

2015 EnKF Instructional Sessions
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NOAA EnKF Diagnostics

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**Developmental Testbed Center (DTC)



Developmental Testbed Center

Outline

- EnKF Overview and Theory
- Downloading and building the EnKF system
- Scripts overview, configuration, and running the EnKF system
- EnKF Diagnostics
 - *Standard output (stdout)*
 - *Check ensemble spread and observation fits*
 - *Tuning EnKF through Namelist: inflation, localization*
- ✓ This talk is tailored to Chapter 4 of the EnKF User's Guide for Community Release v1.0 Beta

Standard Output (stdout)

Details in User's Guide Section 4.1

- ✓ Including useful information about the EnKF:
 1. Did EnKF successfully complete?
 2. Does inflation look good?
 3. Are the background and analysis fields reasonable?
- ✓ Helpful in understanding where and why EnKF may have failed

stdout: structure

- The structure of stdout is as follows:
 1. Read in data and prepare analysis:
 1. Read in configuration (namelist)
 2. Read in constant fields (fixed files)
 3. Read in observations
 4. Read in ensemble prior ensemble
 2. EnKF analysis
 3. Inflation of posterior ensemble

Indicates the start of the EnKF

```
Execute poe command line: poe ./enkf.x  
running on           32 processors ...
```

```
* . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * .
```

```
The analysis date is 2012102506
```

```
The analysis date is 2012102506
```

```
PROGRAM ENKF_ANL HAS BEGUN. COMPILED 2011319.55      ORG: NP25
```

```
STARTING DATE-TIME JAN 16,2015  12:45:58.893  16  FRI    2457039
```

Stdout: read in namelist

```
&NAM_ENKF
DATEIN = 2012102506,
DATAPATH = ./
IASSIM_ORDER = 0,
COVINFLATEMAX = 100.0000 ,
COVINFLATEMIN = 1.000000 ,
DETERMINISTIC = T,
SORTINC = T,
CORRLENGTHNH = 500.0000 ,
CORRLENGTHTR = 500.0000 ,
CORRLENGTHSH = 500.0000 ,
VARQC = F,
HUBER = F,
NLONS = 111,
NLATS = 111,
SMOOTHPARM = -1.000000 ,
...
NLEVS = 56,
NANALS = 20,
NVARS = 5,
SATERRFACT = 1.000000 ,
...
IAU = F,
NHR_ANAL = 6,
LETKF_FLAG = F,
BOXSIZE = 90.00000 ,
MASSBAL_ADJUST = F,
USE_EDGES = F,
EMISS_BC = T
/
```

Details covered in appendix and Section 4.3
of the User's Guide

20 members
first-guess forecast hour for analysis = 06
5 3d vars to update
total of **281** 2d grids will be updated
(including ps)
using multiplicative inflation based on Pa/Pb

Read in namelist
show key parameters
Configure analysis variables:
Var 1, 2, 3, 4, 5

Updating U, V, T, QVAPOR, PH,
and MU for WRF-ARW...

Stdout: info files and bias correction coefficients

```
READ_CONVINFO: tcp      112    0  1  3.00000    0  0  0  75.0000    5.00000
1.000000    75.0000    0.00000    0  0.00000    0.00000    0
READ_CONVINFO: ps      120    0  1  3.00000    0  0  0  4.00000    3.00000
1.000000    4.00000    0.300000E-03    0  0.00000    0.00000    0
  line ignored in convinfo due to use flag ps      132    0
-1
```

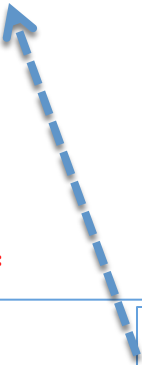
```
OZINFO_READ:  jpch_oz=    272
  1 sbuv6_n14      lev =    1 use = -1 pob =    0.240 gross =    1.000 error =
1.000 b_oz = 10.000 pg_oz =    0.000
  2 sbuv6_n14      lev =    2 use = -1 pob =    0.490 gross =    1.000 error =
1.000 b_oz = 10.000 pg_oz =    0.000
```

```
RADINFO_READ:  jpch_rad=    2680
  1 amsua_n15      chan=    1 var=    3.000 varch_cld=    9.100 use=    1 ermax=
4.500 b_rad= 10.00 pg_rad=    0.00 icld_det=-2
  2 amsua_n15      chan=    2 var=    2.000 varch_cld=   13.500 use=    1 ermax=
4.500 b_rad= 10.00 pg_rad=    0.00 icld_det=-2
  3 amsua_n15      chan=    3 var=    2.000 varch_cld=    7.100 use=    1 ermax=
4.500 b_rad= 10.00 pg_rad=    0.00 icld_det=-2
```

```
RADINFO_READ:  guess air mass bias correction coefficients below
  1      amsua_n15    0.472353  -0.231512    0.291223    0.000634  -0.148959
0.000000    0.000000    0.000000
  2      amsua_n15   -0.677697    0.382025    1.424922   -0.000061    0.016514
0.000000    0.000000    0.000000
```

stdout: check observations (diag files)

1	amsua_n15	nkeep=	0	num_obs_tot=	0	
2	amsua_n18	nkeep=	1467	num_obs_tot=	1467	
. . .						
1	sbuvs2_n16	nread=	0	nkeep=	0	num_obs_tot= 0
2	sbuvs2_n17	nread=	0	nkeep=	0	num_obs_tot= 0
. . .						
7	gome_metop-b	nread=	0	nkeep=	0	num_obs_tot= 0
	0 ozone obs					
. . .						
58	atms_npp	nkeep=	0	num_obs_tot=	1467	
59	cris_npp	nkeep=	0	num_obs_tot=	1467	
nobs_conv, nobs_oz, nobs_sat =			3275	0	1467	



- Multiple processors involved
- Important information on data usage

3275 obs in diag_conv_ges file		
columns below obtype, nread, nkeep		
t	544	544
q	196	196
ps	835	835
uv	1700	1700
sst	0	0
gps	0	0
pw	0	0
dw	0	0
srw	0	0
rw	0	0
tcp	0	0

stdout: innovation statistics for prior

innovation statistics for prior:

conventional obs

region, obtype, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

NH	all ps	552	-0.130E+01	0.152E+01	0.172E+01	0.674E+00	0.158E+01
TR	all ps	283	-0.748E+00	0.131E+01	0.189E+01	0.667E+00	0.177E+01
NH	all t	317	-0.282E+00	0.190E+01	0.201E+01	0.661E+00	0.190E+01
TR	all t	227	0.830E-01	0.140E+01	0.948E+01	0.689E+00	0.946E+01
NH	all uv	1068	-0.458E+00	0.369E+01	0.451E+01	0.176E+01	0.415E+01
TR	all uv	632	-0.272E+00	0.372E+01	0.425E+01	0.166E+01	0.391E+01
NH	all q	112	-0.707E-01	0.180E+00	0.191E+00	0.964E-01	0.165E+00
TR	all q	84	0.292E-01	0.134E+00	0.205E+00	0.101E+00	0.178E+00

satellite brightness temp

instrument, channel #, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

amsua_n18	1	77	-0.341E+00	0.243E+01	0.111E+02	0.259E+01	0.108E+02
amsua_n18	2	72	-0.163E+00	0.213E+01	0.104E+02	0.179E+01	0.103E+02
amsua_n18	3	90	-0.271E+01	0.293E+01	0.777E+01	0.905E+00	0.772E+01
amsua_n18	4	97	-0.256E+00	0.481E+00	0.143E+01	0.151E+00	0.142E+01
amsua_n18	5	97	0.273E+00	0.369E+00	0.467E+00	0.101E+00	0.456E+00
amsua_n18	6	154	0.420E+00	0.439E+00	0.330E+00	0.752E-01	0.321E+00
amsua_n18	7	263	0.294E+00	0.351E+00	0.333E+00	0.833E-01	0.322E+00
amsua_n18	8	279	-0.896E-01	0.334E+00	0.376E+00	0.137E+00	0.350E+00
amsua_n18	10	213	0.412E-01	0.484E+00	0.605E+00	0.324E+00	0.511E+00
amsua_n18	11	71	0.172E+00	0.370E+00	0.845E+00	0.526E+00	0.661E+00
amsua_n18	15	54	-0.266E+01	0.293E+01	0.789E+01	0.180E+01	0.768E+01

Most important statistics of ensemble and observations.

Will discuss this table in details in next section.

stdout: read in ensemble priors

U, V, T, QVAPOR, PH, MU from member 001

READGRIDDATA_ARW: U	1	-20.63564	14.28071
READGRIDDATA_ARW: U	2	-23.05487	16.09545
READGRIDDATA_ARW: U	3	-24.08159	17.07574
.			
READGRIDDATA_ARW: U	56	-17.74460	22.63066
READGRIDDATA_ARW: V	57	-13.06189	19.37896
READGRIDDATA_ARW: V	58	-14.51239	22.18587
.			
READGRIDDATA_ARW: PH	280	13110.12	15289.34
READGRIDDATA_ARW: MU	281	-891.6020	1907.053
	n	Minimum	Maximum

Check that background fields look reasonable

stdout: observations and inflation

```

assimilate obs in order they were read in
      423 out of      4742 obs skipped
      2877 out of      4319 same lat/long
1 timing on proc      0 =      0.61      0.14      0.00      0.01      0.46      0.01      0
1 timing on proc      31 =      0.61      0.15      0.00      0.01      0.45      0.01      0
    
```

```

min/max var 1 inflation =      1.000000      3.757024      U
min/max var 2 inflation =      1.000000      3.591980      V
min/max var 3 inflation =      1.000000      2.607338      T
min/max spfh inflation =      1.000000      2.986892      moisture
min/max ps inflation =      1.000000      3.694926

global ps prior std. dev min/max =      36.07194      205.9449
NH mean ps prior standard deviation =      76.92429
NH mean ps posterior standard deviation (before inflation)=      52.80397
NH mean ps posterior standard deviation (after inflation) =      74.21063
NH mean ps inflation =      1.743494
TR mean ps prior standard deviation =      77.48872
TR mean ps posterior standard deviation (before inflation)=      62.23104
TR mean ps posterior standard deviation (after inflation) =      75.86496
TR mean ps inflation =      1.310104
    
```

3D inflation array

stdout: innovation statistics for posterior

```
innovation statistics for posterior:
conventional obs
region, obtype, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):
NH    all ps    552 -0.364E-01  0.720E+00  0.159E+01  0.167E+00  0.158E+01
TR    all ps    283 -0.338E+00  0.943E+00  0.180E+01  0.278E+00  0.177E+01
NH    all t     317 -0.205E+00  0.127E+01  0.195E+01  0.411E+00  0.190E+01
TR    all t     227  0.211E+00  0.104E+01  0.946E+01  0.377E+00  0.946E+01
NH    all uv   1068 -0.281E-01  0.224E+01  0.425E+01  0.914E+00  0.415E+01
TR    all uv    632 -0.807E-01  0.248E+01  0.400E+01  0.855E+00  0.391E+01
NH    all q     112 -0.198E-01  0.144E+00  0.170E+00  0.390E-01  0.165E+00
TR    all q      84  0.234E-01  0.107E+00  0.183E+00  0.414E-01  0.178E+00
satellite brightness temp
instrument, channel #, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):
amsua_n18  1    77  0.744E+00  0.244E+01  0.109E+02  0.130E+01  0.108E+02
amsua_n18  2    72  0.519E+00  0.206E+01  0.103E+02  0.918E+00  0.103E+02
amsua_n18  3    90 -0.244E+01  0.265E+01  0.773E+01  0.473E+00  0.772E+01
amsua_n18  4    97 -0.353E+00  0.520E+00  0.142E+01  0.106E+00  0.142E+01
amsua_n18  5    97  0.116E+00  0.268E+00  0.462E+00  0.726E-01  0.456E+00
amsua_n18  6   154  0.276E+00  0.303E+00  0.325E+00  0.514E-01  0.321E+00
amsua_n18  7   263  0.209E+00  0.261E+00  0.326E+00  0.467E-01  0.322E+00
amsua_n18  8   279 -0.137E+00  0.250E+00  0.358E+00  0.730E-01  0.350E+00
amsua_n18 10   213 -0.449E-01  0.246E+00  0.531E+00  0.145E+00  0.511E+00
amsua_n18 11    71  0.974E-01  0.277E+00  0.694E+00  0.212E+00  0.661E+00
amsua_n18 15    54 -0.219E+01  0.263E+01  0.772E+01  0.850E+00  0.768E+01
```

Most important statistics on analysis and inflation.
Will discuss this table in details in next section.

stdout: analysis increments and exit

ens. mean anal. increment min/max ps	-269.1015	62.77728	
ens. mean anal. increment min/max var	1 -11.01143	8.155481	u
ens. mean anal. increment min/max var	2 -6.704343	8.965038	v
ens. mean anal. increment min/max var	3 -12.04501	3.471832	t
ens. mean anal. increment min/max var	4 -0.3514615	0.2903060	q
ens. mean anal. increment min/max var	5 -117.4268	273.7598	PH

```
ENDING DATE-TIME      JAN 16,2015  12:46:01.911   16  FRI   2457039
PROGRAM ENKF_ANL HAS ENDED.
* . * . * . * . * . * . * . * . * . * . * . * . * . * . * . * .
*****RESOURCE STATISTICS*****
The total amount of wall time                = 3.027633
The total amount of time in user mode        = 2.493620
The total amount of time in sys mode         = 0.393940
The maximum resident set size (KB)          = 163840
Number of page faults without I/O activity   = 51626
Number of page faults with I/O activity      = 0
Number of times filesystem performed INPUT    = 0
Number of times filesystem performed OUTPUT  = 0
Number of Voluntary Context Switches        = 12899
Number of InVoluntary Context Switches      = 74
*****END OF RESOURCE STATISTICS*****
```

all done!

Final normal exit information



Check Inflation and observation fits

Details in User's Guide Section 4.2

stdout: innovation statistics for prior

innovation statistics for prior:

conventional obs

region, obtype, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

NH	all ps	552	-0.130E+01	0.152E+01	0.172E+01	0.674E+00	0.158E+01
TR	all ps	283	-0.748E+00	0.131E+01	0.189E+01	0.667E+00	0.177E+01
NH	all t	317	-0.282E+00	0.190E+01	0.201E+01	0.661E+00	0.190E+01
TR	all t	227	0.830E-01	0.140E+01	0.948E+01	0.689E+00	0.946E+01
NH	all uv	1068	-0.458E+00	0.369E+01	0.451E+01	0.176E+01	0.415E+01
TR	all uv	632	-0.272E+00	0.372E+01	0.425E+01	0.166E+01	0.391E+01
NH	all q	112	-0.707E-01	0.180E+00	0.191E+00	0.964E-01	0.165E+00
TR	all q	84	0.292E-01	0.134E+00	0.205E+00	0.101E+00	0.178E+00

satellite brightness temp

instrument, channel #, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

amsua_n18	1	77	-0.341E+00	0.243E+01	0.111E+02	0.259E+01	0.108E+02
amsua_n18	2	72	-0.163E+00	0.213E+01	0.104E+02	0.179E+01	0.103E+02
amsua_n18	3	90	-0.271E+01	0.293E+01	0.777E+01	0.905E+00	0.772E+01
amsua_n18	4	97	-0.256E+00	0.481E+00	0.143E+01	0.151E+00	0.142E+01
amsua_n18	5	97	0.273E+00	0.369E+00	0.467E+00	0.101E+00	0.456E+00
amsua_n18	6	154	0.420E+00	0.439E+00	0.330E+00	0.752E-01	0.321E+00
amsua_n18	7	263	0.294E+00	0.351E+00	0.333E+00	0.833E-01	0.322E+00
amsua_n18	8	279	-0.896E-01	0.334E+00	0.376E+00	0.137E+00	0.350E+00
amsua_n18	10	213	0.412E-01	0.484E+00	0.605E+00	0.324E+00	0.511E+00
amsua_n18	11	71	0.172E+00	0.370E+00	0.845E+00	0.526E+00	0.661E+00
amsua_n18	15	54	-0.266E+01	0.293E+01	0.789E+01	0.180E+01	0.768E+01

Most important statistics of ensemble and observations.

Content of the table

innovation statistics for prior:

conventional obs

region, obtype, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

NH	all ps	552	-0.130E+01	0.152E+01	0.172E+01	0.674E+00	0.158E+01
TR	all ps	283	-0.748E+00	0.131E+01	0.189E+01	0.667E+00	0.177E+01
NH	all t	317	-0.282E+00	0.190E+01	0.201E+01	0.661E+00	0.190E+01
TR	all t	227	0.830E-01	0.140E+01	0.948E+01	0.689E+00	0.946E+01
NH	all uv	1068	-0.458E+00	0.369E+01	0.451E+01	0.176E+01	0.415E+01
TR	all uv	632	-0.272E+00	0.372E+01	0.425E+01	0.166E+01	0.391E+01
NH	all q	112	-0.707E-01	0.180E+00	0.191E+00	0.964E-01	0.165E+00
TR	all q	84	0.292E-01	0.134E+00	0.205E+00	0.101E+00	0.178E+00

satellite brightness temp

instrument, channel #, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

amsua_n18	1	77	-0.341E+00	0.243E+01	0.111E+02	0.259E+01	0.108E+02
amsua_n18	2	72	-0.163E+00	0.213E+01	0.104E+02	0.179E+01	0.103E+02

Meanings of each column:

region: NH=north hemisphere; TR=tropic

obtype: ps, t, uv, q, radiance channel, ...

nobs: number observations

bias: bias of innovation

innov stdev: standard deviation of innovations

sqrt(S+R):

sqrt(S): S=spread of ensemble

sqrt(R): R=observation error variance

01
01
00
00
00
00
00
00
01



Check ensemble prior spread

innovation statistics for prior:

conventional obs

region	obtype	nobs	bias	innov stdev	sqrt(S+R)	sqrt(S)	sqrt(R)
NH	all ps	552	-0.130E+01	0.152E+01	0.172E+01	0.674E+00	0.158E+01
TR	all ps	283	-0.748E+00	0.131E+01	0.189E+01	0.667E+00	0.177E+01
NH	all t	317	-0.282E+00	0.190E+01	0.201E+01	0.661E+00	0.190E+01
TR	all t	227	0.830E-01	0.140E+01	0.948E+01	0.689E+00	0.946E+01
NH	all uv	1068	-0.458E+00	0.369E+01	0.451E+01	0.176E+01	0.415E+01
TR	all uv	632	-0.272E+00	0.372E+01	0.425E+01	0.166E+01	0.391E+01
NH	all q	112	-0.707E-01	0.180E+00	0.191E+00	0.964E-01	0.165E+00
TR	all q	84	0.292E-01	0.134E+00	0.205E+00	0.101E+00	0.178E+00

satellite brightness temp

The ensemble spread should satisfy the following relation (Houtekamer, et al., 2005), as close as possible:

$$\langle (y^o - H\bar{X}^b)(y^o - H\bar{X}^b)^T \rangle = (HP^bH^T + R)$$

The RMS of observation innovation (ensemble priors against observations)

.484E+0
.370E+0
.293E+0

The total ensemble spreads = ensemble spreads + observational error covariance

0
0
1

Check ensemble prior spread

innovation statistics for prior:

conventional obs

region	obtype	nobs	bias	innov stdev	sqrt(S+R)	sqrt(S)	sqrt(R)
NH	all ps	552	-0.130E+01	0.152E+01	0.172E+01	0.674E+00	0.158E+01
TR	all ps	283	-0.748E+00	0.131E+01	0.189E+01	0.667E+00	0.177E+01
NH	all t	317	-0.282E+00	0.190E+01	0.201E+01	0.661E+00	0.190E+01
TR	all t	227	0.830E-01	0.140E+01	0.948E+01	0.689E+00	0.946E+01
NH	all uv	1068	-0.458E+00	0.369E+01	0.451E+01	0.176E+01	0.415E+01
TR	all uv	632	-0.272E+00	0.372E+01	0.425E+01	0.166E+01	0.391E+01
NH	all q	112	-0.707E-01	0.180E+00	0.191E+00	0.964E-01	0.165E+00
TR	all q	84	0.292E-01	0.134E+00	0.205E+00	0.101E+00	0.178E+00

satellite brightness temp

instrument, channel #, nobs, bias, innov stdev, sqrt(S+R), sqrt(S), sqrt(R):

amsua_n18	1	77	-0.341E+00	0.243E+01	0.111E+02	0.259E+01	0.108E+02
amsua_n18	2	72	-0.163E+00	0.213E+01	0.104E+02	0.179E+01	0.103E+02
amsua_n18	3	90	-0.271E+01	0.293E+01	0.777E+01	0.905E+00	0.772E+01
amsua_n18	4	97	-0.256E+00	0.481E+00	0.143E+01	0.151E+00	0.142E+01
amsua_n18	5	97	0.273E+00	0.369E+00	0.467E+00	0.101E+00	0.456E+00
amsua_n18	6	154	0.420E+00	0.439E+00	0.330E+00	0.752E-01	0.321E+00
amsua_n18	7	263	0.294E+00	0.351E+00	0.333E+00	0.833E-01	0.322E+00
amsua_n18	8	279	-0.896E-01	0.334E+00	0.376E+00	0.137E+00	0.350E+00
amsua_n18	10	213	0.412E-01	0.484E+00	0.605E+00	0.324E+00	0.511E+00
amsua_n18	11	71	0.172E+00	0.370E+00	0.845E+00	0.526E+00	0.661E+00
amsua_n18	15	54	-0.266E+01	0.293E+01	0.789E+01	0.180E+01	0.768E+01

Check fit of analysis to observations

innovation statistics for prior:
conventional obs

region	obtype	nobs	bias	innov stdev	sqrt(S+R)	sqrt(S)	sqrt(R)
NH	all ps	552	-0.130E+01	0.152E+01	0.172E+01	0.674E+00	0.158E+01
TR	all ps	283	-0.748E+00	0.131E+01	0.189E+01	0.667E+00	0.177E+01
NH	all t	317	-0.282E+00	0.190E+01	0.201E+01	0.661E+00	0.190E+01
TR	all t	227	0.830E-01	0.140E+01	0.948E+01	0.689E+00	0.946E+01

O-B versus O-A:
Bias and standard deviation reduced after analysis

innovation statistics for posterior:
conventional obs

region	obtype	nobs	bias	innov stdev	sqrt(S+R)	sqrt(S)	sqrt(R)
NH	all ps	552	-0.364E-01	0.720E+00	0.159E+01	0.167E+00	0.158E+01
TR	all ps	283	-0.338E+00	0.943E+00	0.180E+01	0.278E+00	0.177E+01
NH	all t	317	-0.205E+00	0.127E+01	0.195E+01	0.411E+00	0.190E+01
TR	all t	227	0.211E+00	0.104E+01	0.946E+01	0.377E+00	0.946E+01

Tuning EnKF through Namelist

Details in User's Guide Section 4.3

Options related to inflation

The inflation can be set up by the following parameters:

anapertwtnh: inflation parameter in NH.

anapertwttr: inflation parameter in TR.

anapertwtsh: inflation parameter in SH.

The $= 0$ means no inflation.

parameters $= 1$ means inflation all the way back to prior spread.

The minimum and maximum inflation values allowed can be controlled by the following parameters:

covinflatemin: minimum inflation factor

covinflatemax: maximum inflation factor

Options related to inflation

The inflation factor fields can be smoothed out using the following parameter:

smoothparm: parameter for smoothing inflation factor,
= -1 for no smoothing.
> 0, the estimated inflation factor is smoothed using a Gaussian spectral filter with an e-folding scale of the parameter.

latbound: where the transition latitude starts (=25N or 25S)

delat: latitude width of transition zone where the inflation parameter is smoothed.

Options related to localization

readin_localization: =.true., customized horizontal and vertical localization values varying with model levels are read in from the external text file “*hybens_locinfo*”.

= .false., the horizontal and vertical localization distances are set by the namelist parameters

length for horizontal localization in km:

corrlengthnh: northern hemisphere (25N-90N, NH)

corrlengthtr: tropics (25S-25N, TR)

corrlengthsh: southern hemisphere (25S-90S, SH)

scale height for vertical localization in $-\log(P/P_{\text{ref}})$:

lnsigcutoffnh: North Hemisphere

lnsigcutofftr: Tropic.

lnsigcutoffsh: South Hemisphere

Options related to localization

The vertical localization distances for satellite radiance :

Insigcutoffsatnh,
Insigcutoffsattr,
Insigcutoffsatsh

The vertical localization distances for surface pressure observations:

Insigcutoffpsnh,
Insigcutoffpstr,
Insigcutoffpssh

The time localization window
(time away from the analyses time in hour)

obtimelnh: for the northern hemisphere
obtimeltr: for the tropics
obtimelsh: for the southern hemisphere

Questions?

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