Main differences from the original source files

par_ini.d

```
1    #############################################
2    ##   parameters for COSMOS code         ##########
3    ##   ver1.00 by Chulmoon Yoo            ##########
4    #############################################
5    999999          # maximum step of the main loop
6    400.            # maximum time to evolve
7    3               # tab number of the bufer grids
8    10.             # amp
9    -60             # minimum grid number of x =-nmax-1
10   60              # maximum grid number of x =imax/2-1
11   0               # minimum grid number of y
12   60              # maximum grid number of y
13   0               # minimum grid number of z
14   60              # maximum grid number of z
15   -1.             # minimum coordinate of x
16   1.              # maximum coordinate of x
17   0.              # minimum coordinate of y
18   1.              # maximum coordinate of y
19   0.              # minimum coordinate of z
20   1.              # maximum coordinate of z
```

```
1    #############################################
2    ##   parameters for COSMOS code         ##########
3    ##   ver1.00 by Chulmoon Yoo            ##########
4    #############################################
5    999999          # maximum step of the main loop
6    1.              # maximum time to evolve
7    3               # tab number of the bufer grids
8    0.              # amp
9    -40             # minimum grid number of x =-nmax-1
10   40              # maximum grid number of x =imax/2-1
11   0               # minimum grid number of y
12   40              # maximum grid number of y
13   0               # minimum grid number of z
14   40              # maximum grid number of z
15   -1.             # minimum coordinate of x
16   1.              # maximum coordinate of x
17   0.              # minimum coordinate of y
18   1.              # maximum coordinate of y
19   0.              # minimum coordinate of z
20   1.              # maximum coordinate of z
```

scale-up coordinate is not used 10. → 0.

number of grids 60 -> 40

par_ini.d

```
34    ###############################################
35    ###  initial data parameter
36    ###############################################
37    0              # 0:no continue 1:continue
38    out_all.dat    # continue file
39    0.50           # amplitude
40    10.            # wave number
41    10.            # xi2 nonsphericity parameter 1
42    0.             # xi3 nonsphericity parameter 2
43    0.             # w3  alignment angle
44    0.             # amplitude for the scalar field
45    10.            # wave number for the scalar field
46    15.            # xi2s
47    0.             # xi3s
48    50.0           # Hubble
```

```
34    ###############################################
35    ###  initial data parameter
36    ###############################################
37    0              # 0:no continue 1:continue
38    out_all.dat    # continue file
39    0.01           # amplitude
40    10.            # wave number (NON-use in pert.)
41    10.            # xi2 nonsphericity parameter 1 (NON-us
42    0.             # xi3 nonsphericity parameter 2 (NON-us
43    0.             # w3  alignment angle  (NON-use in pert
44    0.             # amplitude for the scalar field (NON-use
45    10.            # wave number for the scalar field (NON
46    15.            # xi2s (NON-use in pert.)
47    0.             # xi3s (NON-use in pert.)
48    2.0            # Hubble
```

initial amplitude for the perturbation

not used in sample_pert

initial Hubble parameter = 2/L

```
57    ###############################################
58    ###  parameters for output
59    ###############################################
60    0.5            #1st part print interval boundary time
61    0.5            #2nd part
62    100.           #changing time for print interval
```

```
57    ###############################################
58    ###  parameters for output
59    ###############################################
60    0.25           #1st part print interval boundary time
61    0.5            #2nd part
62    100.           #changing time for print interval
```

output interval setting

cosmos.cpp

```
381    else
382    {
383        cout << "no continue" << endl;
384
385        //initial data setting start
386        //fmv->set_initial_scalar(mus,kks,xi2s,xi3s);
387        //#pragma omp barrier
388        fmv->initial_nonsph(mu,kk,xi2,xi3,xi2s,xi3s,w3);
389        // fmv->initial(mu);
390        #pragma omp barrier
391        printpack(fmv0,ln,pk,pl,filex,filey,filez,filex0z,filexy0);
392        //initial data setting end
393
394        //printpack(fmv0,ln,pk,pl,filex,filey,filez,filex0z,filexy0);
395    }
396    //reading continue or setting initial date end
```

```
381    else
382    {
383        cout << "no continue" << endl;
384
385        //initial data setting start
386        //fmv->set_initial_scalar(mus,kks,xi2s,xi3s);
387        //#pragma omp barrier
388        //fmv->initial_nonsph(mu,kk,xi2,xi3,xi2s,xi3s,w3);
389        fmv->initial(mu);
390        #pragma omp barrier
391        printpack(fmv0,ln,pk,pl,filex,filey,filez,filex0z,filexy0);
392        //initial data setting end
393
394        //printpack(fmv0,ln,pk,pl,filex,filey,filez,filex0z,filexy0);
395    }
396    //reading continue or setting initial date end
```

initial data setting function changed

cosmos_initial_pert.cpp

initial data setting function
"void initial(double mu)"
is defined in cosmos_initial_pert.cpp

cosmos_bssn.cpp

gauge condition changed
to the synchronous gauge

Chulmoon Yoo

makefile

```
33  # source file
34  SRC = $(PROG).cpp cosmos_bssn.cpp cosmos_initial.cpp cosmos_output.cpp cosmos_boundary.cpp cosmos_ahf.cpp cosmos_ipol.cpp
    cosmos_solveconst.cpp cosmos_maxslice.cpp cosmos_fluid.cpp cosmos_mindis.cpp cosmos_fmr.cpp
35  OBJS = $(SRC:%.$(LANG)=%.o)
```

```
36  # source file
37  SRC = $(PROG).cpp cosmos_bssn.cpp ../cosmos_initial.cpp cosmos_initial_pert.cpp ../cosmos_output.cpp ../cosmos_boundary.cpp ../cosmos_ahf.
    cpp ../cosmos_ipol.cpp ../cosmos_solveconst.cpp ../cosmos_maxslice.cpp ../cosmos_fluid.cpp ../cosmos_mindis.cpp ../cosmos_fmr.cpp
38  OBJS = $(SRC:%.$(LANG)=%.o)
```

・cosmos.cpp and cosmos_bssn.cpp is used instead of the original
 ../cosmos.cpp and ../cosmos_bssn.cpp

・cosmos_initial_pert.cpp is added to the list