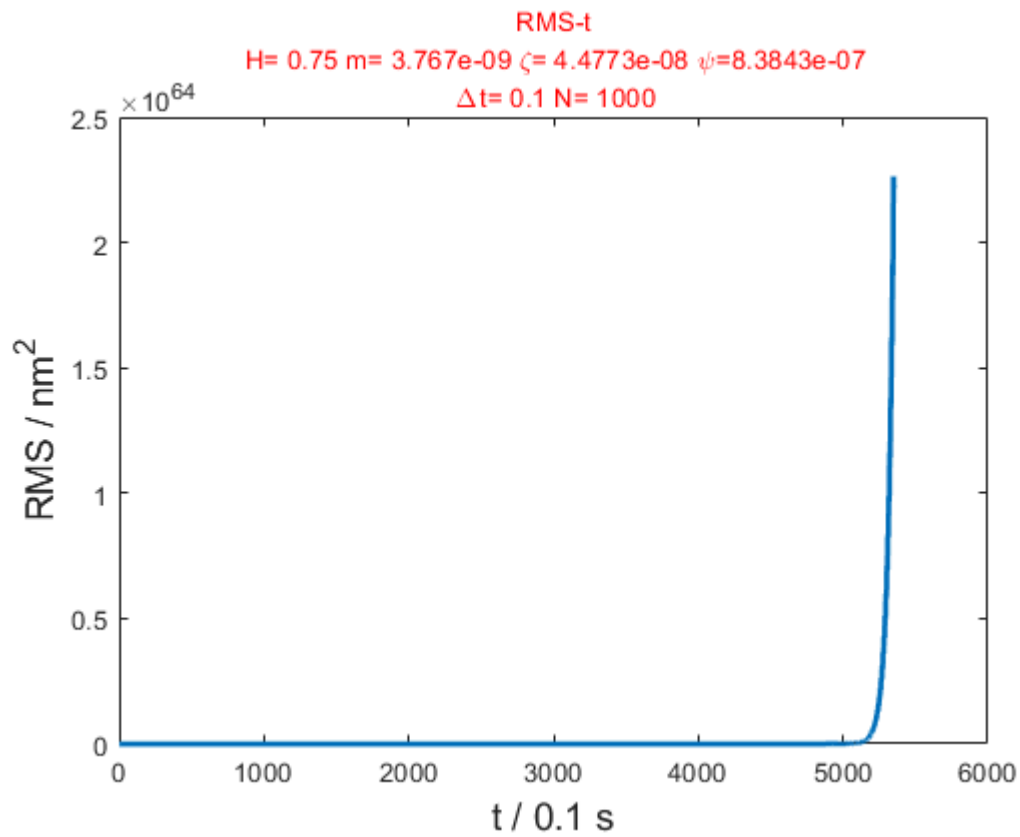Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=5, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 3.767e-09 ζ= 3.4092e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
trying i_m=3, trying i_\psi=5, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
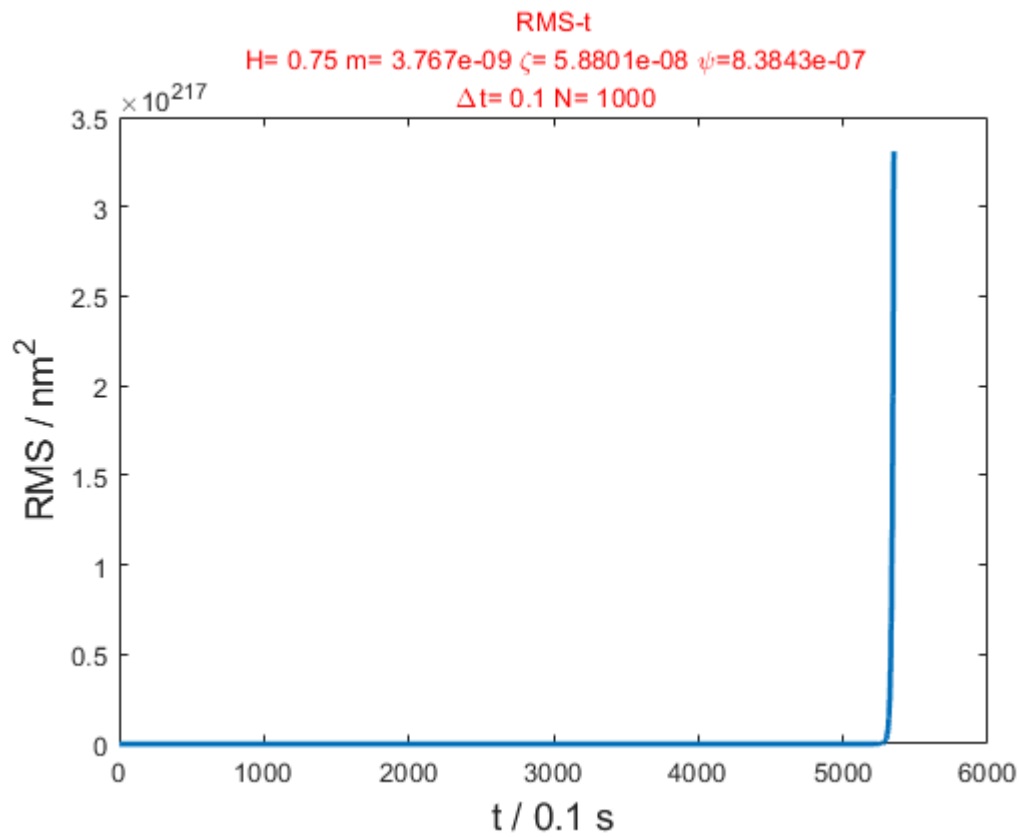
RMS-t
H= 0.75 m= 3.767e-09 ζ= 4.4773e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

explosion!
trying i_m=3, trying i_\psi=5, trying i_\zeta=5, total sampling number=5
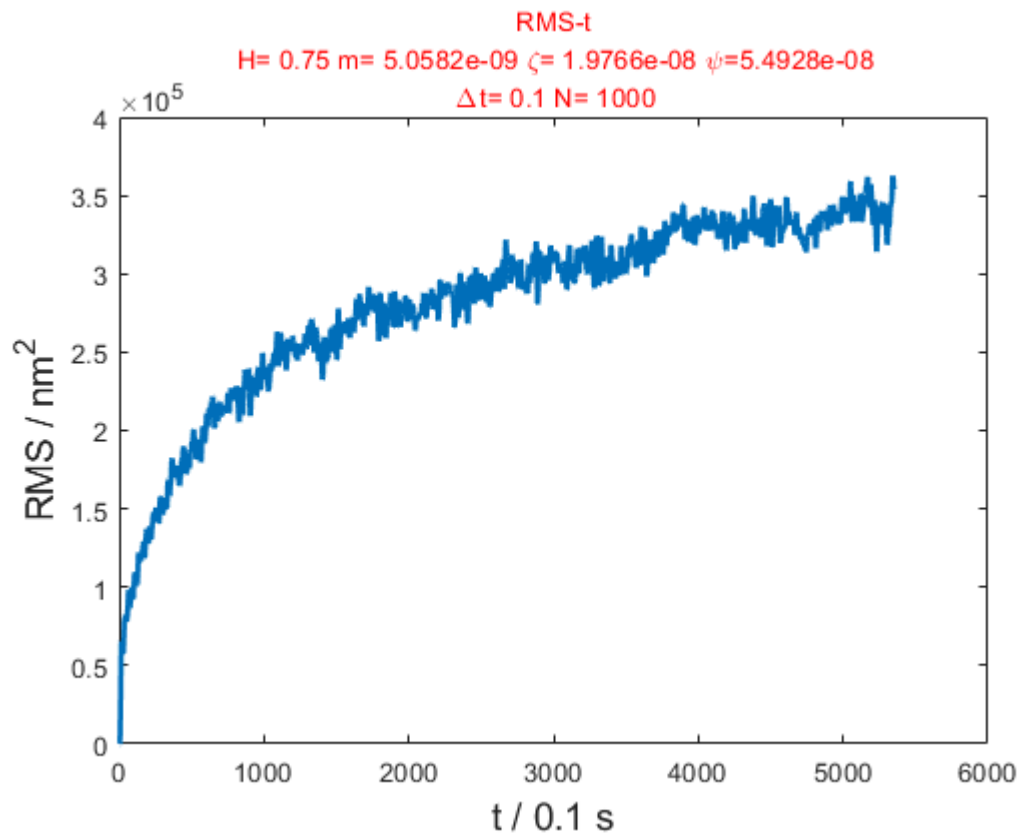
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 3.767e-09 ζ= 5.8801e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=4, trying i_\psi=1, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 5.0582e-09 ζ= 1.9766e-08 ψ=5.4928e-08
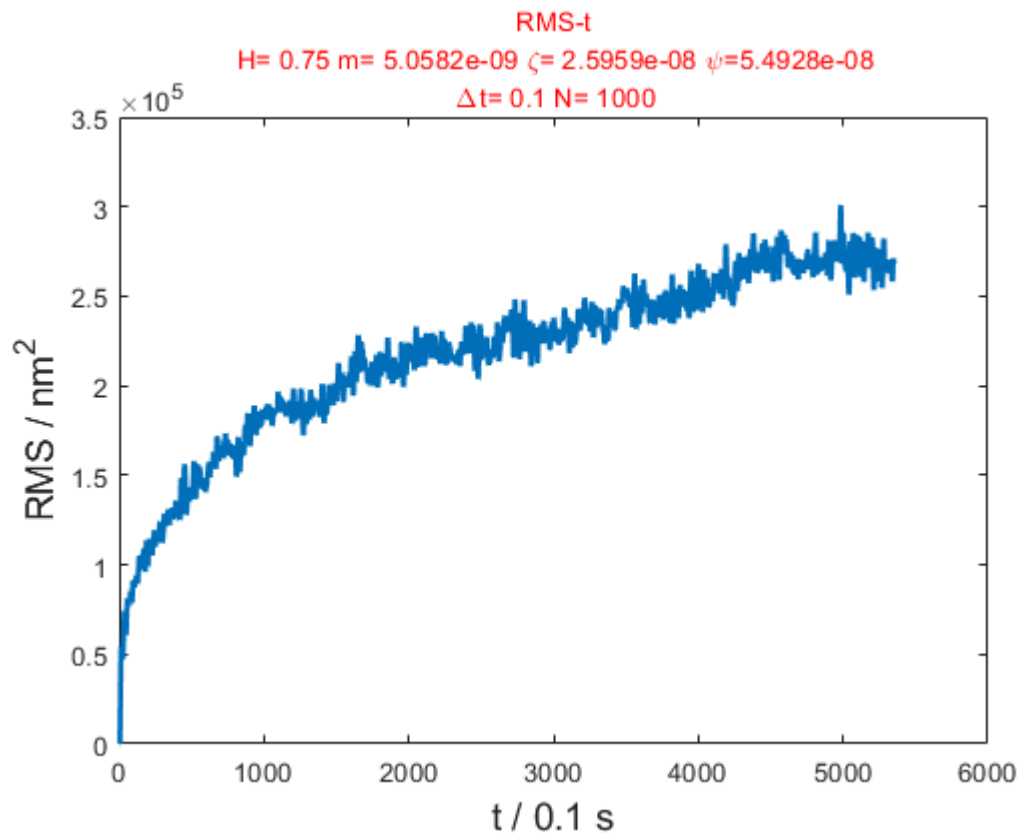Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=1, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
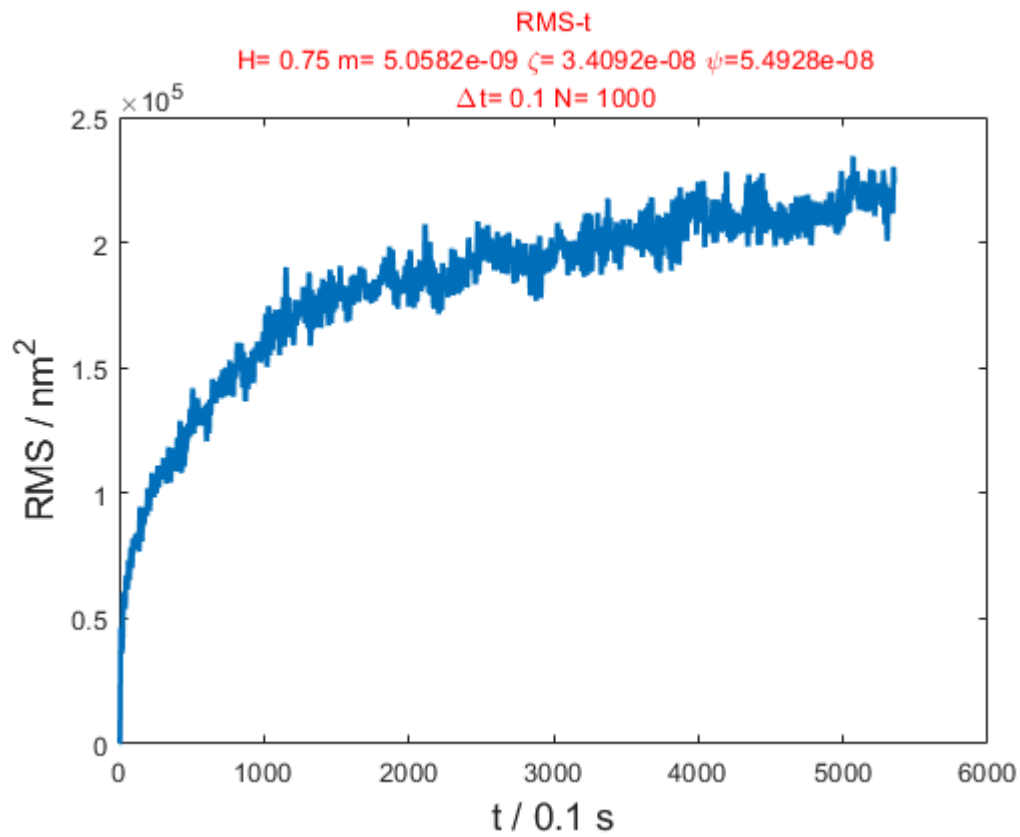
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 2.5959e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=1, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
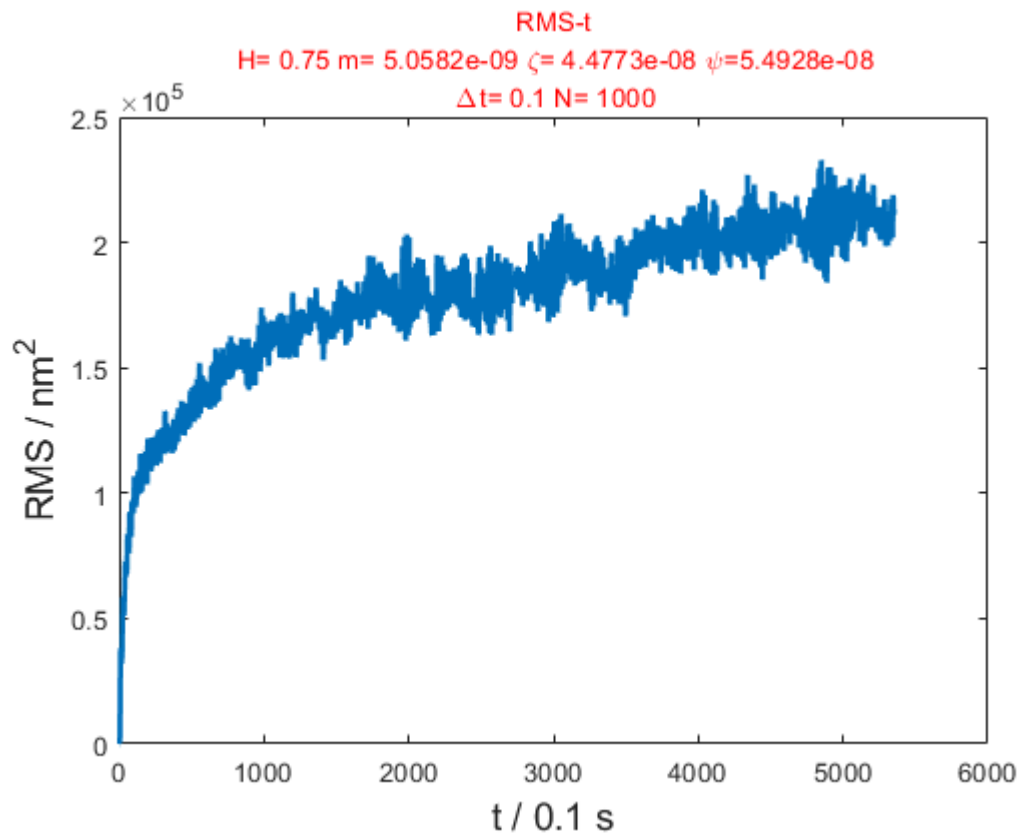
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 3.4092e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=1, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
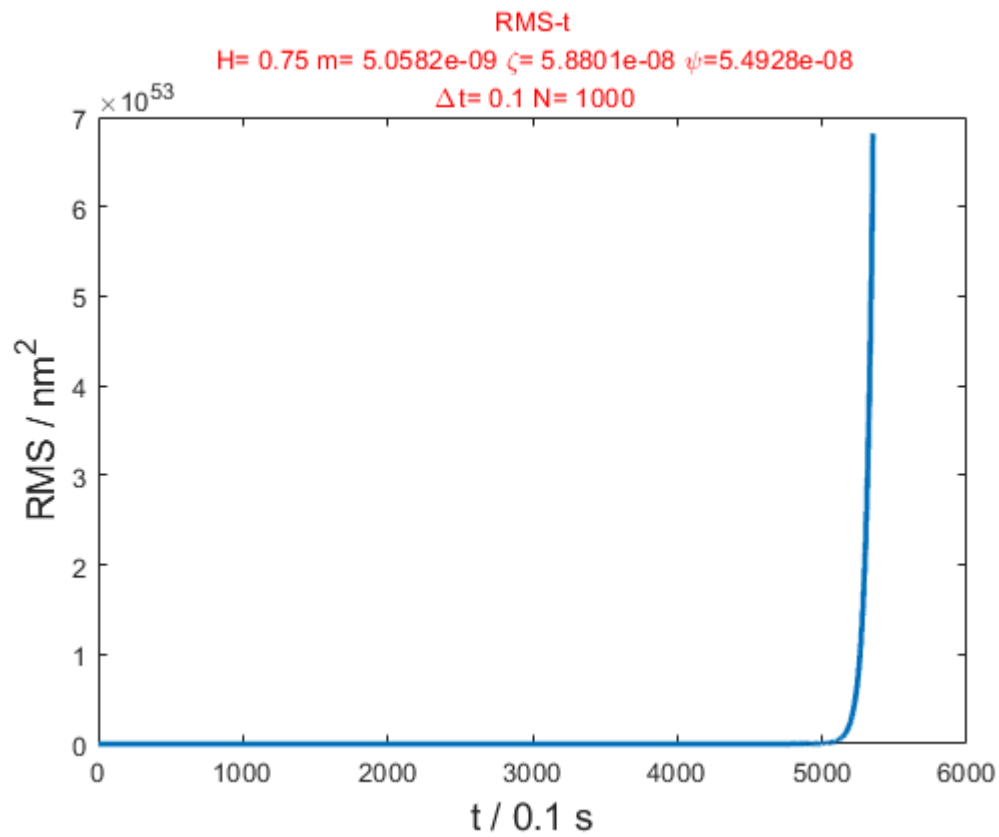
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 4.4773e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=1, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
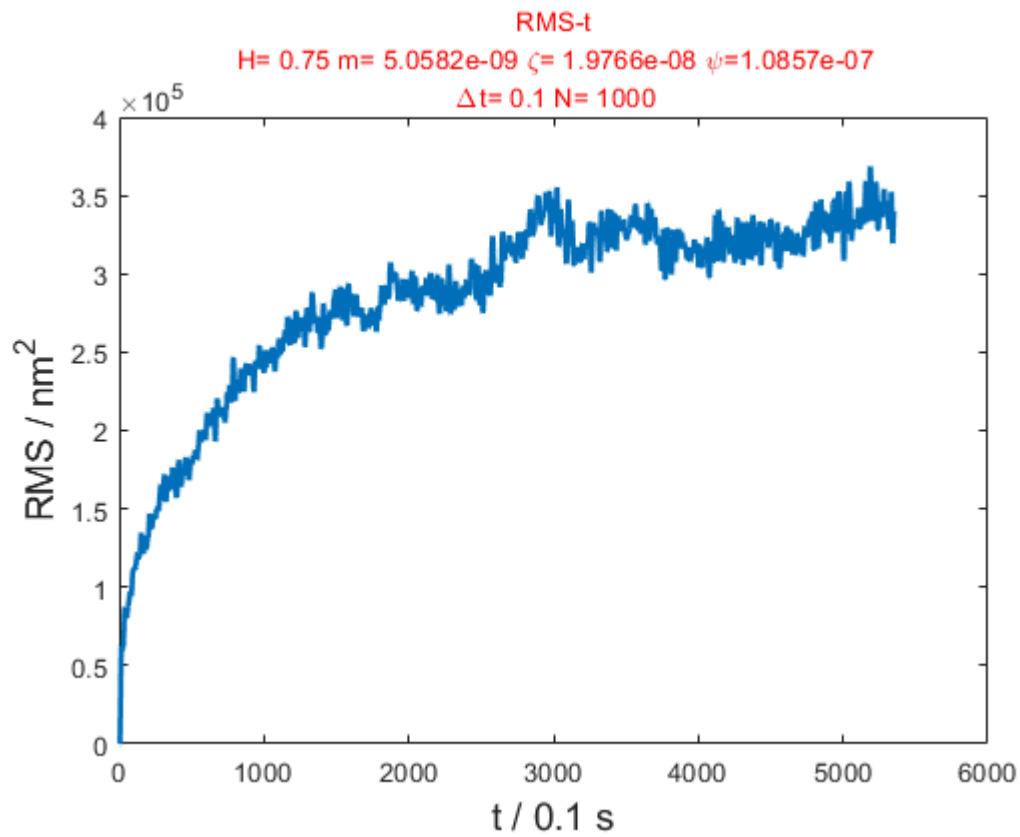
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 5.8801e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
explosion!
trying i_m=4, trying i_\psi=2, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 5.0582e-09 ζ= 1.9766e-08 ψ=1.0857e-07
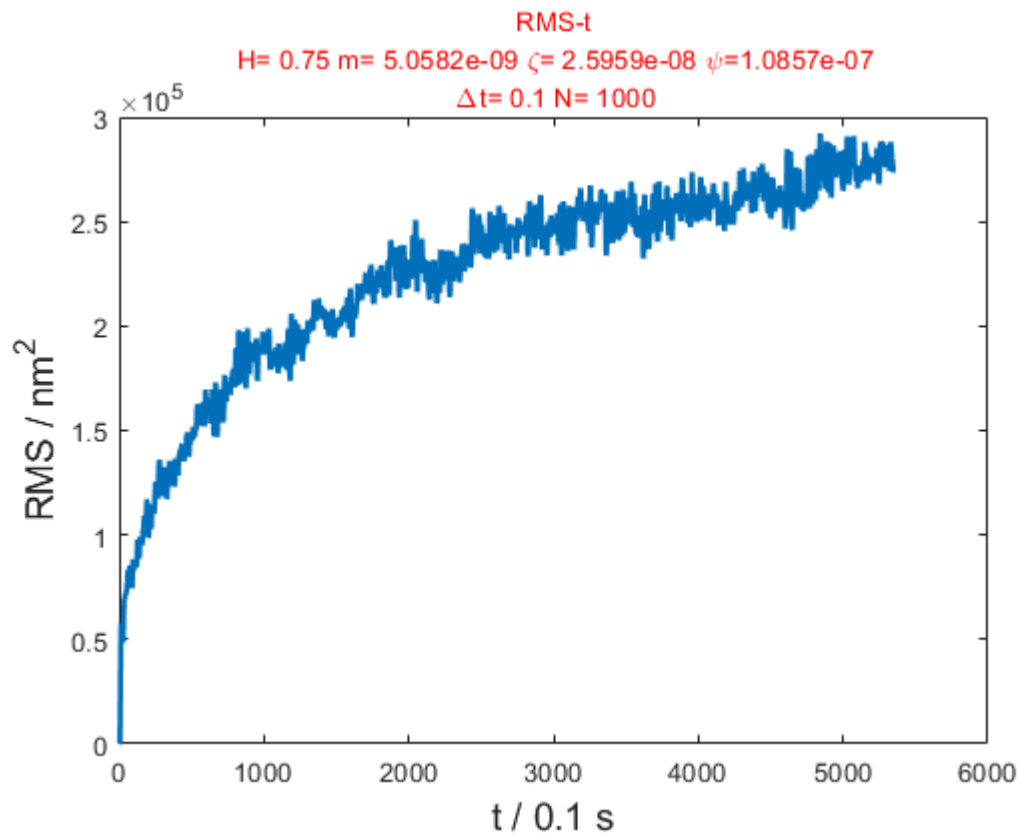Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=2, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
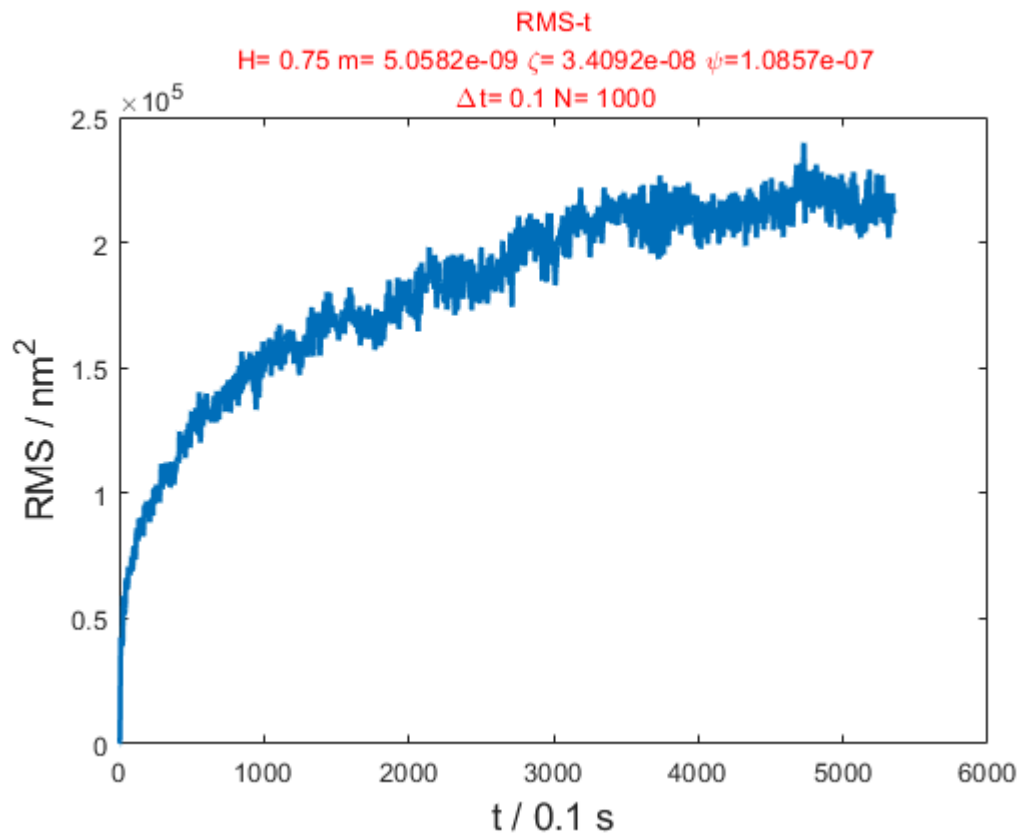
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 2.5959e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=2, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
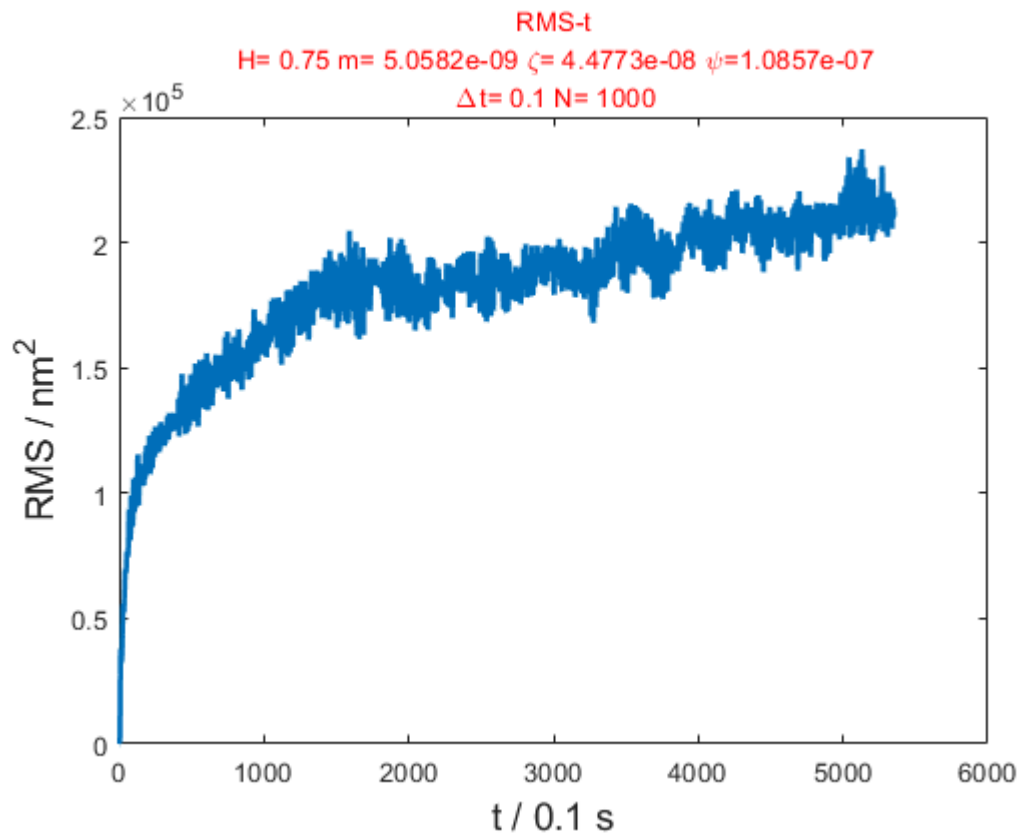
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 3.4092e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=2, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
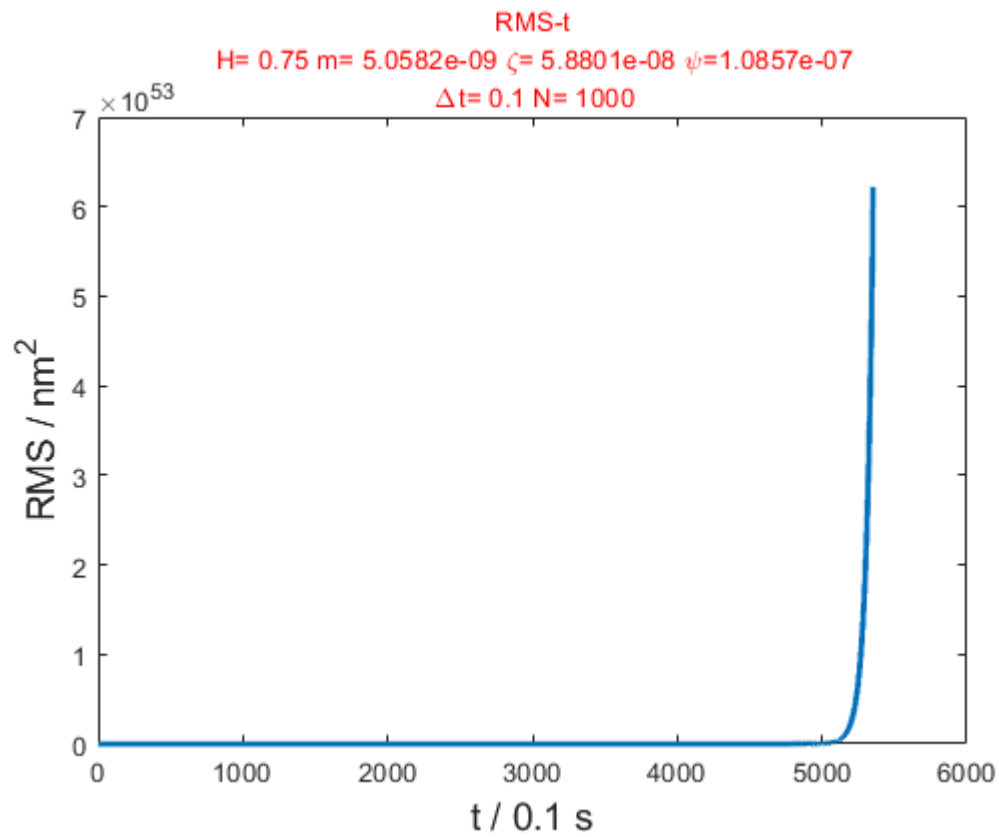
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 4.4773e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=2, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
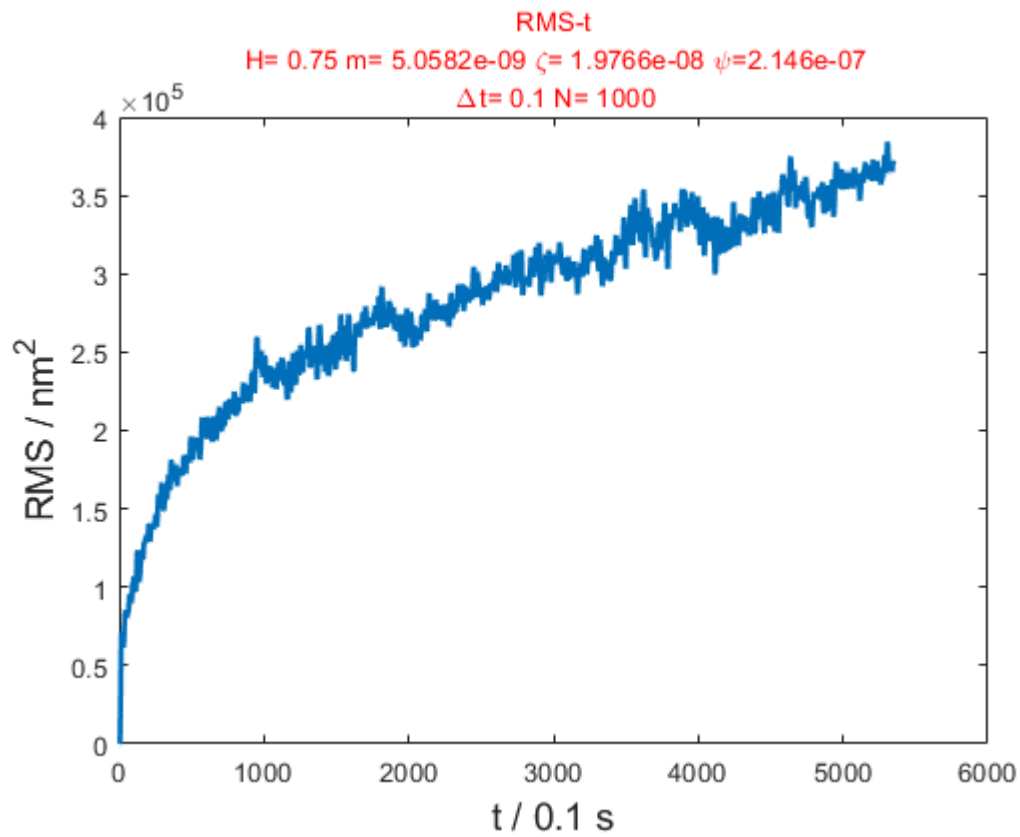
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 5.8801e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000


```
explosion!
trying i_m=4, trying i_\psi=3, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 5.0582e-09 ζ= 1.9766e-08 ψ=2.146e-07
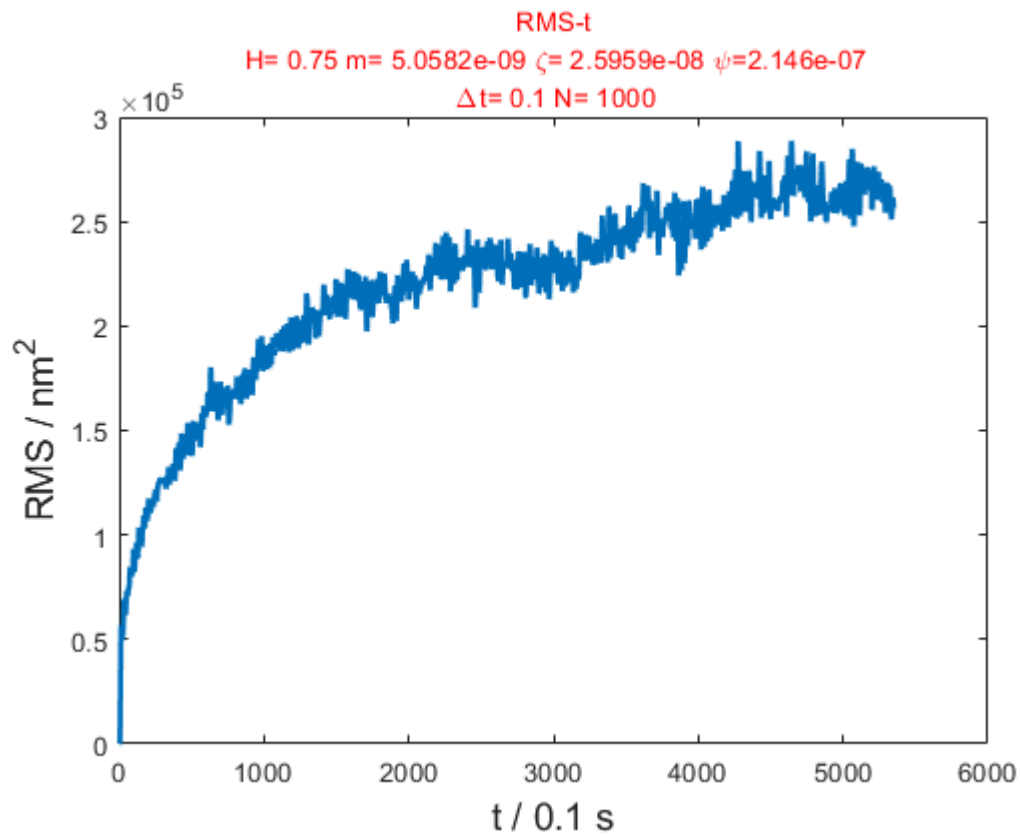Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=3, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
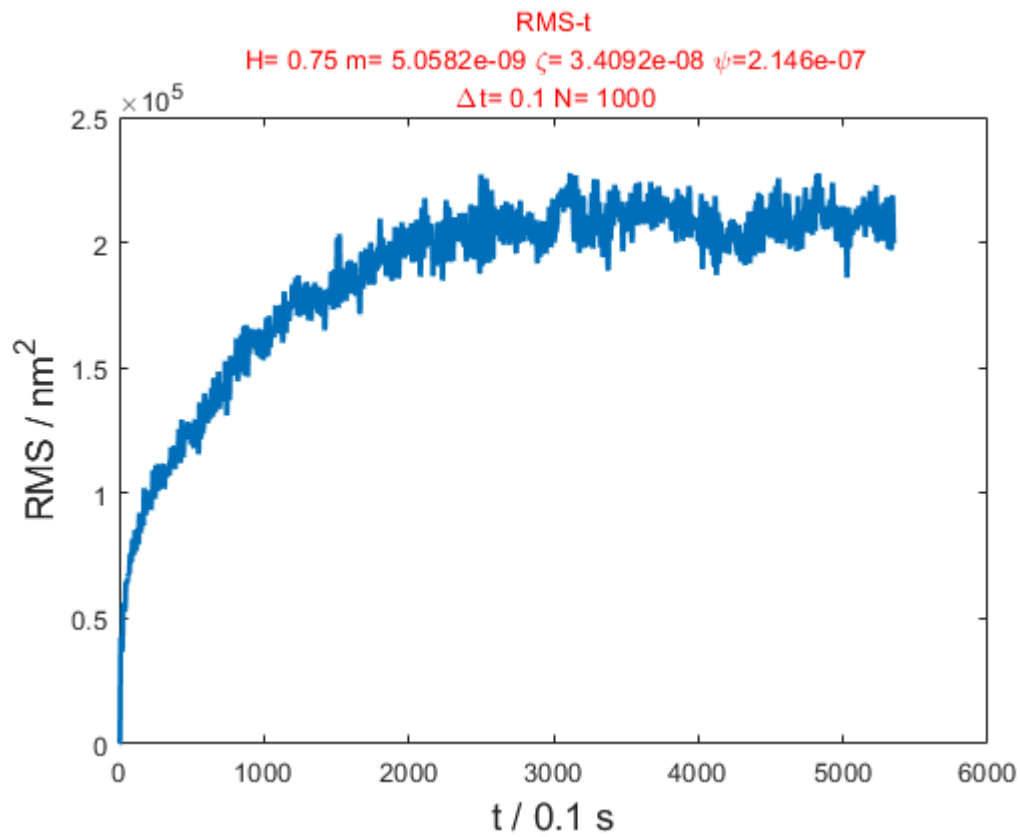
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 2.5959e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=3, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
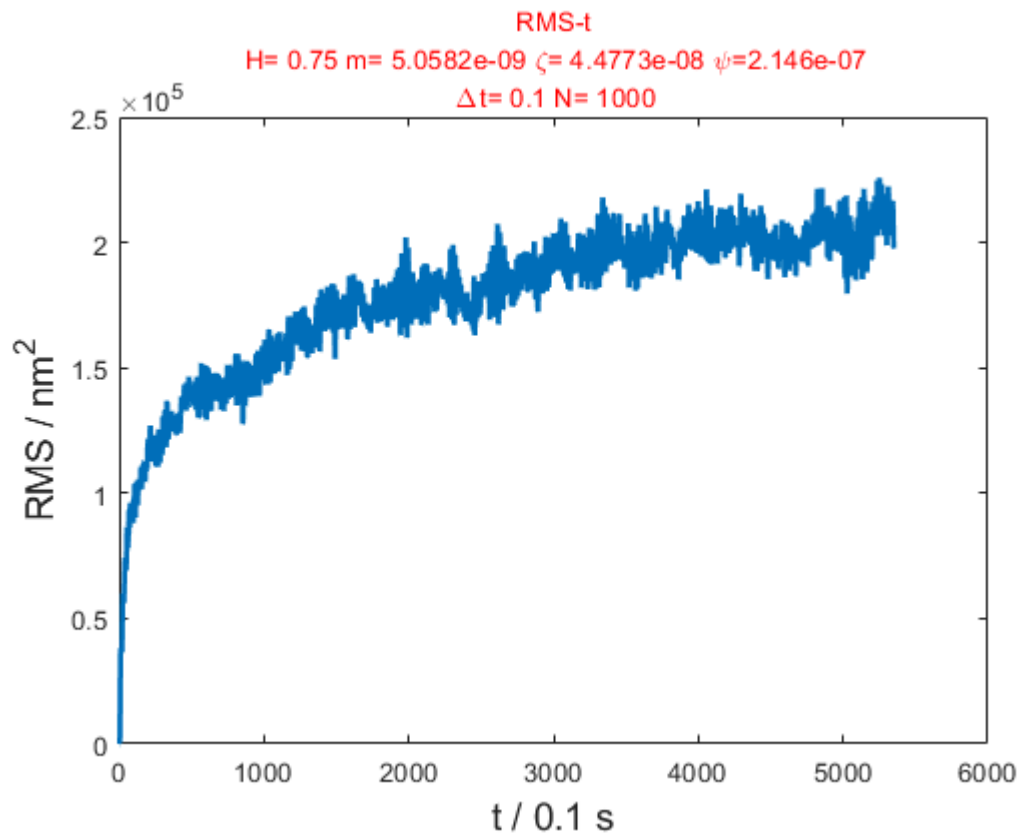
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 3.4092e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=3, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
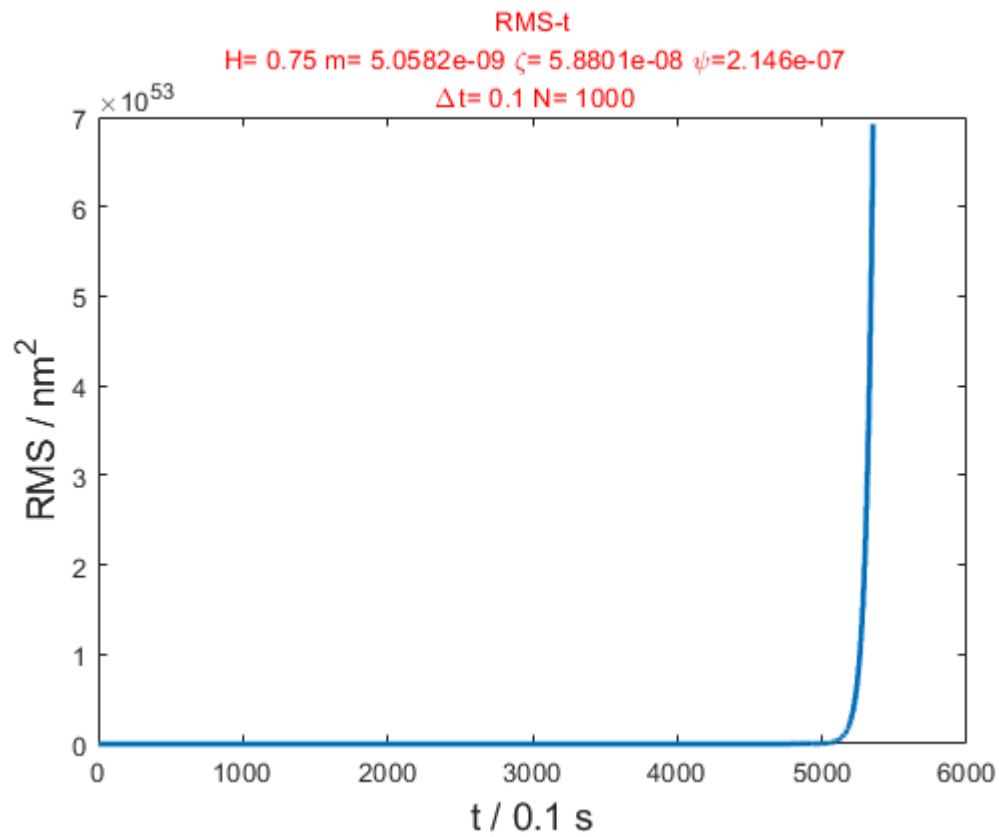
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 4.4773e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=3, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t

H= 0.75 m= 5.0582e-09 ζ= 5.8801e-08 ψ=2.146e-07

Δt= 0.1 N= 1000

```
explosion!
trying i_m=4, trying i_\psi=4, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
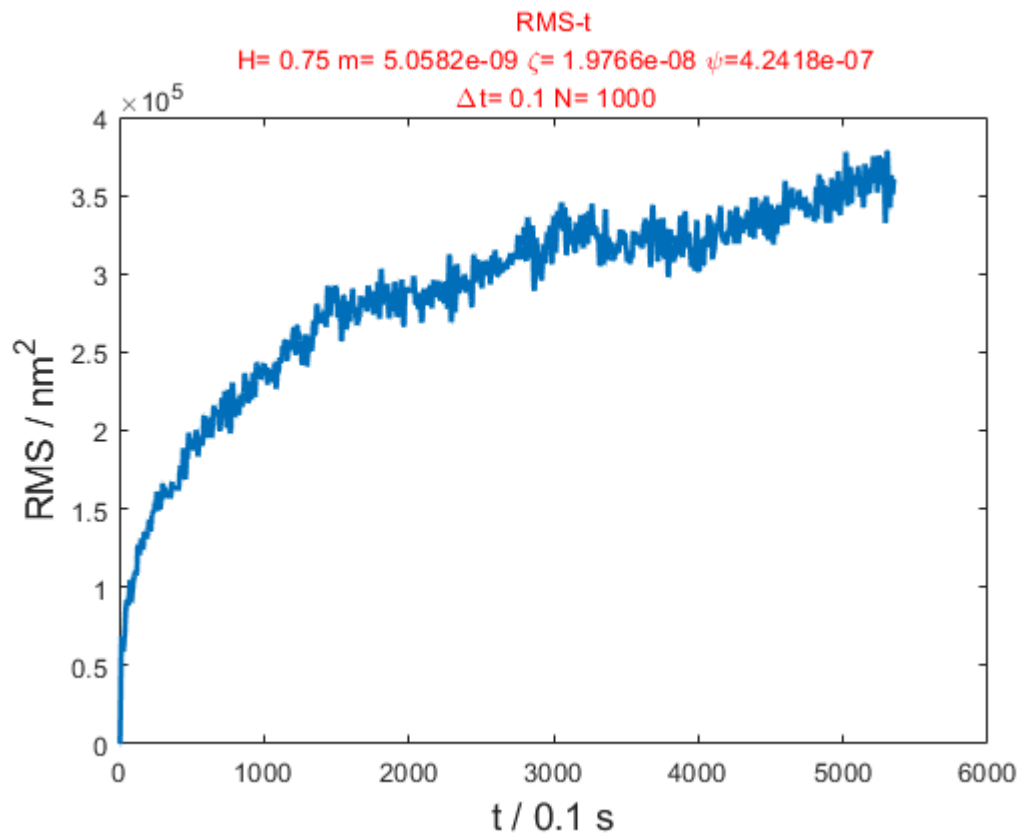
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 1.9766e-08 ψ=4.2418e-07
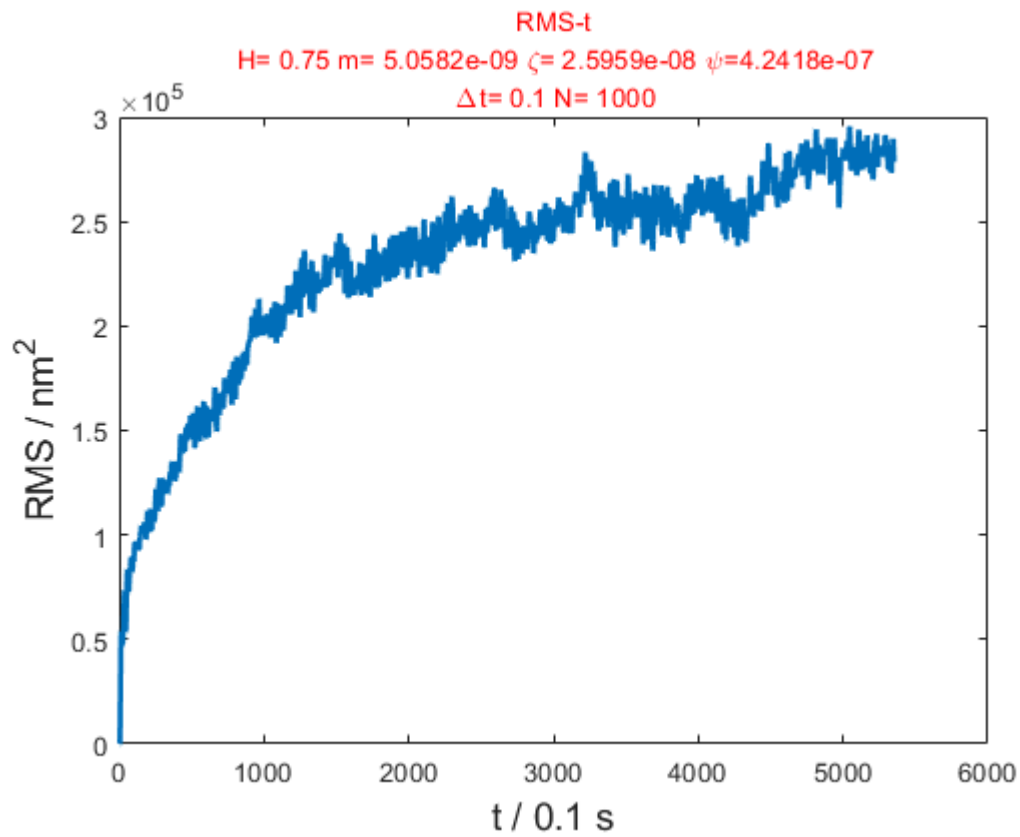**Δt= 0.1 N= 1000**

```
trying i_m=4, trying i_\psi=4, trying i_\zeta=2, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
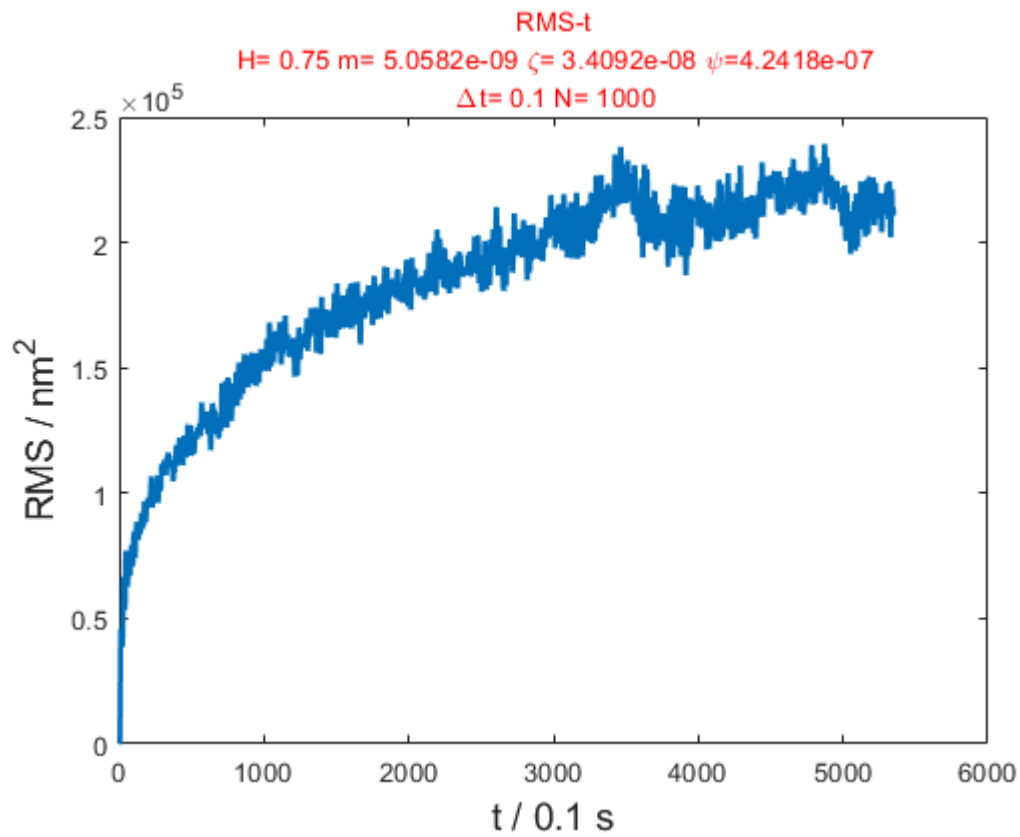
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 2.5959e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=4, trying i_\zeta=3, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
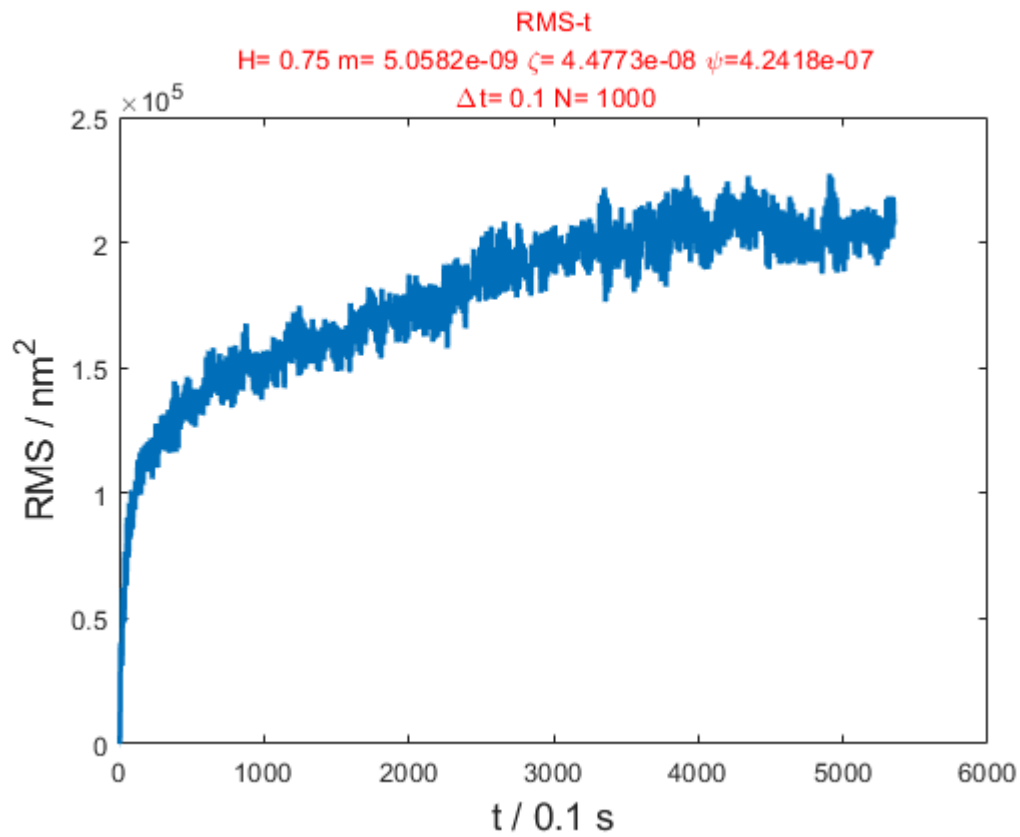
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 3.4092e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=4, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
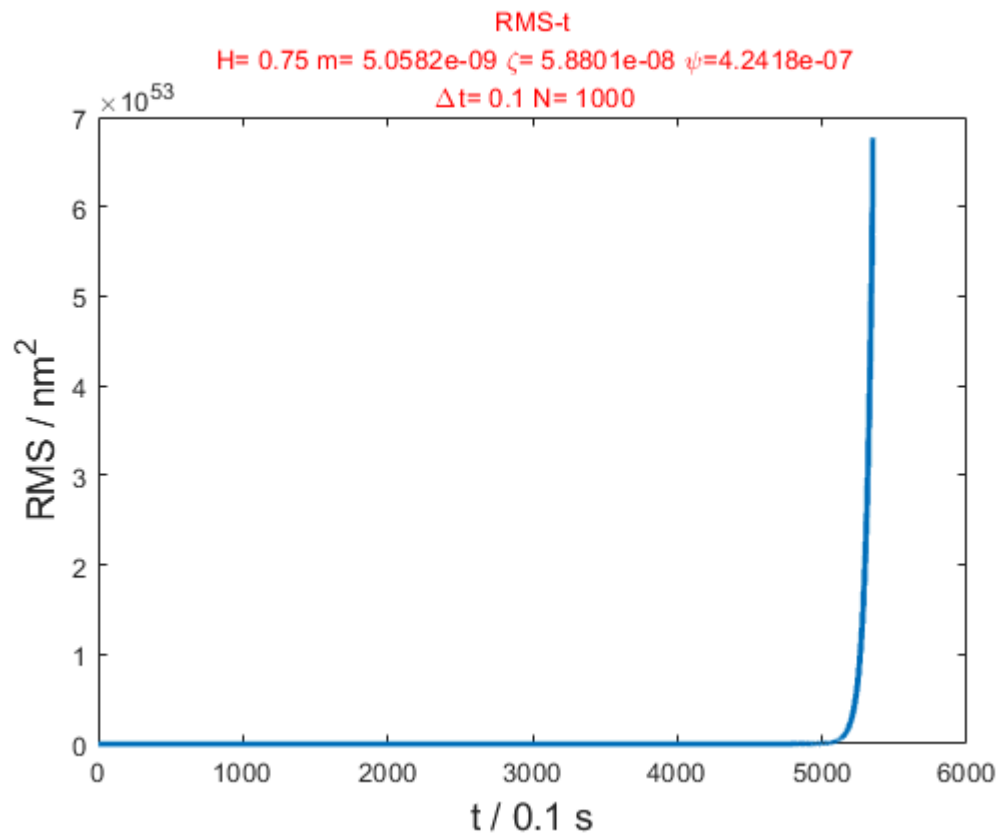
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 4.4773e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=4, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 5.0582e-09 ζ= 5.8801e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=4, trying i_\psi=5, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
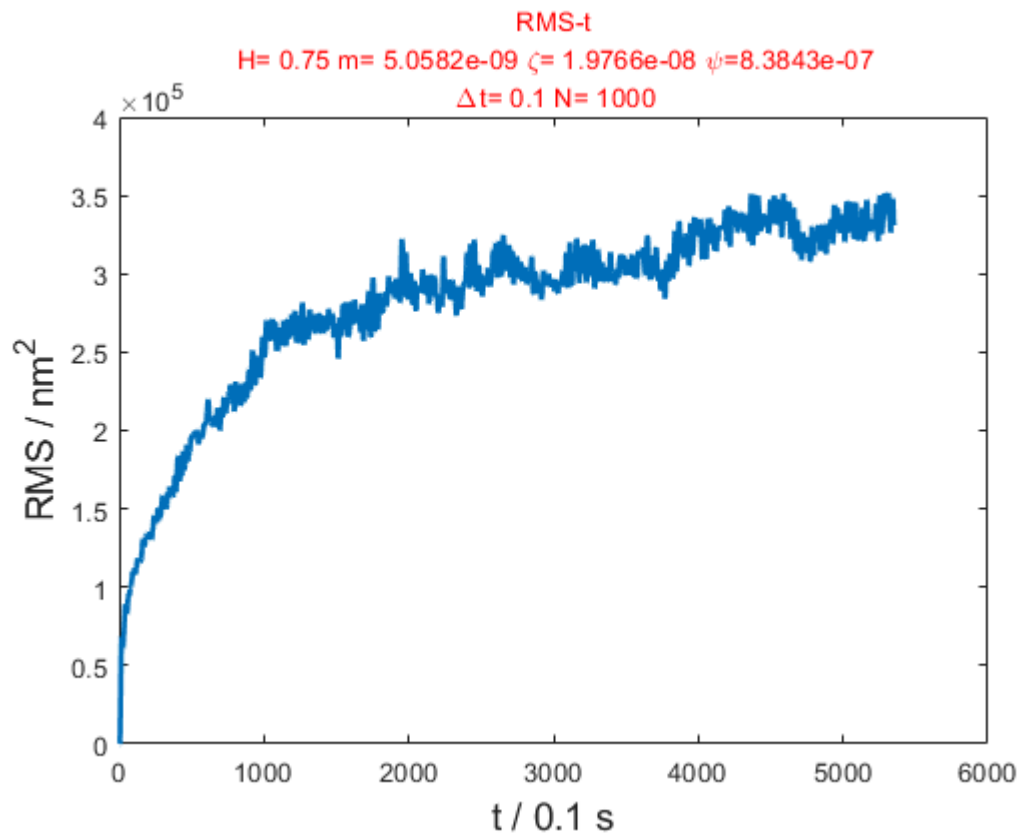
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 1.9766e-08 ψ=8.3843e-07
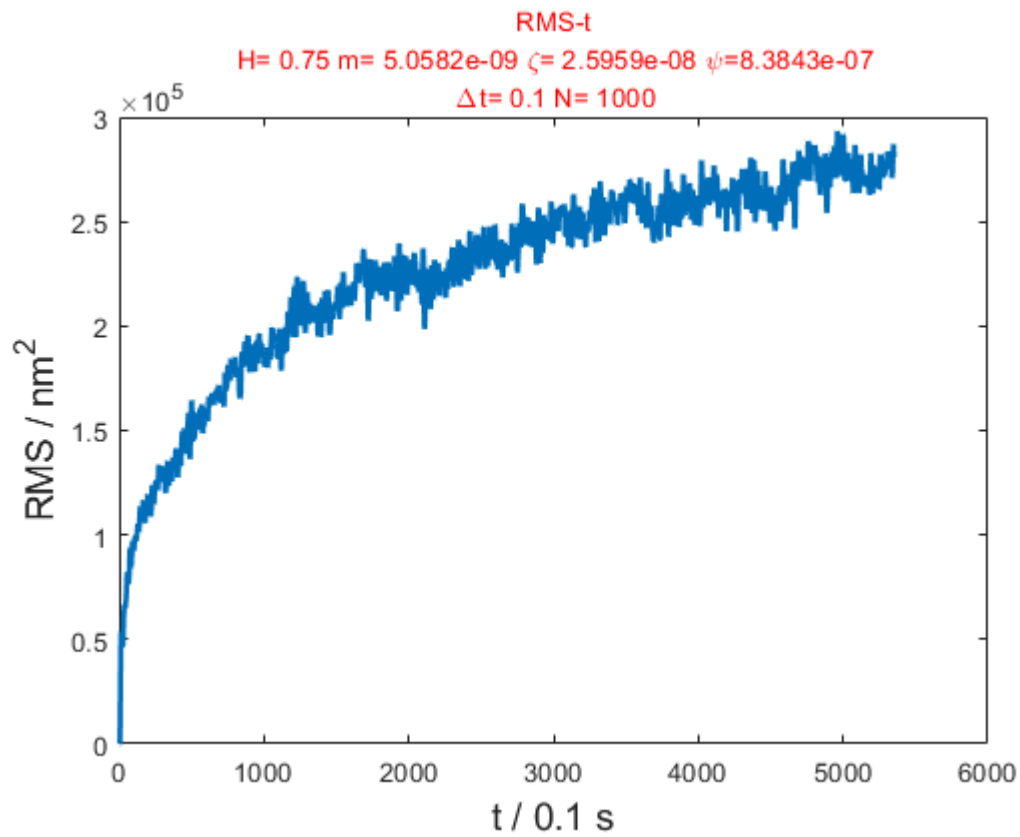Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=5, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
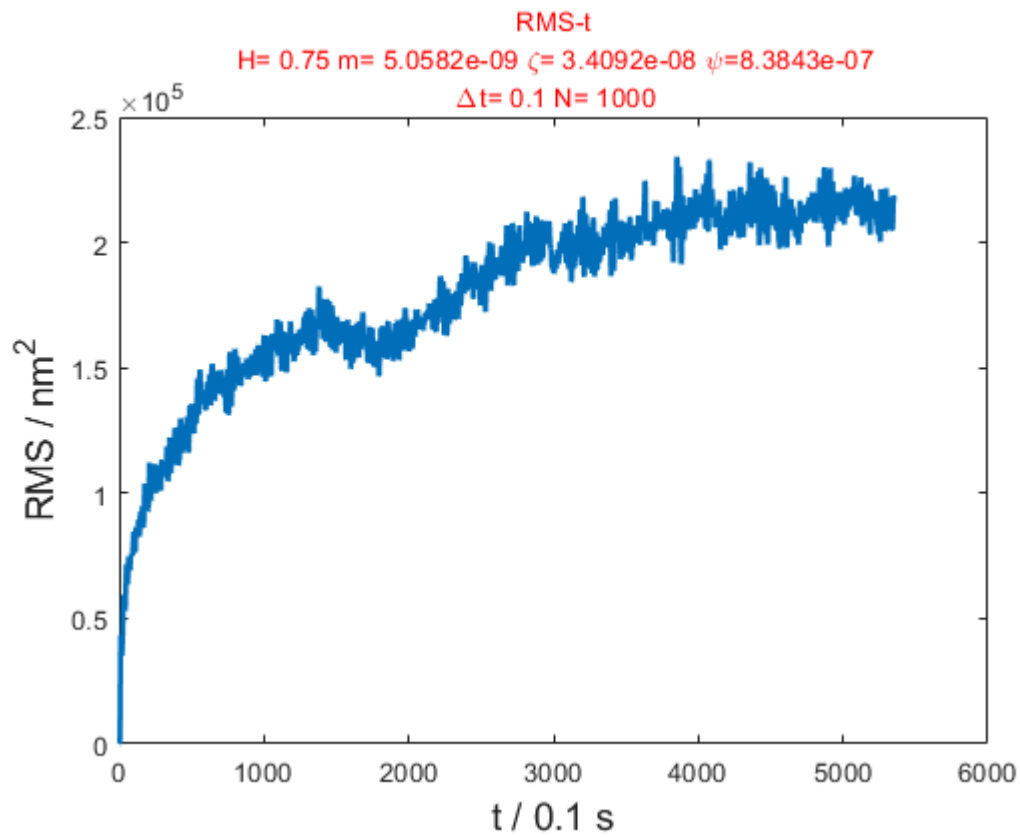
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 2.5959e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=5, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
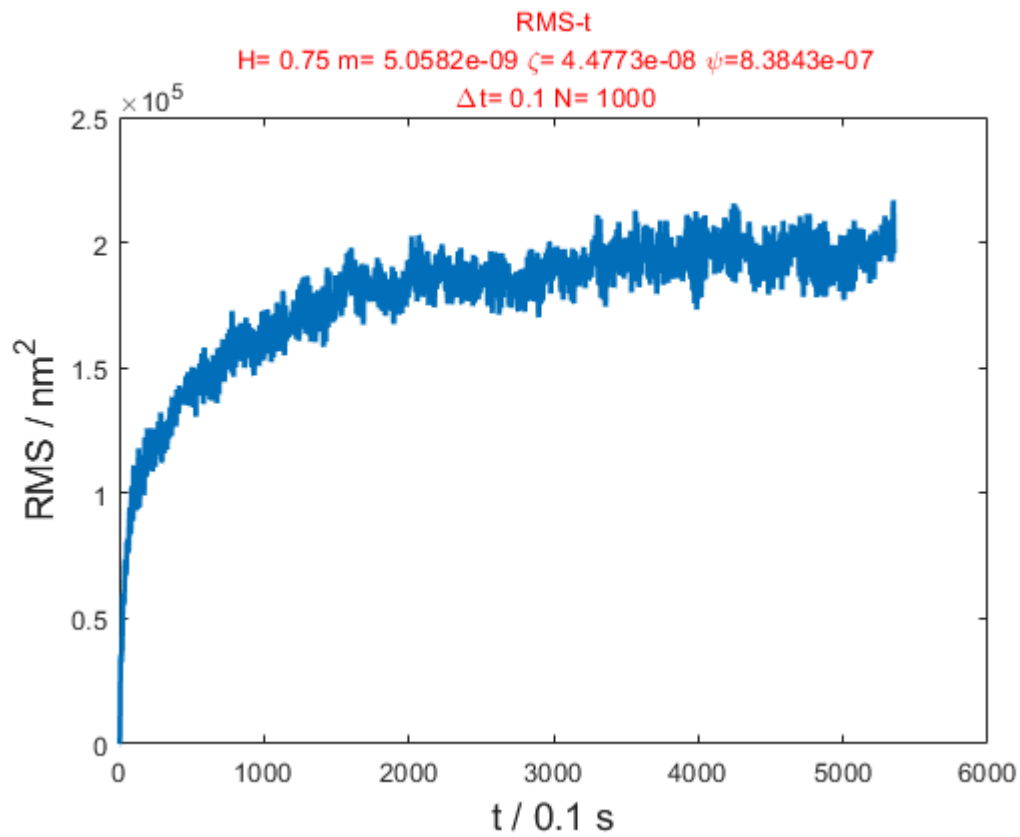
RMS-t
H= 0.75 m= 5.0582e-09 ζ= 3.4092e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

trying i_m=4, trying i_\psi=5, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
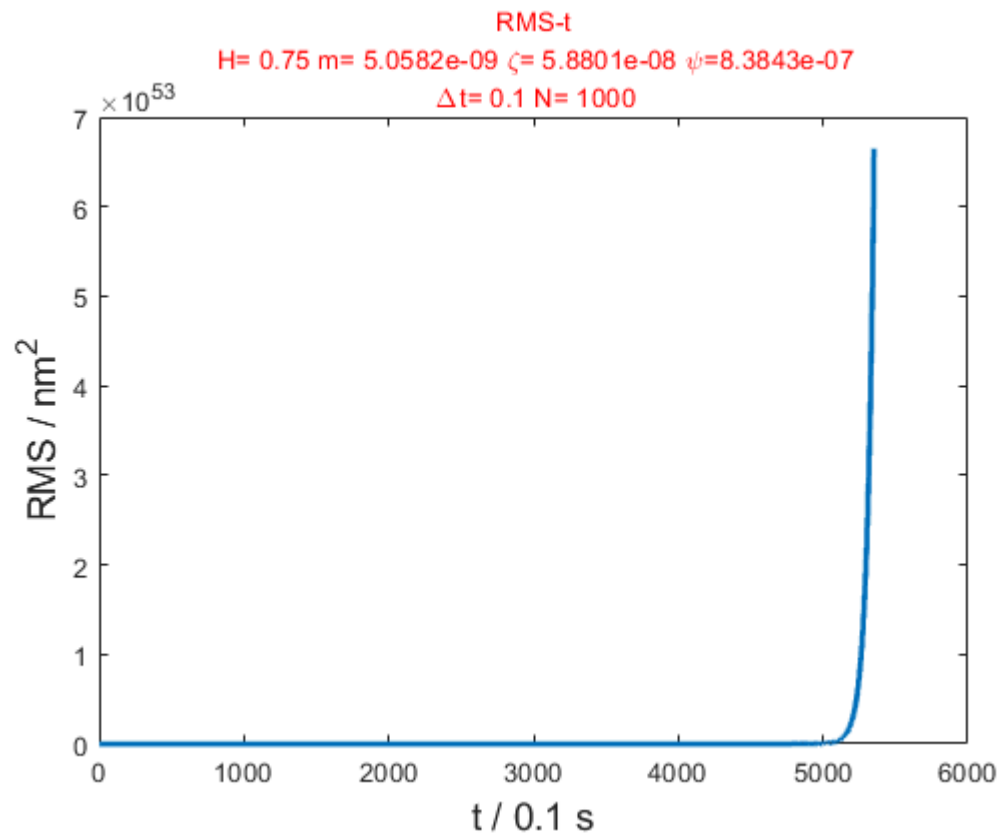progress rate   80 %
progress rate   90 %
progress rate   100 %

RMS-t
H= 0.75 m= 5.0582e-09 ζ= 4.4773e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
trying i_m=4, trying i_\psi=5, trying i_\zeta=5, total sampling number=5
progress rate  10 %
progress rate  20 %
progress rate  30 %
progress rate  40 %
progress rate  50 %
progress rate  60 %
progress rate  70 %
progress rate  80 %
progress rate  90 %
progress rate  100 %
```

RMS-t
H= 0.75 m= 5.0582e-09 ζ= 5.8801e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
explosion!
trying i_m=5, trying i_\psi=1, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
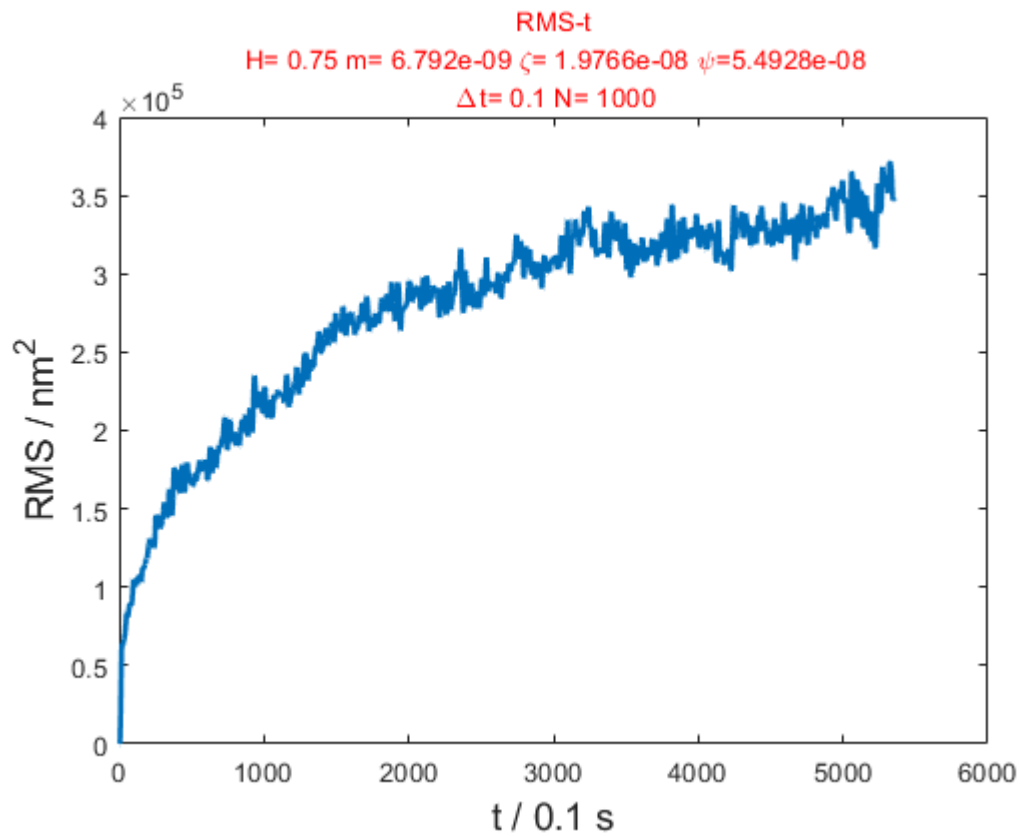
RMS-t

H= 0.75 m= 6.792e-09 ζ= 1.9766e-08 ψ=5.4928e-08
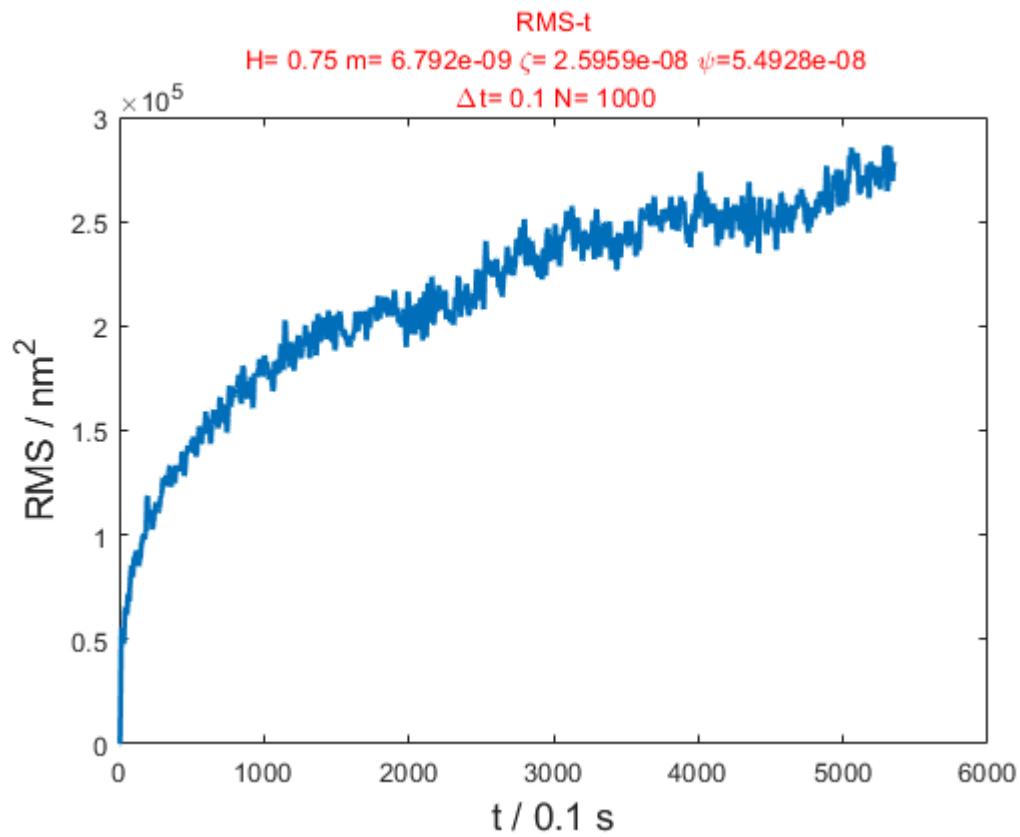
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=1, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
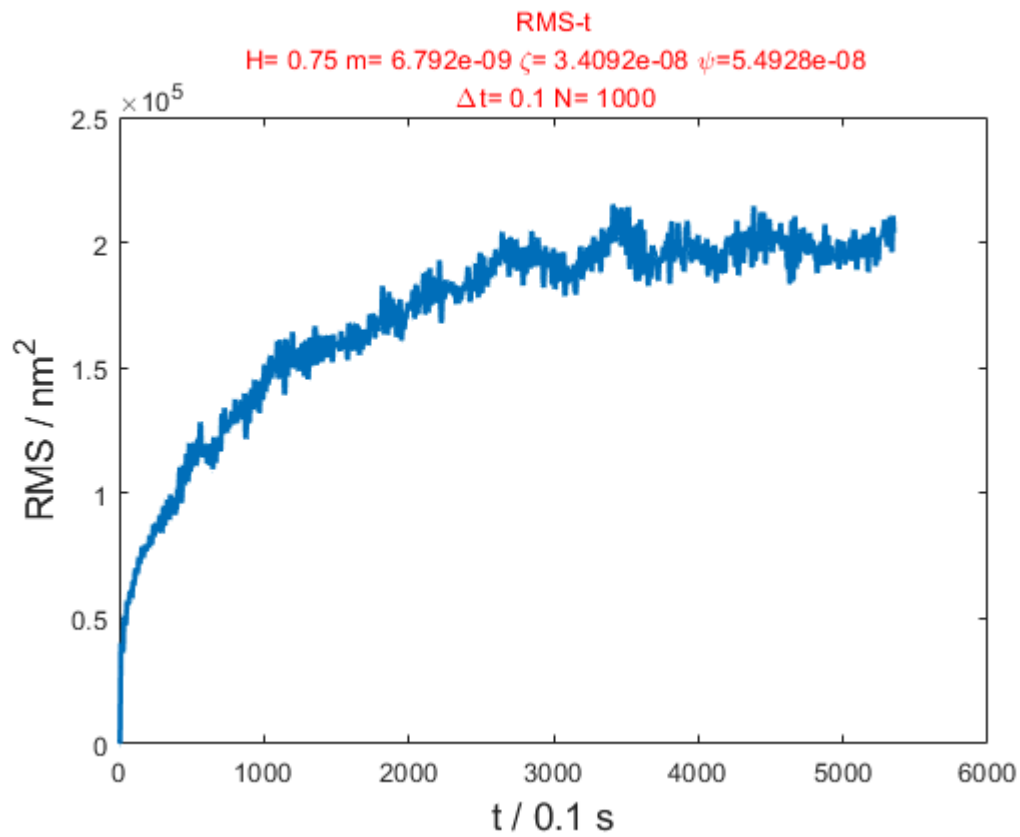
RMS-t

H= 0.75 m= 6.792e-09 ζ= 2.5959e-08 ψ=5.4928e-08

Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=1, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
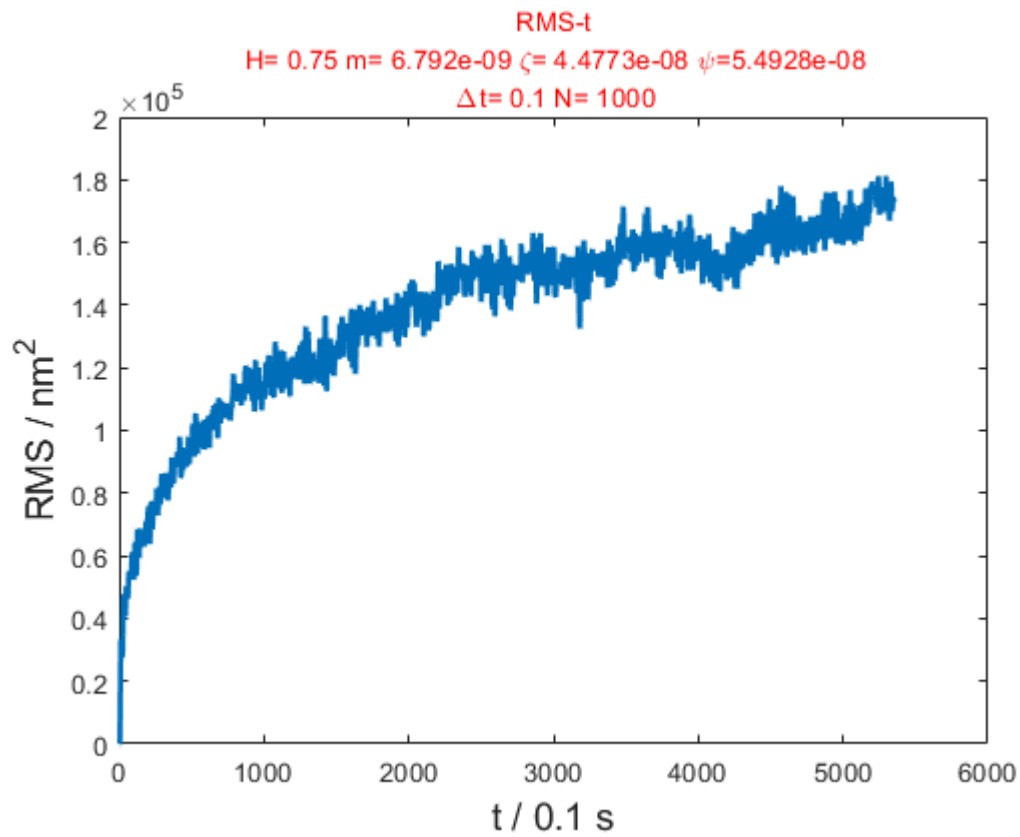
RMS-t

H= 0.75 m= 6.792e-09 ζ= 3.4092e-08 ψ=5.4928e-08

Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=1, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
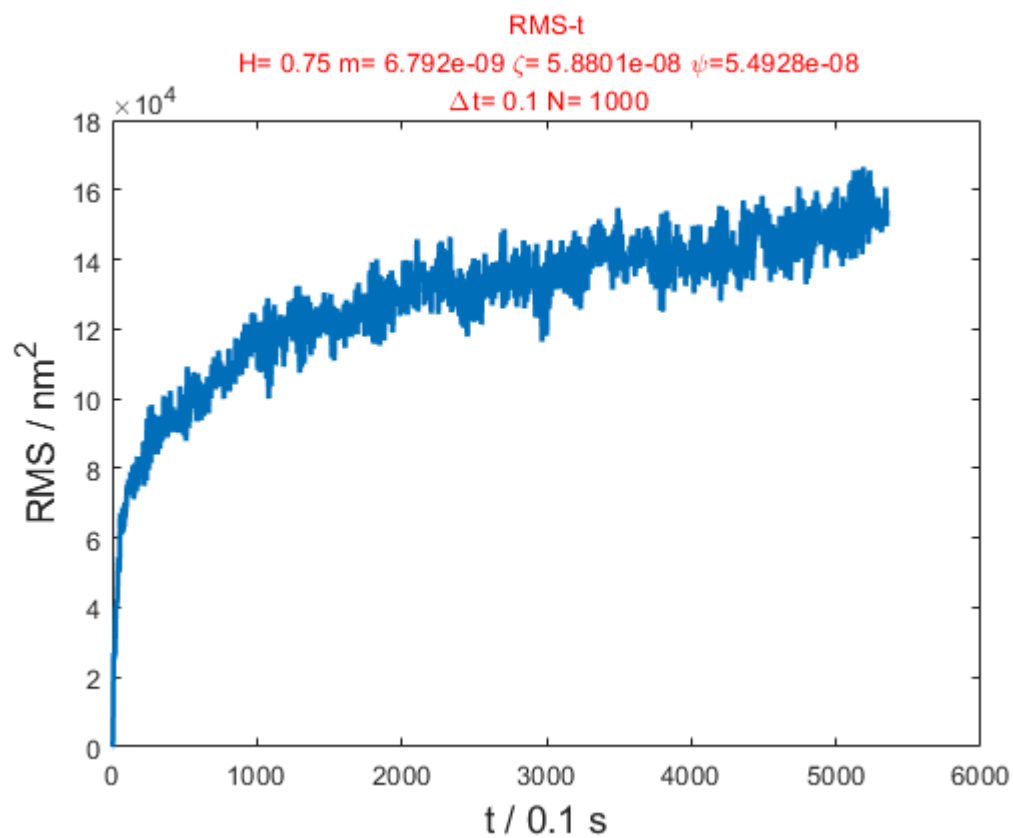
RMS-t
H= 0.75 m= 6.792e-09 ζ= 4.4773e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=1, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
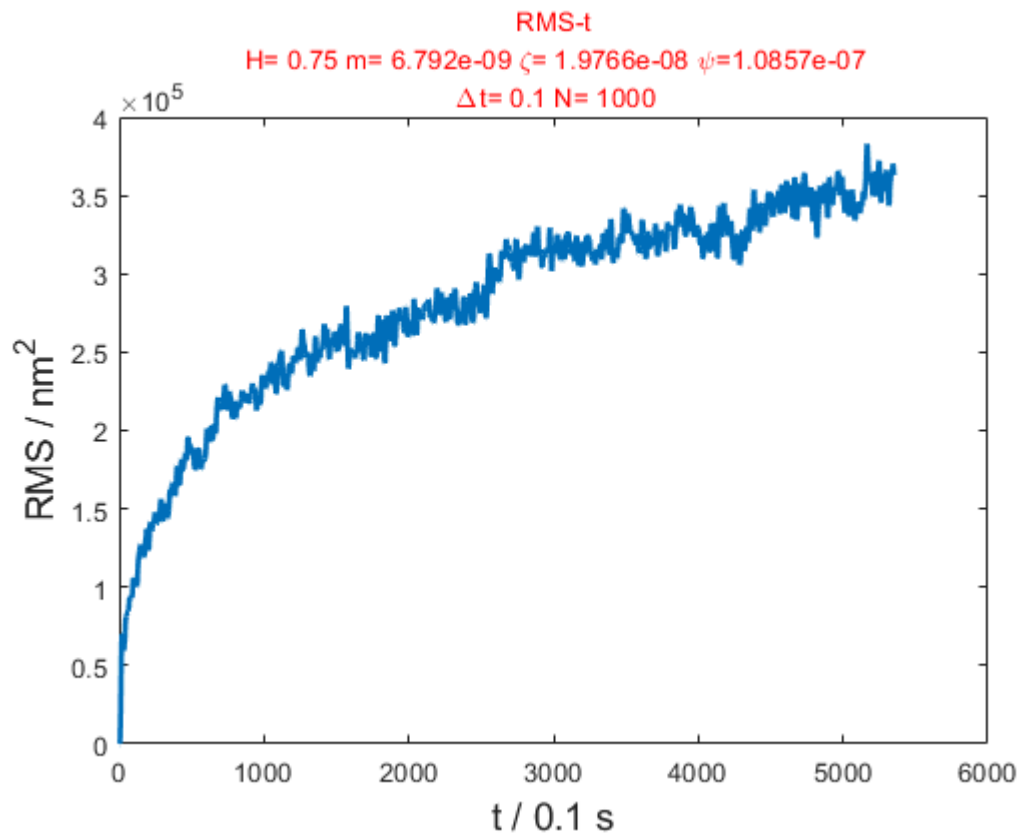
RMS-t
H= 0.75 m= 6.792e-09 ζ= 5.8801e-08 ψ=5.4928e-08
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=2, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
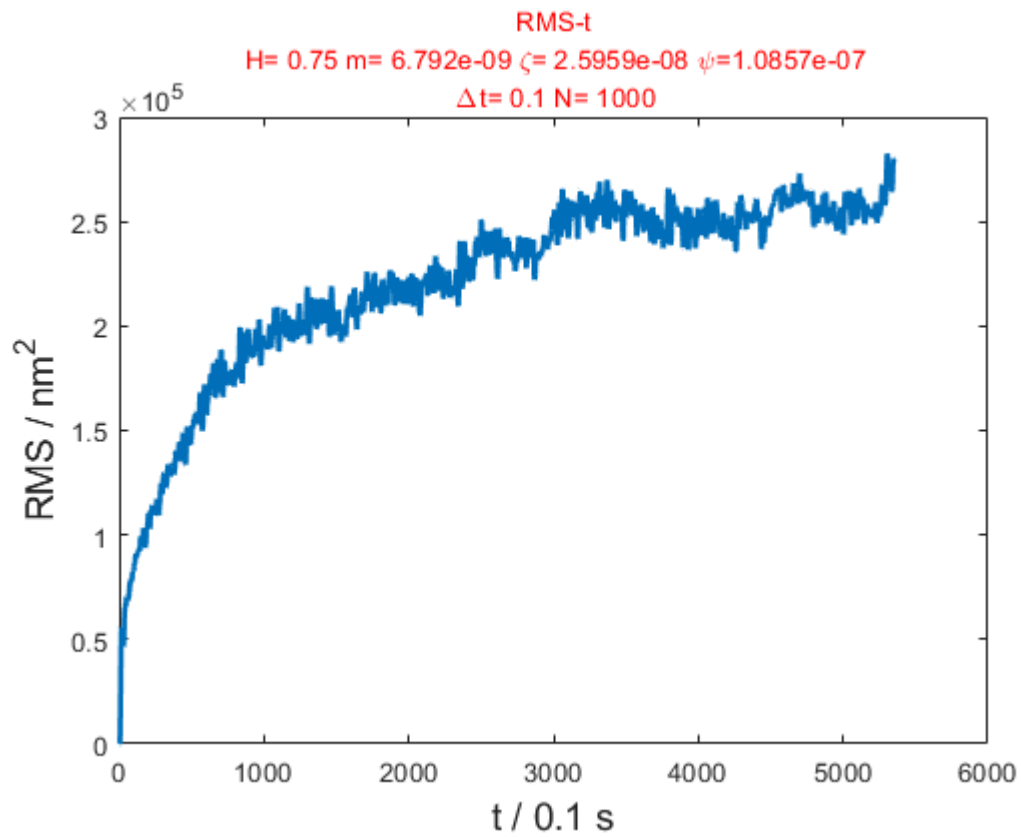
RMS-t
H= 0.75 m= 6.792e-09 ζ= 1.9766e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=2, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
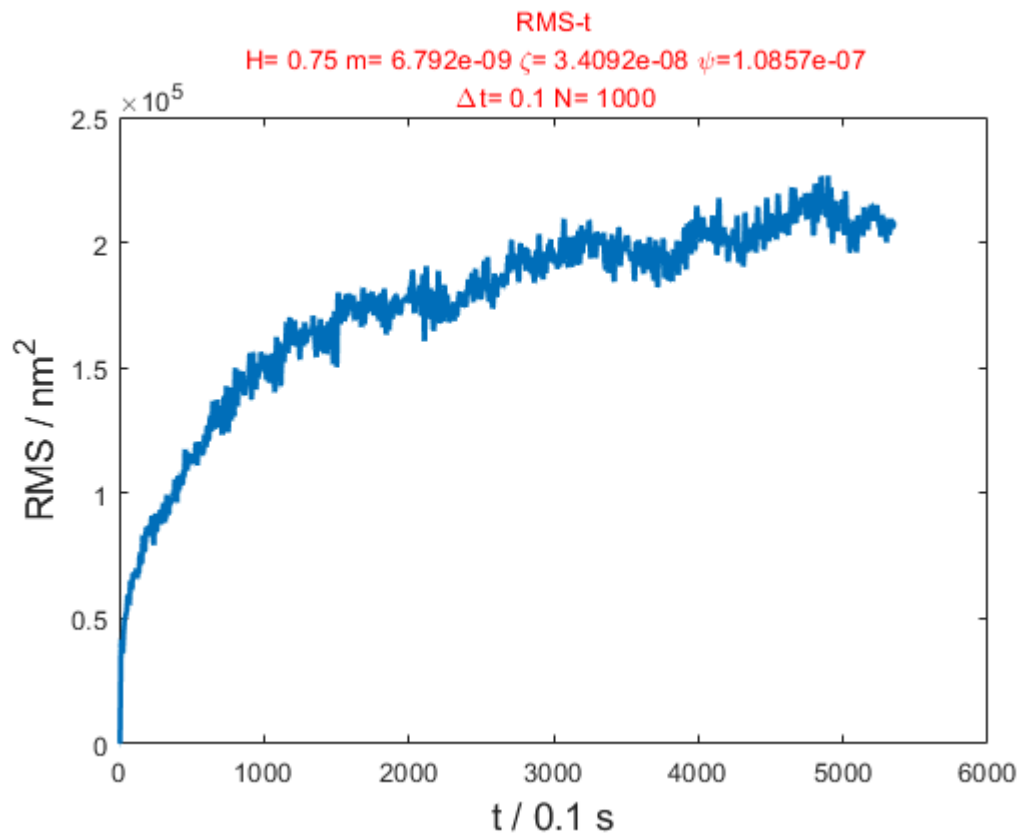
RMS-t
H= 0.75 m= 6.792e-09 ζ= 2.5959e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=2, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
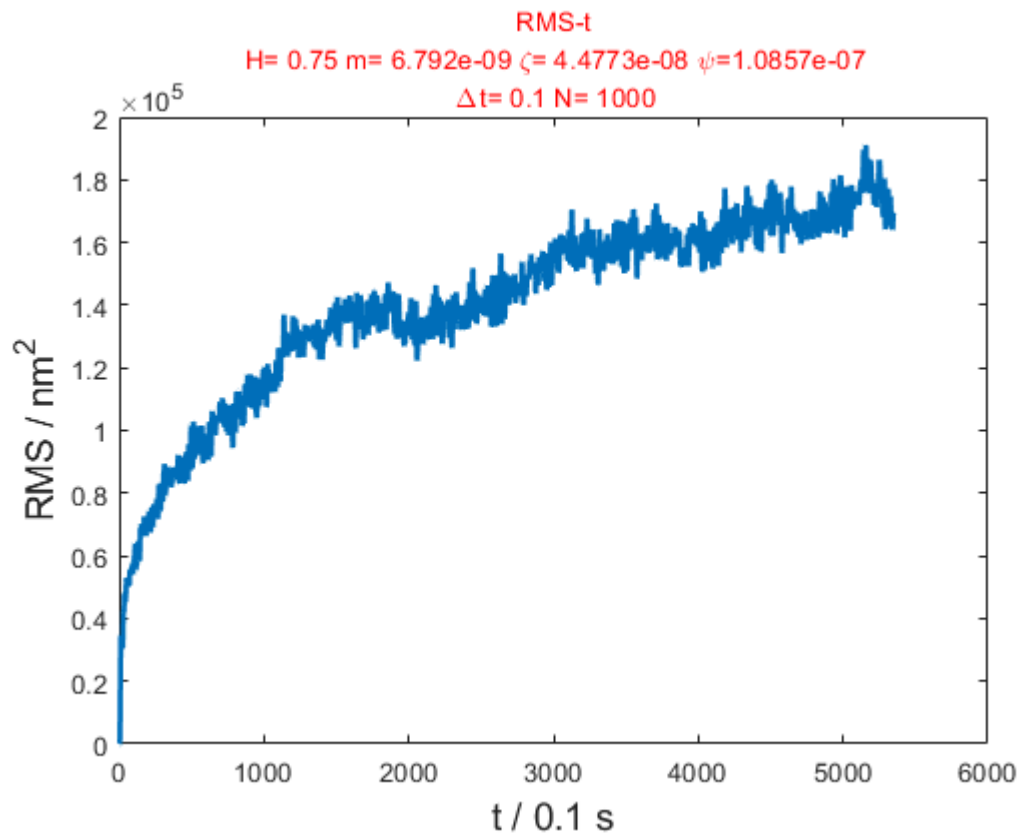
RMS-t
H= 0.75 m= 6.792e-09 ζ= 3.4092e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=2, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
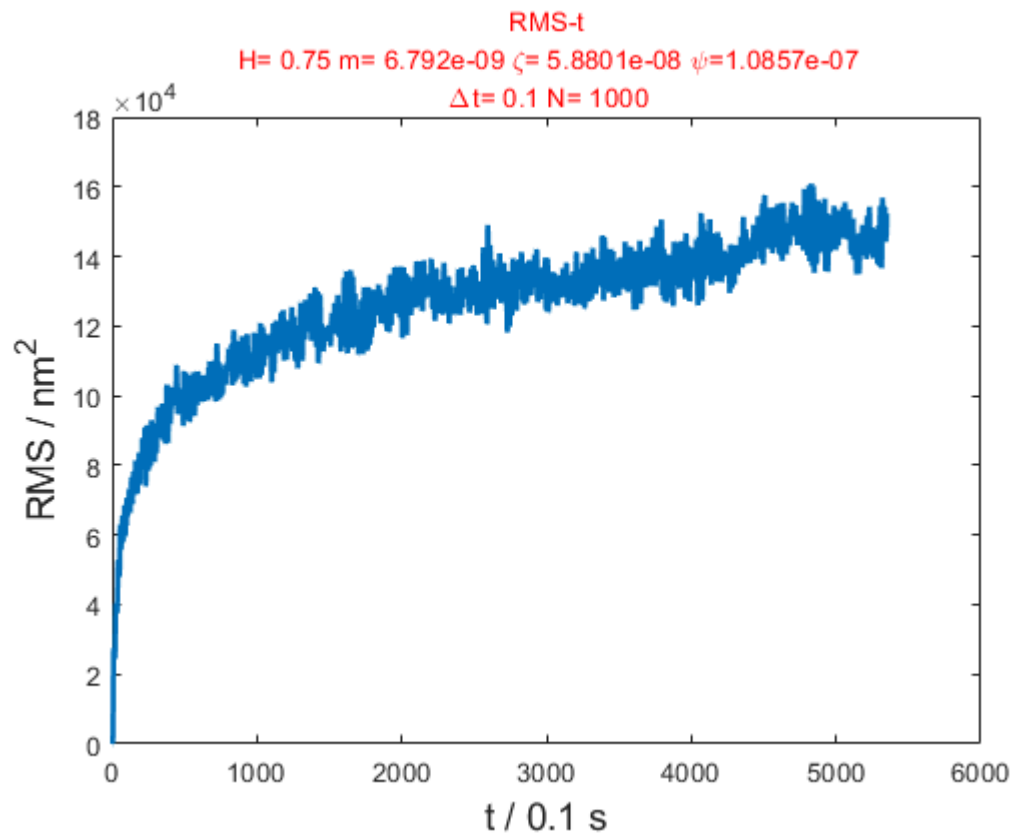
RMS-t
H= 0.75 m= 6.792e-09 ζ= 4.4773e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=2, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
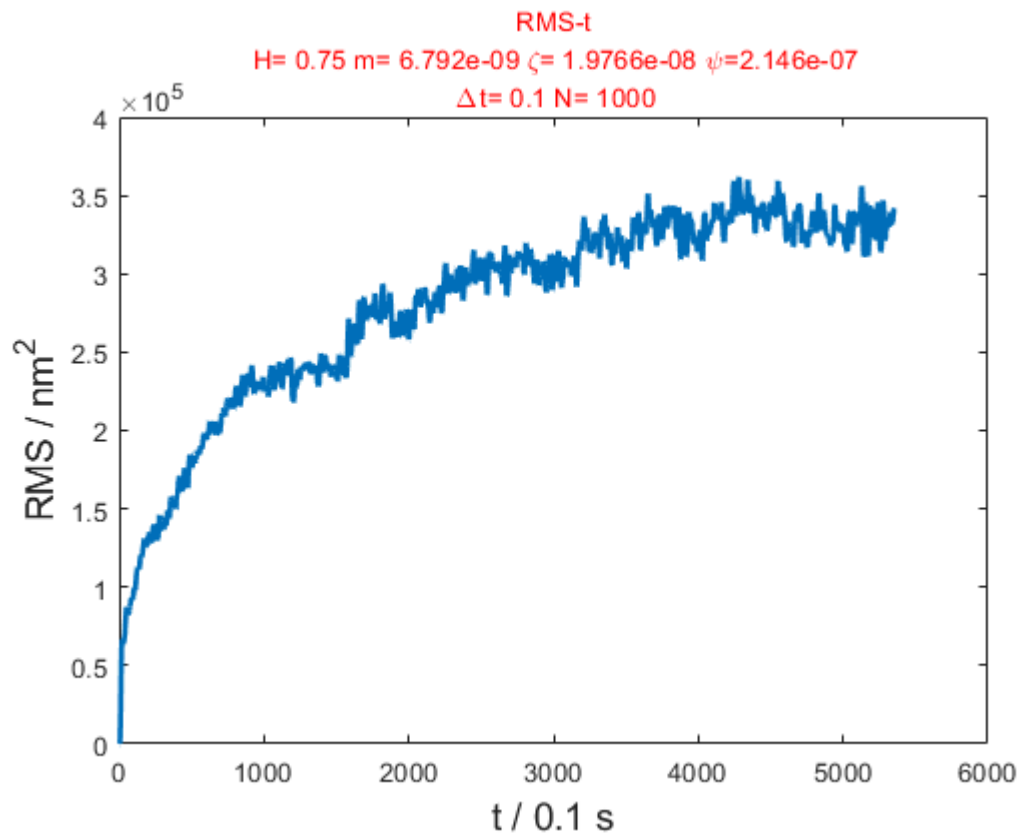
RMS-t
H= 0.75 m= 6.792e-09 ζ= 5.8801e-08 ψ=1.0857e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=3, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
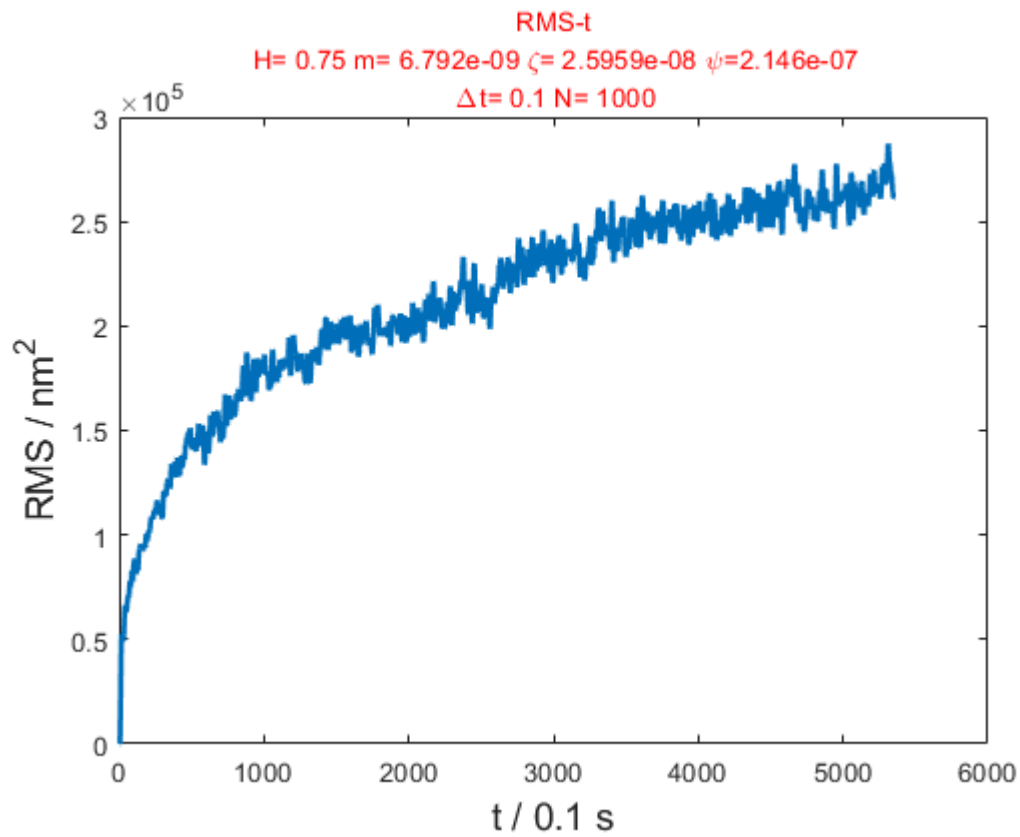
RMS-t

$H= 0.75 \ m= 6.792e-09 \ \zeta= 1.9766e-08 \ \psi=2.146e-07$

$\Delta t= 0.1 \ N= 1000$


```
trying i_m=5, trying i_\psi=3, trying i_\zeta=2, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
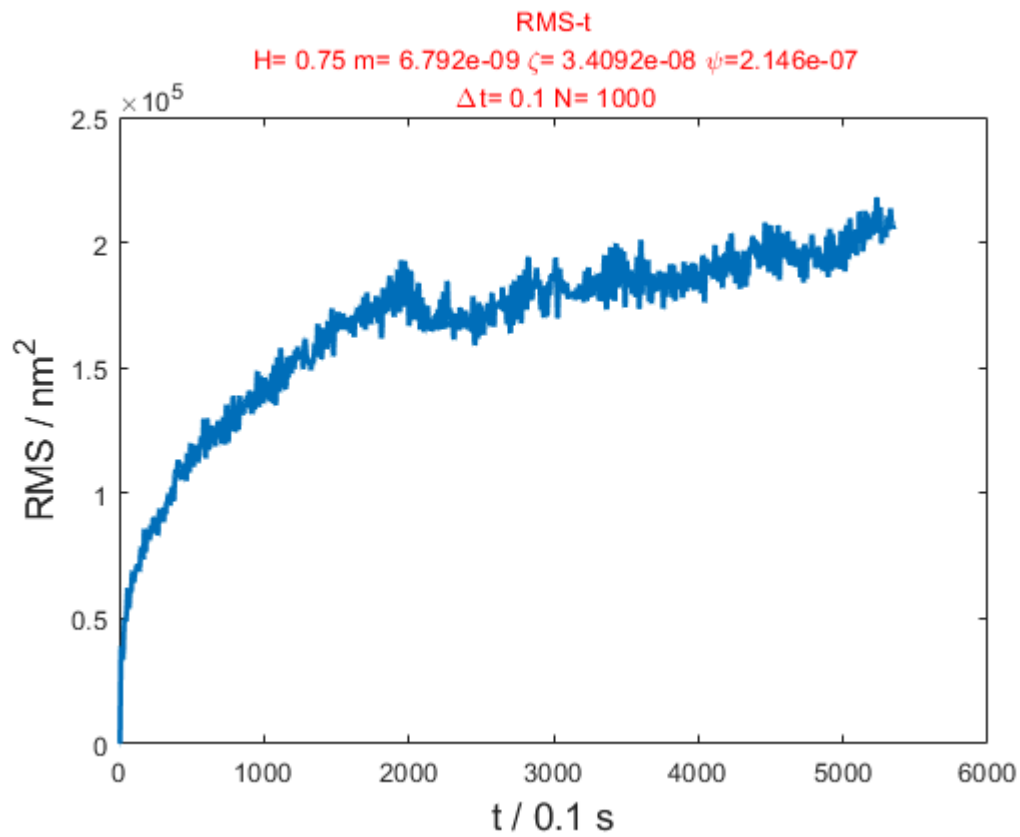
RMS-t
H= 0.75 m= 6.792e-09 ζ= 2.5959e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=3, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
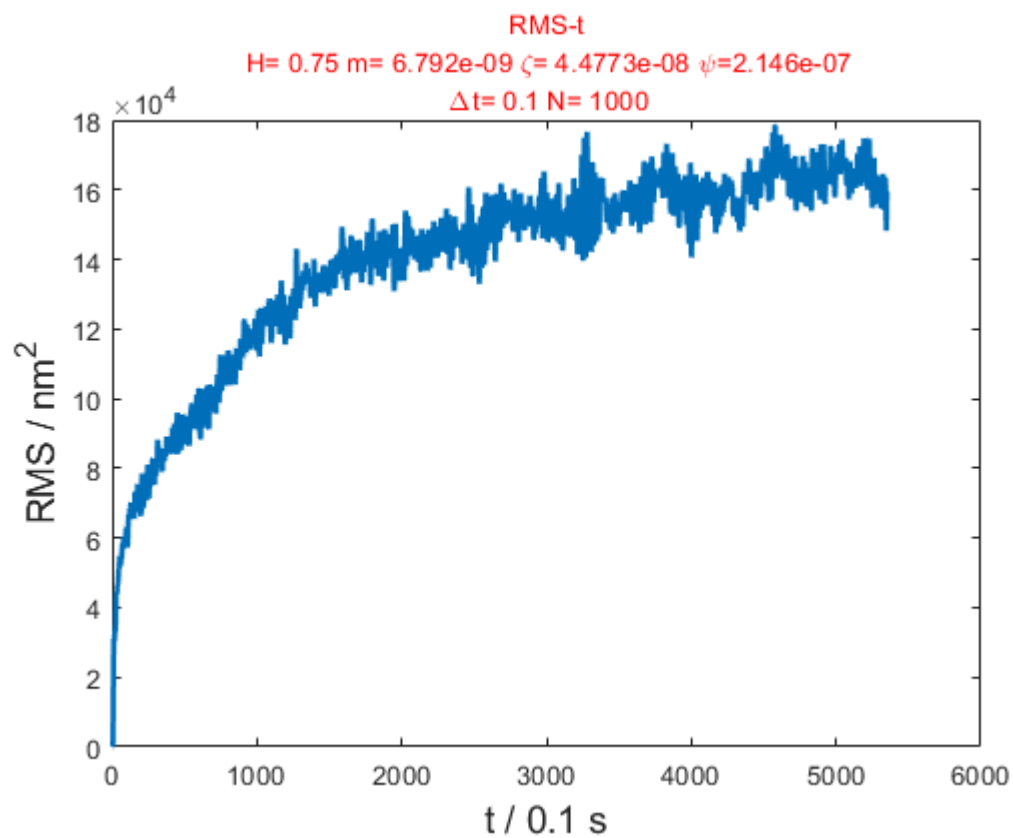
RMS-t
H= 0.75 m= 6.792e-09 ζ= 3.4092e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=3, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
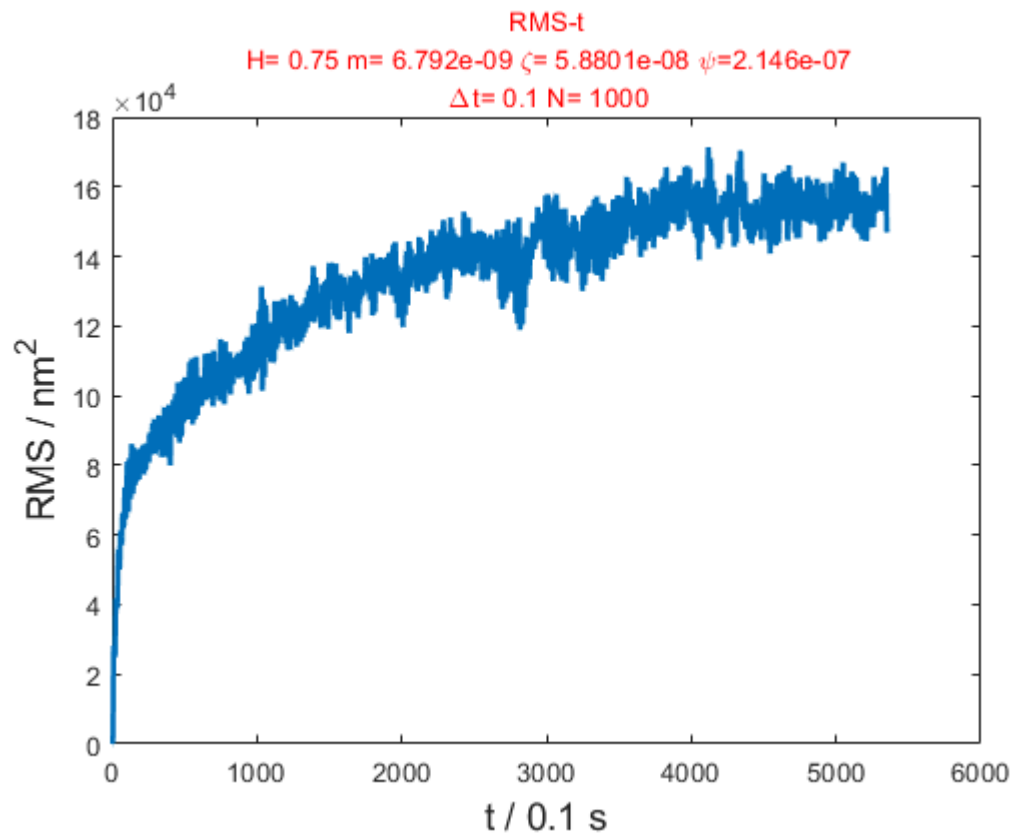
RMS-t
H= 0.75 m= 6.792e-09 ζ= 4.4773e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=3, trying i_\zeta=5, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
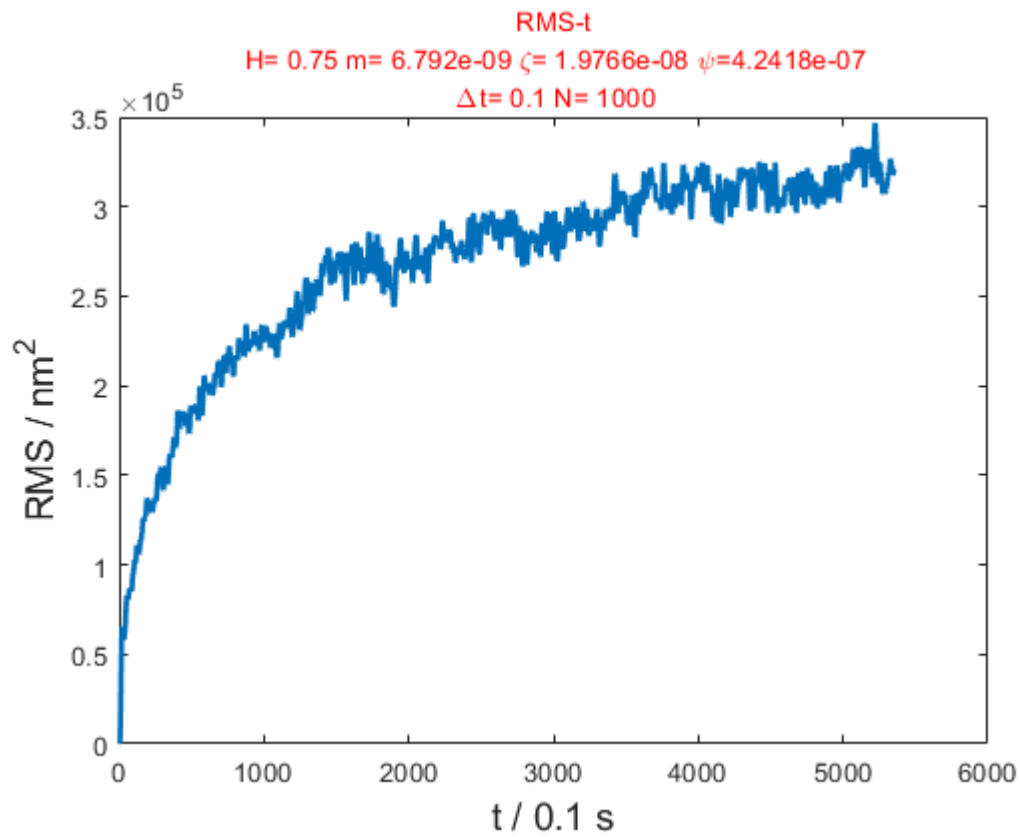
RMS-t
H= 0.75 m= 6.792e-09 ζ= 5.8801e-08 ψ=2.146e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=4, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
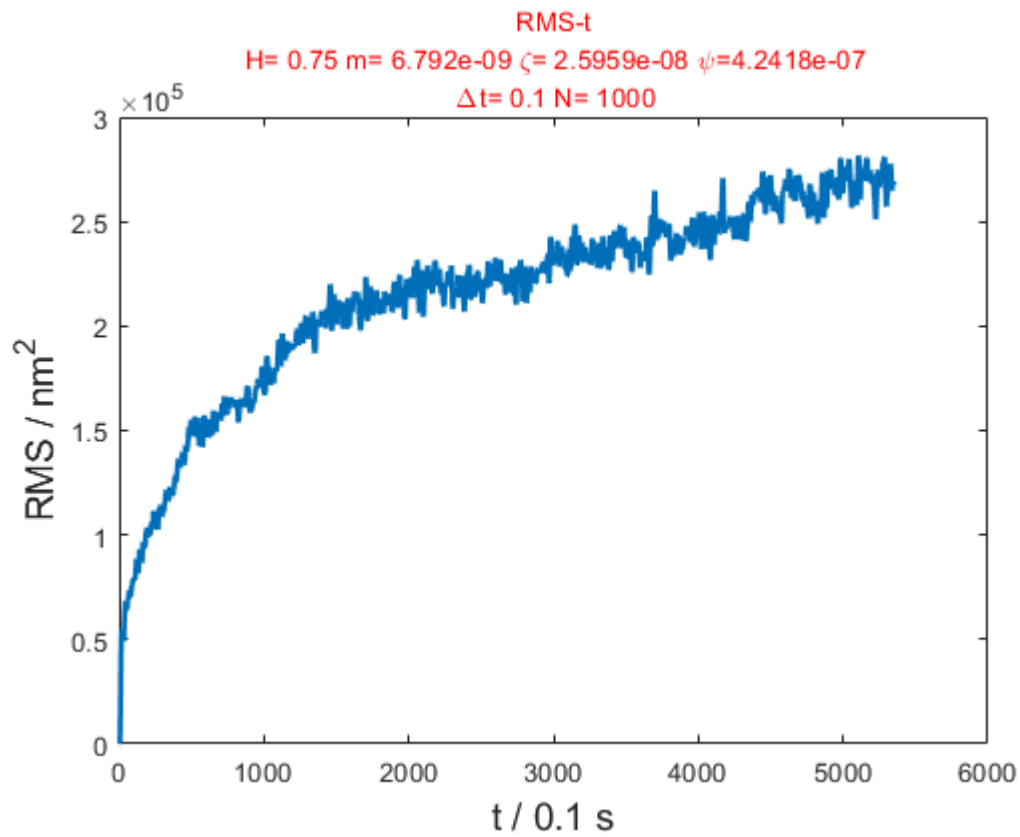
RMS-t
H= 0.75 m= 6.792e-09 ζ= 1.9766e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=4, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
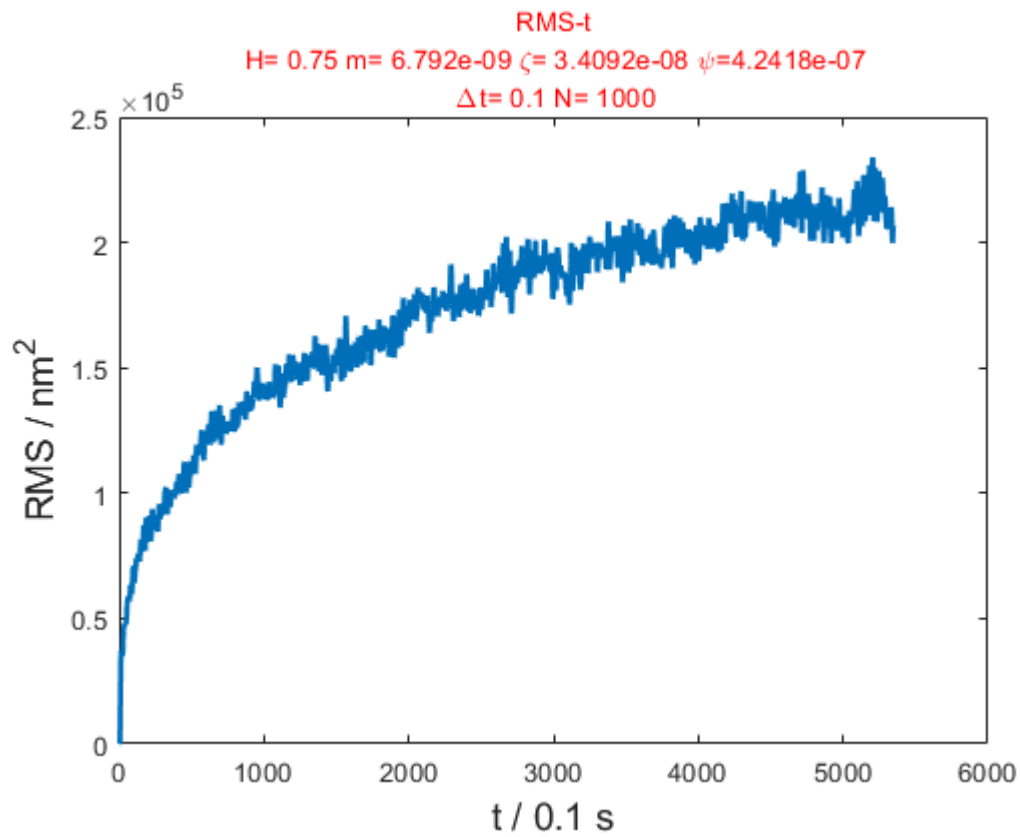
RMS-t

H= 0.75 m= 6.792e-09 ζ= 2.5959e-08 ψ=4.2418e-07

Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=4, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
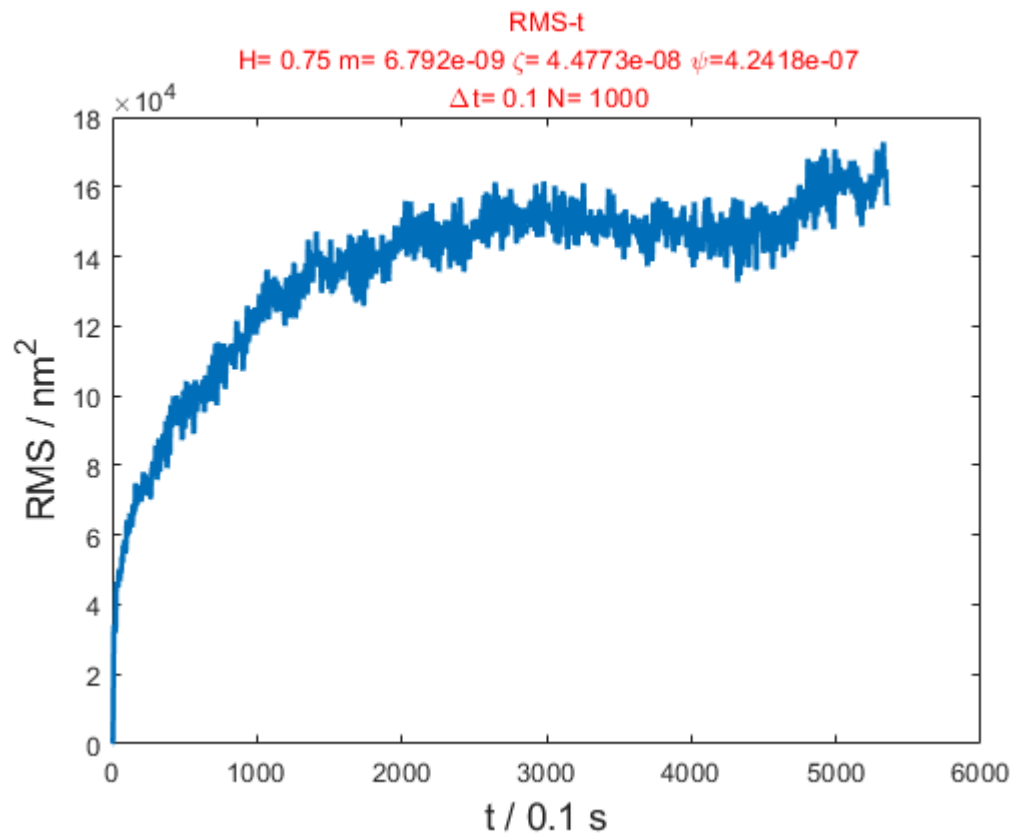
RMS-t
H= 0.75 m= 6.792e-09 ζ= 3.4092e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=4, trying i_\zeta=4, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
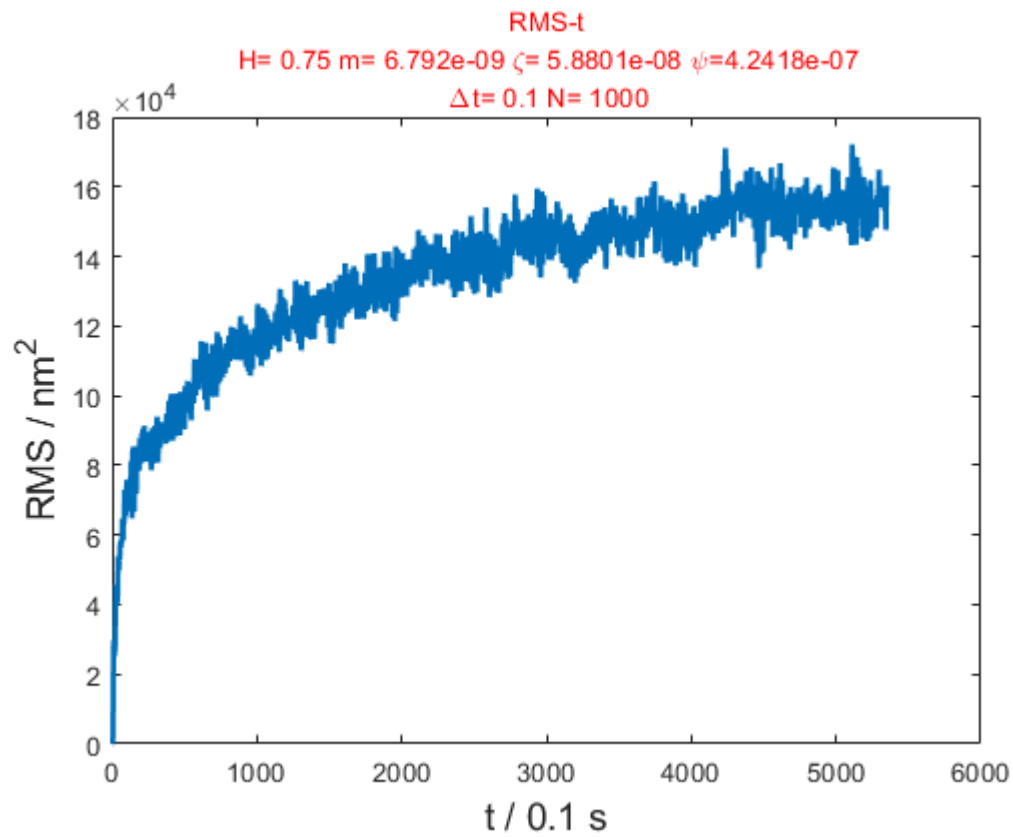
RMS-t
H= 0.75 m= 6.792e-09 ζ= 4.4773e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=4, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
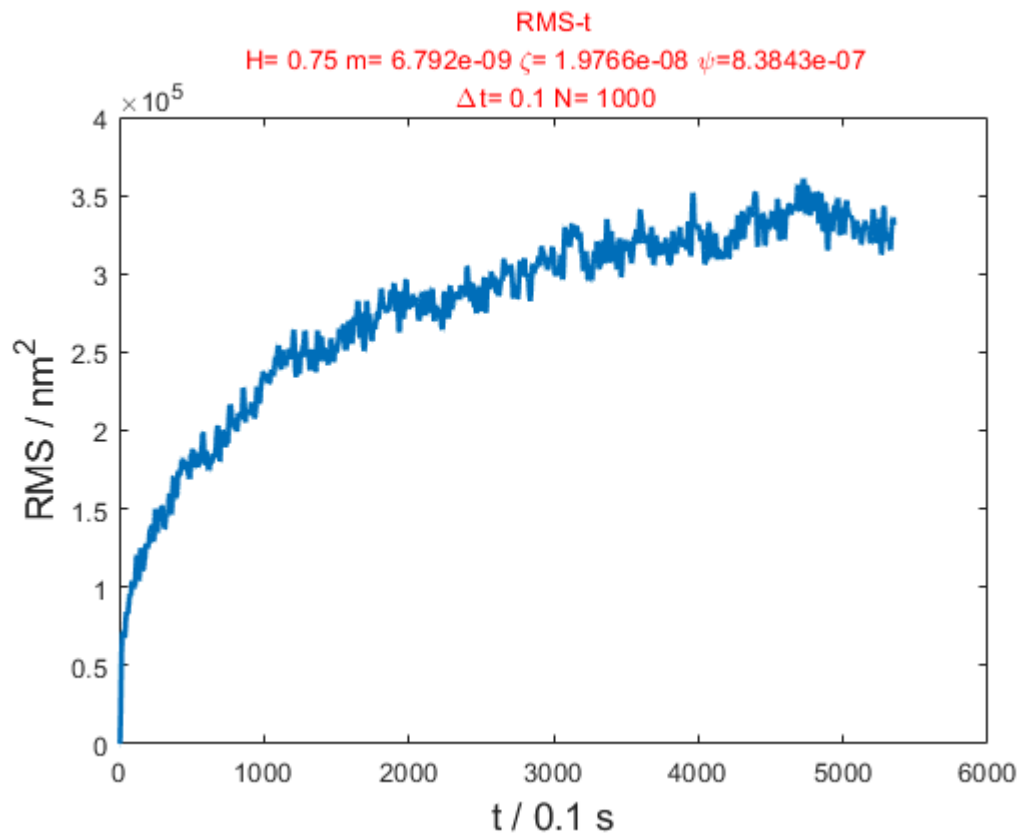
RMS-t
H= 0.75 m= 6.792e-09 ζ= 5.8801e-08 ψ=4.2418e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=5, trying i_\zeta=1, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
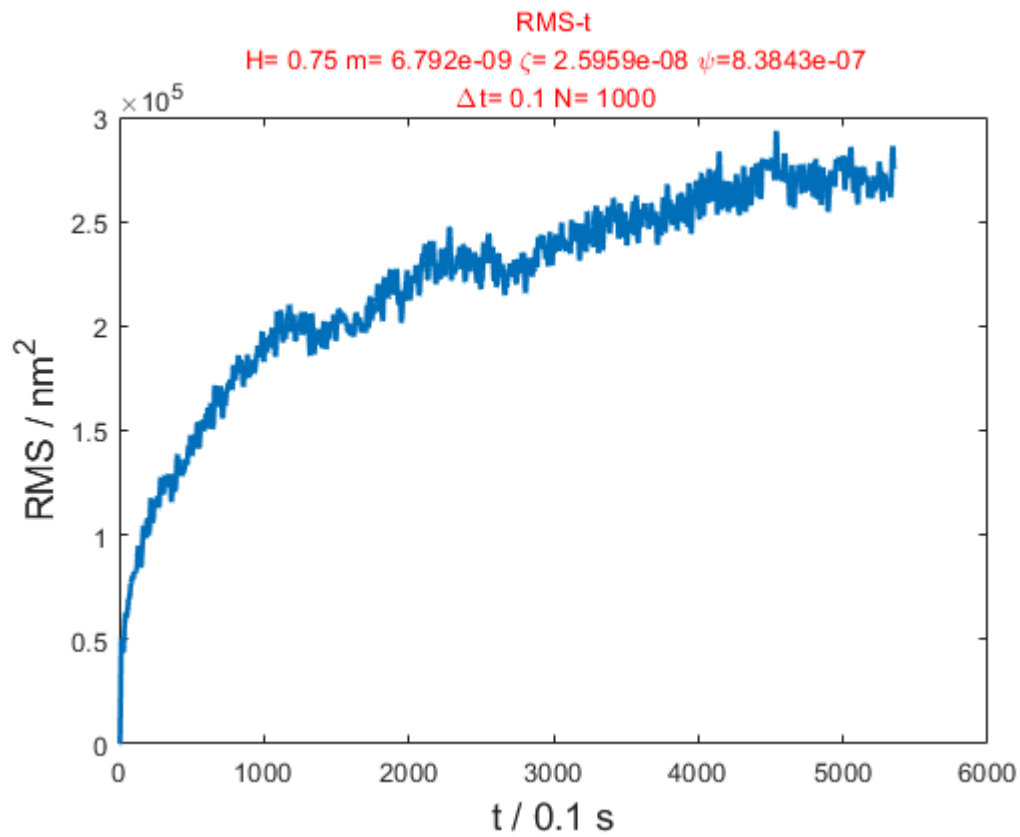
RMS-t

$H= 0.75$ $m= 6.792e-09$ $\zeta= 1.9766e-08$ $\psi=8.3843e-07$

$\Delta t= 0.1$ $N= 1000$

```
trying i_m=5, trying i_\psi=5, trying i_\zeta=2, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
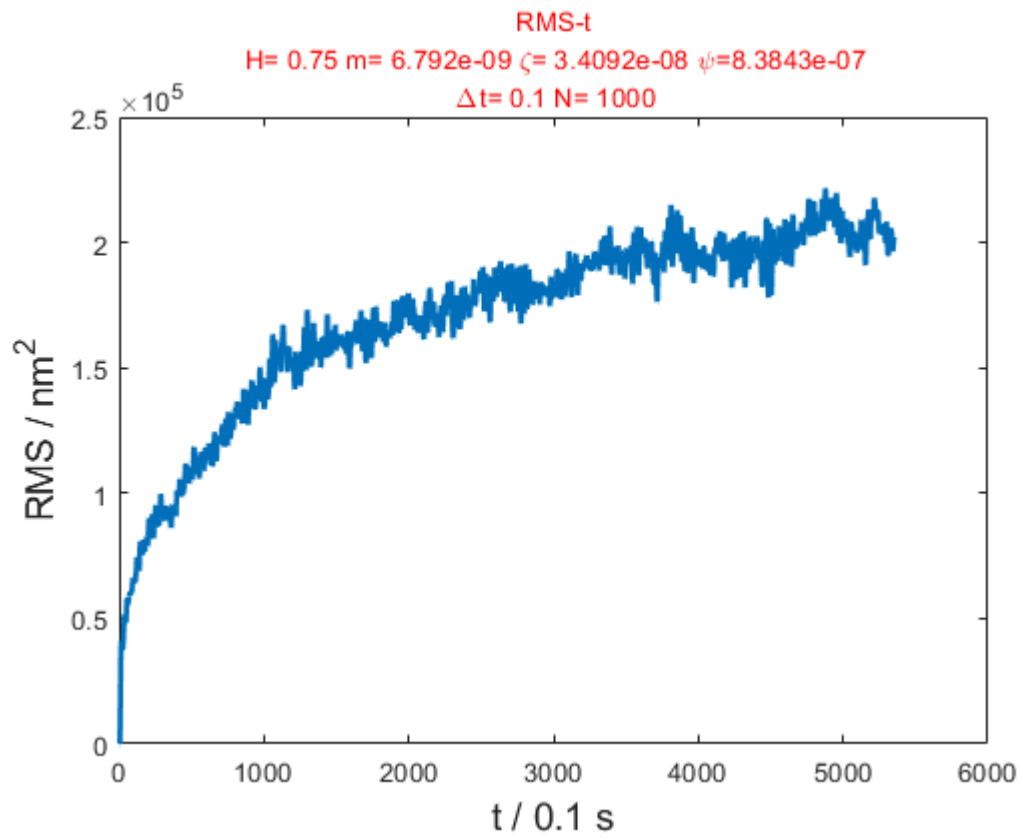
RMS-t

H= 0.75 m= 6.792e-09 ζ= 2.5959e-08 ψ=8.3843e-07

Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=5, trying i_\zeta=3, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
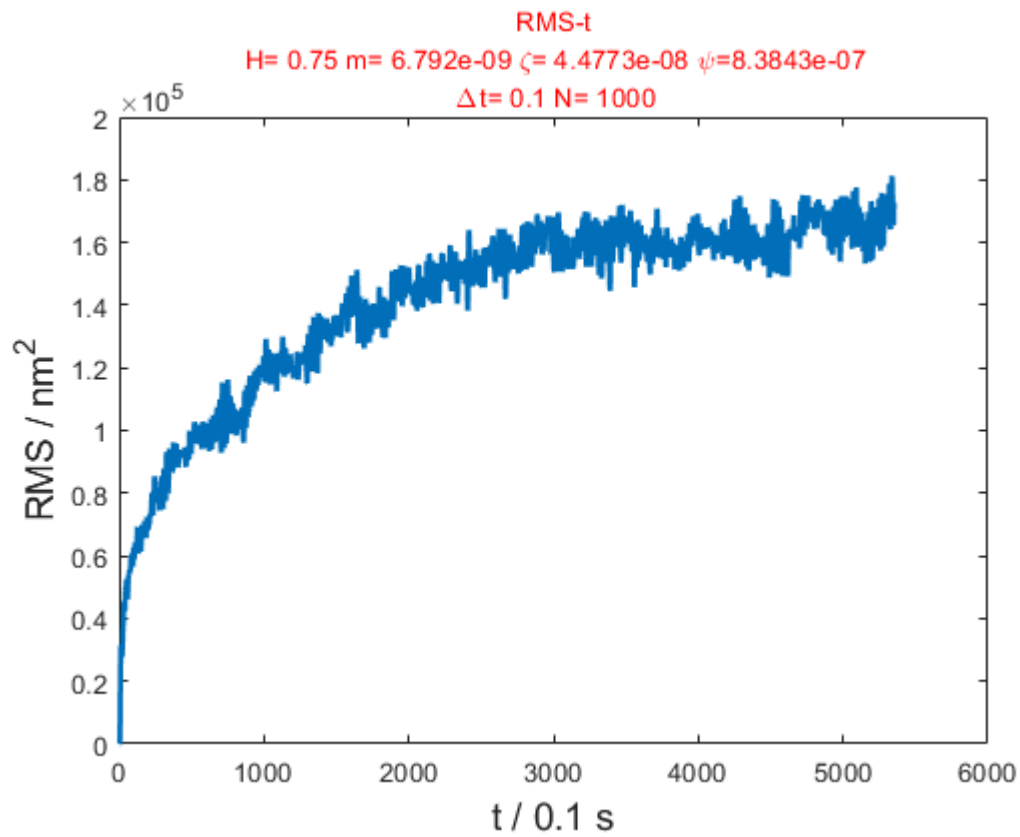
RMS-t

$H= 0.75$ m$= 6.792$e-09 $\zeta= 3.4092$e-08 $\psi=8.3843$e-07

$\Delta t= 0.1$ $N= 1000$

```
trying i_m=5, trying i_\psi=5, trying i_\zeta=4, total sampling number=5

progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```
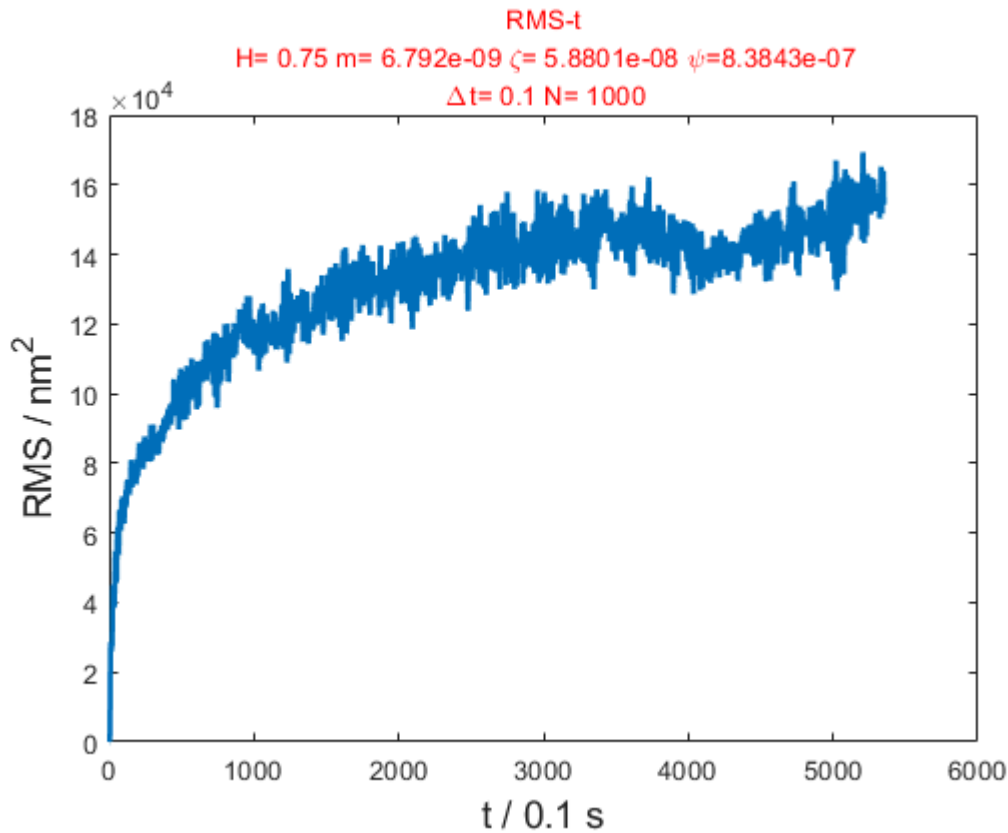
RMS-t
H= 0.75 m= 6.792e-09 ζ= 4.4773e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

```
trying i_m=5, trying i_\psi=5, trying i_\zeta=5, total sampling number=5
progress rate   10 %
progress rate   20 %
progress rate   30 %
progress rate   40 %
progress rate   50 %
progress rate   60 %
progress rate   70 %
progress rate   80 %
progress rate   90 %
progress rate   100 %
```

RMS-t
H= 0.75 m= 6.792e-09 ζ= 5.8801e-08 ψ=8.3843e-07
Δt= 0.1 N= 1000

index system: find the minimum of residuals and its lication.

```
%[mini,best_linear_location]=min(residual_compare,[],'all','linear');
%[best_m,best_psi_zeta]=find(residual_compare==mini);
%sampling_size=[sampling_frequency,sampling_frequency];
%[best_psi,best_zeta]=ind2sub(sampling_size,best_psi_zeta);
%good_parameter_location=find(residual_compare<=10*min(residual_compare,[],'all'));
%disp(['best m near ',num2str(sample_m(best_m))])
%disp(['best psi near ',num2str(sample_psi(best_psi))])
%disp(['best zeta near ',num2str(sample_zeta(best_zeta))])
```

saving

```
saving_loacation='C:\Users\dell\Desktop\zq\数据模拟\P.S.v3';
save([saving_loacation,'\data\parameterselection','m,psi,zeta',num2str(clock),'.mat'],'residua]
```