[lgchen@cheyenne5 oisst.v2.1-master]% sh build/script/oisst.sh --part=sobs --when=20160114,20160115 interim

sh build/script/oisst.sh --part=sobs --when=20160105,20160106 interim

sh build/script/oisst.sh --part=eotwt --when=20160114,20160115 interim

sh build/script/oisst.sh --part=eotcor --when=20160114,20160115 interim

sh build/script/oisst.sh --part=oi --when=20160114,20160115 interim

sh build/script/oisst.sh --part=output --when=20160114,20160115 interim

if [[ ( $1 == "--help") || $1 == "-h" ]]; then

echo "Usage: `basename $0` final|interim [--part=sobs|eotwt|eotcor|oi|output|nosobs]"

echo " [--when=[lastDate][,endDate]]"

echo " `basename $0` --help|-h"

echo

echo "Run the OISST processing. The options are:"

echo

echo "final|interim Do either the final or the interim processing. (Required)"

echo "--part Direct the software to do only part of the processing. (Optional)"

echo "--when Set the dates that control what data is processed. lastDate and"

echo " endDate both have the form YYYYMMDD. Zero, one or two dates may"

echo " be present. (Optional)"

echo "--help|-h Print this help message and exit."

echo

echo "If the --part option is specified, the processing will be limited to the named"

echo "section. The section names and their meanings are:"

echo

echo "sobs Run only the superobs step."

echo "eotwt Run only the eot weights step."

echo "eotcor Run only the eot correction step."

echo "oi Run only the oi step."

echo "output Run only the output generation step."

echo "nosobs Run all but the superobs step. (Use existing superobs.)"

echo

echo "If no --when option is specified, the processing will be started with the"

echo "stopDate unset, which will cause it to be set appropriately for production"

echo "(one day prior for interim, 15 days prior for final)."

echo "If the --when option is specified with no dates (--when=), the processing will"

echo "be started with both the lastProcessedDate and the stopDate unset. This will"

echo "cause the stopDate to be set as for production, and the lastProcessedDate set to"

echo "two days prior for interim and 16 days prior for final."

echo "If the --when option is specified with only a lastDate argument"

echo "(--when=YYYYMMDD), the processing will be started with the lastProcessedDate set"

echo "to lastDate and the stopDate unset, which will cause it to be set as above."

echo "If the --when option is specified with only an endDate argument"

echo "(--when=,YYYYMMDD), the processing will be started with the lastProcessedDate"

echo "unset and the stopDate set to endDate. This will cause the lastProcessedDate to"

echo "be set as above."

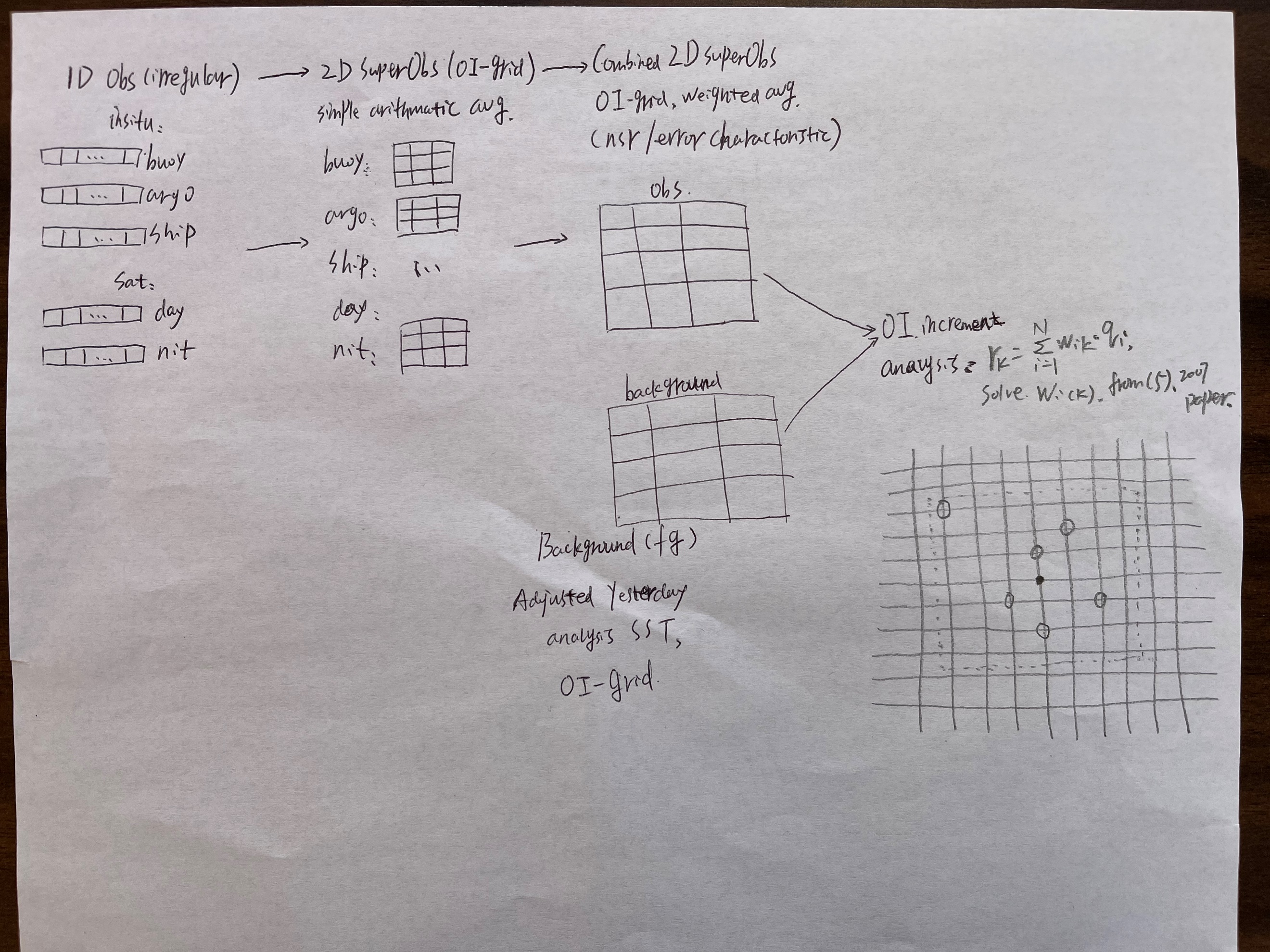
echo "If the --when option is specified with both lastDate and endDate specified"

echo "(--when=YYYYMMDD,YYYYMMDD), the processing will be started with the"

echo "lastProcessedDate set to lastDate and the stopDate set to endDate."

exit 1

fi



oisst.sh:

main(${runType} ${runPart} ${lastDate} ${endDate}) {

# setup date control for interim/final runtype

# i.e. setup ${lastProcessedDate} and ${stopDate};

# for interim, ${TMtoday}-2 / ${TMtoday}-1; for final, ${TMtoday}-16 / ${TMtoday}-15;

init(${runType} ${lastDate} ${endDate})

setup(${runType} ${runPart})

# Get the processing date as setup above, ${lastProcessedDate} / ${stopDate};

# set ${curDate} = ${lastProcessedDate} + 1;

#loopDate=$curDate

#while [ "$loopDate" -le "$stopDate" ]; do

# then loop until the stop date is reached;

# firstguess, fgDate = $curDate - 1;

# curDate12 = ${curDate} + 11 # set the date for final run sobs calculation

# curDate\_ice = ${curDate} + 1 # icesst date which is the next day

# ... setup a lot of dates

load(${runType} $curDate)

# use python to generate the script workfile

python -m build.script.parseConfig ${runType} $curDate

if ${runType} == interim

avhrr\_interim\_main.sh

avhrr\_dataprep.sh # just to source, to make the function definition effective, which will be called in the following process($runPart) function;

Prepare $TMP/buoyship.param

$BIN/buoy\_ship\_daily\_firstguessclim.x -Wl,-T < $TMP/buoyship.param

...

elif ${runType} == final

avhrr\_final\_main.sh

process(${runPart})

if ($interim)

AVHRRInterim $curDate ${runPart} # function from avhrr\_interim\_main.sh

dataPrep # function from avhrr\_dataprep.sh, calls buoyshipPrep, satellitePrep and icePrep; which call the .x exe files

or runEOTWT

or runEOTCOR

……

eotCorrection $curDate $satBNightSuperobs 'satBNightWeights' $satBNightAnalysis $satBNightCorrected

or runOI

or runOutput

elif ($final)

AVHRRFinal $curDate ${runPart}

similar to the above with certain diff.

loopDate=$curDate+1

#end of while loop

}

avhrr\_dataprep.sh -> buoyshipPrep()

1. $BIN/buoy\_ship\_daily\_firstguessclim.x -Wl,-T < $TMP/buoyship.param

91 cat <<- oiEOF > $TMP/buoyship.param

92 $quarterMaskIn

93 $fileStdevIn

94 $buoyshipSSTDaily

95 $EOTfg

96 $shipObsOut

97 $buoyObsOut

98 $argoObsOut

99 $shipGridOut

100 $buoyGridOut

101 $argoGridOut

102 $shipSobsOut

103 $buoySobsOut

104 $argoSobsOut

105 $covName

106 $curYear $curMonth $curDay

107 $covBuoy

108 $covArgo

109 $covShip

110 $covBuoyship

111 oiEOF

[lgchen@cheyenne3 Tmp]% vim buoyship.param

1 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

2 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/stdev1d-coads3-fill

3 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/in/buoyship/argoNicoads/2016/mq.20160117

4 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160116

5 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/buoyship/2016/ship.20160117

6 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/buoyship/2016/buoy.20160117

7 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/buoyship/2016/argo.20160117

8 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/buoyship/2016/ship.20160117

9 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/buoyship/2016/buoy.20160117

10 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/buoyship/2016/argo.20160117

11 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.20160117

12 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.20160117

13 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.20160117

14 /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/Tmp/cover\_buoyship.txt

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16 0.1

17 0.1

18 0.05

19 0.0

$quarterMaskIn ! from climatology.f90; converted to NetCDF;

! read quater degree mask

OPEN (UNIT = 30, FILE = quarter\_mask, IOSTAT = iostat\_val, FORM = 'unformatted')

READ (30, IOSTAT = iostat\_val) mask ! REAL :: mask(QUART\_DEG\_LON\_DIM=1440, QUART\_DEG\_LAT\_DIM=720)

$fileStdevIn ! climatology.f90, converted to NetCDF;

! read in coads standard deviation for 1950-79,

OPEN (UNIT = 4, FILE = file\_stdev, IOSTAT = iostat\_val, FORM = 'unformatted')

DO imo = 1, MONTHS\_IN\_YEAR # REAL, DIMENSION (ONE\_DEG\_LON\_DIM=360, ONE\_DEG\_LAT\_DIM=180) :: wk, stand\_dev

READ (4, IOSTAT=iostat\_val)base\_year, base\_month, stand\_dev # INTEGER base\_year, base\_month;

……

END D0

$buoyshipSSTDaily ! buoy\_ship\_daily\_firstguessclim.f90

! read in the buoy ship file

! /glade/scratch/lgchen/data/oisstv2.1/in/buoyship/argoNicoads/2016/mq.20160117 ! Formatted text file.

OPEN(UNIT = INSITU\_INPUT\_UNIT, FILE = file\_in, IOSTAT = iostat\_val, FORM = 'formatted', STATUS = 'old')

! read in buoy ship observations and put them into buoy ship array separately

DO

READ(UNIT= INSITU\_INPUT\_UNIT, FMT=\*, IOSTAT=iostat\_val) year2,month,day,hour, latitude,longitude,depth, IDIDID,cid,isst

! 2016, 1, 17, 1370, 2640, 21387, 407, 4, 5904124 , 22818

IF(julian\_day /= analysis\_julian\_day)CYCLE # should be the same

alat = 0.01 \* latitude

alon = 0.01 \* longitude

sst = 0.001 \* isst

hour= hour/100

! Inside the loop mostly check to see if the current obs\_sst is a “good” obs, or it’ll throw away;

! If it’s “good” obs, it will be distributed to either

! ship\_arr(ship\_arr\_dim) = obs\_arr ! if (IDIDID == 1)

! buoy\_arr(buoy\_arr\_dim) = obs\_arr ! if (IDIDID == 2 .or. IDIDID == 3)

! argo\_arr(argo\_arr\_dim) = obs\_arr ! if (IDIDID == 4)

……

END DO

……

CALL super\_obs(1, analysis\_year, analysis\_mon, analysis\_day, buoy\_arr, tot\_good\_buoy\_obs, LON\_START,LAT\_START,grid\_lat,grid\_lon, sat\_source, sea\_ict, cov\_buoyship, cov\_buoy, cover)

! The above calculate the super obs, i.e. compute the avg\_obs\_sst inside a quarter-degree-box; then write to binary file.

**! Ligang: so superobs is just a simple arithmetic average of raw observations for a certain type, will combine various types together later using weighted average considering error statistics.**

! CHARACTER(LEN=SITU\_ARRAY\_LEN) :: buoy\_arr(MAX\_SITU\_OBS), argo\_arr(MAX\_SITU\_OBS), ship\_arr(MAX\_SITU\_OBS) !buoy ship observation array

WRITE (iv) analysis\_year, analysis\_mon, analysis\_day, ctype (ic)

WRITE (iv) ict

WRITE (iv) (wnum (ii), ii = 1, ict)

WRITE (iv) (wsst (ii), ii = 1, ict)

WRITE (iv) (wlat (ii), ii = 1, ict)

WRITE (iv) (wlon (ii), ii = 1, ict)

! Write out the grid obs SST

WRITE (iw) analysis\_year, analysis\_mon, analysis\_day, sst

$EOTfg ! CHARACTER(LEN=FILENAME\_LEN) :: firstguess\_file, converted to NetCDF file.

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160116 ! binary

INTEGER, PARAMETER :: DAYDIFF = 1 ! date differrence between analysis date and firstguess date, from oisst\_constants.f90

! read in the first guess ! from climatology.f90

OPEN (UNIT = 31, FILE = firstguess\_file, IOSTAT=iostat\_val, FORM = 'unformatted', STATUS = 'old')

CALL firstguess (31, QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM, ierr, analysis\_julian\_day, DAYDIFF, gsst)

SUBROUTINE firstguess(IUN, IMX, IMY, IERR, iday, daydiff, gsst) ! get\_firstguess.f90, REAL :: gsst (IMX, IMY)

! READING IN THE FIRST-GUESS

READ (IUN, IOSTAT = iostat\_val) jyr, jmo, jda, gsst ! it only reads the first 1/3, what bout the rest 2/3?

! printed message while checking the first-guess file

[lgchen@cheyenne1 oisst.v2.1-master]% ./check\_data.py

header= [4147212] jyr= [2016] , jmo= [1] , jda= [16] , tail= [4147212]

header2= [4147212] jyr= [2016] , jmo= [1] , jda= [16] , tail2= [4147212]

header3= [4147212] jyr= [2016] , jmo= [1] , jda= [16] , tail3= [4147212]

header4= [110]

$shipObsOut ! CHARACTER(LEN=FILENAME\_LEN) :: ship\_obs\_out,

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/buoyship/2016/ship.20160117

! Formatted text file

OPEN (UNIT = SHIP\_OBS\_UNIT = 53, FILE = ship\_obs\_out, IOSTAT=iostat\_val, FORM = 'formatted')

! No write or read, weird!! Should read (or write) in some called subroutines.

$buoyObsOut ! CHARACTER(LEN=FILENAME\_LEN) :: buoy\_obs\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/buoyship/2016/buoy.20160117

! Formatted text file

OPEN (UNIT = BUOY\_OBS\_UNIT = 51, FILE = buoy\_obs\_out, IOSTAT=iostat\_val, FORM = 'formatted')

! No write or read, weird!!

$argoObsOut ! CHARACTER(LEN=FILENAME\_LEN) :: argo\_obs\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/buoyship/2016/argo.20160117

! Formatted text file

OPEN (UNIT = ARGO\_OBS\_UNIT = 52, FILE = argo\_obs\_out, IOSTAT=iostat\_val, FORM = 'formatted')

! No write or read, weird!!

$shipGridOut ! CHARACTER(LEN=FILENAME\_LEN) :: ship\_grid\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/buoyship/2016/ship.20160117

! binary file, with size: 4147220

OPEN (UNIT = SHIP\_GRID\_UNIT = 63, FILE = ship\_grid\_out, IOSTAT=iostat\_val, FORM = 'unformatted')

! No write or read, weird!!

WRITE (iw) analysis\_year, analysis\_mon, analysis\_day, sst ! Write file in create\_super\_obs.f90, REAL :: sst(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM)

$buoyGridOut ! CHARACTER(LEN=FILENAME\_LEN) :: buoy\_grid\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/buoyship/2016/buoy.20160117

! binary file, with size: 4147220

OPEN (UNIT = BUOY\_GRID\_UNIT, FILE = buoy\_grid\_out, IOSTAT=iostat\_val, FORM = 'unformatted')

! No write or read, weird!!

WRITE (iw) analysis\_year, analysis\_mon, analysis\_day, sst ! Write file in create\_super\_obs.f90, REAL :: sst(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM)

$argoGridOut ! CHARACTER(LEN=FILENAME\_LEN) :: argo\_grid\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/buoyship/2016/argo.20160117

! binary file, with size: 4147220

OPEN (UNIT = argo\_GRID\_UNIT, FILE = argo\_grid\_out, IOSTAT=iostat\_val, FORM = 'unformatted')

! No write or read, weird!!

WRITE (iw) analysis\_year, analysis\_mon, analysis\_day, sst ! Write file in create\_super\_obs.f90, REAL :: sst(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM)

$shipSobsOut ! CHARACTER(LEN=FILENAME\_LEN) :: ship\_sobs\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.20160117

! binary file, with variable size

OPEN (UNIT = SHIP\_SOBS\_UNIT=73, FILE = ship\_sobs\_out, IOSTAT=iostat\_val, FORM = 'unformatted')

……

! obs in sequence, while shipGridOut is obs in 2D-dimention which is not spacial-efficient!

WRITE (iv=73) analysis\_year, analysis\_mon, analysis\_day, ctype (ic) ! in file create\_super\_obs.f90, CHARACTER(LEN=8) :: ctype(3)

ict = 0

isup = 0

iwrt = 0

DO i = 1, QUART\_DEG\_LON\_DIM

DO j = 1, QUART\_DEG\_LAT\_DIM

IF (num (i, j) > 0) THEN

ict = ict + 1

wnum (ict) = FLOAT (num (i, j) )

wsst (ict) = sst (i, j) - delt\_sst

wlat (ict) = blat (j)

wlon (ict) = blon (i)

ENDIF

IF (ict == MAX\_OBS\_BOX) THEN ! MAX\_OBS\_BOX=10000, while 1440x720=1,036,800!

iwrt = iwrt + 1

WRITE (iv) ict

WRITE (iv) (wnum (ii), ii = 1, ict) ! REAL, DIMENSION(MAX\_OBS\_BOX) :: wsst, wlat, wlon, wnum

WRITE (iv) (wsst (ii), ii = 1, ict)

WRITE (iv) (wlat (ii), ii = 1, ict)

WRITE (iv) (wlon (ii), ii = 1, ict)

isup = isup + ict

ict = 0

ENDIF

END DO

END DO

IF (ict > 0) THEN

isup = isup + ict

iwrt = iwrt + 1

icts = ict

WRITE (iv) ict

WRITE (iv) (wnum (ii), ii = 1, ict)

WRITE (iv) (wsst (ii), ii = 1, ict)

WRITE (iv) (wlat (ii), ii = 1, ict)

WRITE (iv) (wlon (ii), ii = 1, ict)

ENDIF

$buoySobsOut ! ! CHARACTER(LEN=FILENAME\_LEN) :: buoy\_sobs\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.20160117

! binary file, with variable size

OPEN (UNIT = BUOY\_SOBS\_UNIT, FILE = buoy\_sobs\_out, IOSTAT=iostat\_val, FORM = 'unformatted')

…… ! same as above ship

! printed message

[lgchen@cheyenne6 oisst.v2.1-master]% ./check\_data.py  
header= [20] , jyr= [2016] , jmo= [1] , jda= [17] , str\_ctype= b'    buoy' , tail= [20]  
header= [4] , ict= [2995] , tail= [4]  
header= [11980] , wnum= [ 9.  3.  1. ... 19.  4. 47.] , tail= [11980]  
header= [11980] , wsst= [ 6.2499995  6.2000003 28.1       ... 21.671057  21.625      6.094683 ] , tail= [11980]  
header= [11980] , wlat= [-47.125 -46.875  -0.125 ... -31.125 -31.125 -47.125] , tail= [11980]  
header= [11980] , wlon= [1.25000e-01 1.25000e-01 1.25000e-01 ... 3.59375e+02 3.59625e+02 3.59875e+02] , tail= [11980]

$argoSobsOut ! CHARACTER(LEN=FILENAME\_LEN) :: argo\_sobs\_out

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.20160117

! binary file, with variable size

OPEN (UNIT = ARGO\_SOBS\_UNIT, FILE = argo\_sobs\_out, IOSTAT=iostat\_val, FORM = 'unformatted')

…… ! same as above ship

$covName ! CHARACTER(LEN=FILENAME\_LEN) :: cov\_file, !buoy ship coverage output file

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/Tmp/cover\_buoyship.txt

! open daily coverage file

OPEN (UNIT = INSITU\_COV\_UNIT, FILE = cov\_file, IOSTAT = iostat\_val, FORM = 'formatted')

……

WRITE(UNIT = INSITU\_COV\_UNIT, FMT = '(f4.1)')cover ! REAL :: cover, coverage for buoy, e.g. 0.4 which represents 0.4%;

WRITE(UNIT = INSITU\_COV\_UNIT, FMT = '(f4.1)')cover ! coverage for argo, e.g. 0. which represents 0%;

WRITE(UNIT = INSITU\_COV\_UNIT, FMT = '(f4.1)')cover ! coverage for ship, e.g. 0.3 which represents 0.3%;

avhrr\_dataprep.sh -> satellitePrep()

! Process satellite A files, create satellite superobs.

$BIN/sat\_navy\_daily\_firstguessclim.x -Wl,-T < $TMP/satelliteAParam

! Process satellite B files

$BIN/sat\_navy\_daily\_firstguessclim.x -Wl,-T < $TMP/satelliteBParam

! Below we only show satelliteA as an example.

cat <<- oiEOF > $TMP/satelliteAParam

$quarterMaskIn

$fileStdevIn

$satSSTCatObs

$EOTfg

$satADayGridOut

$satANightGridOut

$satADaySobsOut

$satANightSobsOut

$covNameSatA

$curYear $curMonth $curDay

$satRunType

$satASource

$covSat

$covSat2

oiEOF

[lgchen@cheyenne3 Tmp]% cat satelliteAParam

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/stdev1d-coads3-fill

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/satsst/2016/satobs.017

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160116

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/metopa/2016/dgrid.sst.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/metopa/2016/ngrid.sst.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopa/2016/dsobs.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopa/2016/nsobs.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/Tmp/cover\_sat\_A.txt

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avhrr6hr # $satRunType

12 # $satASource

2.5 # $covSat

0.1 # $covSat2

READ(\*, FMT = FILE\_PATH\_FMT, IOSTAT = iostat\_val) &

quarter\_mask, &

file\_stdev, &

file\_in, &

firstguess\_file, &

file\_dgrid\_out, &

file\_ngrid\_out, &

file\_dsobs\_out, &

file\_nsobs\_out, &

cov\_name\_sat, &

analysis\_year, analysis\_mon, analysis\_day, &

sat\_run\_type, &

sat\_source, &

cov\_sat, &

cov\_sat2

$quarterMaskIn # See above

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

$fileStdevIn # See above

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/stdev1d-coads3-fill

$satSSTCatObs # ultimately 1-D sst obs records.

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/satsst/2016/satobs.017

CALL get\_6hr\_avhrr(file\_in, sat\_source, analysis\_julian\_day, records, ierr) ! sat\_navy\_daily\_firstguessclim.f90 calling satellite\_file\_parser.f90

! INTEGER :: sat\_source, INTEGER :: analysis\_julian\_day, TYPE(linked\_list) :: records (!list of sat. file records), INTEGER :: ierr;

MODULE sst\_linked\_list ! sst\_linked\_list.f90

TYPE sst\_record

INTEGER :: obs\_type, obs\_source, year, month, day, hour, lat, lon, sst

END TYPE sst\_record

TYPE node

TYPE(node), POINTER :: next => null()

TYPE(sst\_record) :: record

END TYPE node

TYPE linked\_list

TYPE(node), POINTER :: first\_ptr => null()

TYPE(node), POINTER :: cur\_ptr => null()

END TYPE linked\_list

…

END MODULE

CALL read\_satellite\_file(sat\_source(=12), AVHRR\_DAY\_OBS\_TYPE (=151), AVHRR\_NIGHT\_OBS\_TYPE(=152), julian\_day, record\_list) ! satellite\_file\_parser.f90

SUBROUTINE read\_satellite\_file(sat\_source, day\_obs\_type\_id, night\_obs\_type\_id, julian\_day, record\_list)

alat = 0.01 \* latitude; alon = 0.01 \* longitude; isst = isst\*100; sst = 0.001 \* isst;

WRITE(dsat\_arr(dim\_dsat), FMT = '(10x,i2,i5,i6,i5)')hour, latitude, longitude, isst ! CHARACTER(LEN=SAT\_ARRAY\_LEN=28) :: dsat\_arr(MAX\_SAT\_OBS=500,000)

WRITE(nsat\_arr(dim\_nsat), FMT = '(10x,i2,i5,i6,i5)')hour, latitude, longitude, isst

$EOTfg ! See above

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160116

$satADayGridOut

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/metopa/2016/dgrid.sst.20160117

! generated NetCDF

$satANightGridOut

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/metopa/2016/ngrid.sst.20160117

! generated NetCDF

$satADaySobsOut

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopa/2016/dsobs.20160117

[lgchen@cheyenne2 oisst.v2.1-master]% ./check\_data.py

header= [20] , jyr= [2016] , jmo= [1] , jda= [17] , str\_ctype= b'dmetopa ' , tail= [20]

header= [4] , ict= [10000] , tail= [4] # As MAX\_OBS\_BOX=10000<59595, while 1440x720=1,036,800!

header= [40000] , wnum= [4. 4. 1. ... 4. 2. 1.] , tail= [40000]

header= [40000] , wsst= [21.975 22.075 22.000002 ... 12.85 13.35 13.400001] , tail= [40000]

header= [40000] , wlat= [-22.375 -22.125 -21.125 ... -44.625 -43.875 -43.375] , tail= [40000]

header= [40000] , wlon= [ 0.125 0.125 0.125 ... 116.375 116.375 116.375] , tail= [40000]

$satANightSobsOut

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopa/2016/nsobs.20160117

$covNameSatA

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/Tmp/cover\_sat\_A.txt

! Coverage percentage, day: 8.6%; night: 11.3%;

Avhrr\_dataprep.sh -> interpIce()

$BIN/interp\_ice\_half\_to\_quarter\_deg.x -Wl,-T < $TMP/ice\_read.parm

! read in 1/2 degree grib2 ice concentration data, an interpolation module is called to interpolate it to 1/4 degree ice concentration.

INPUTS:

file\_quarter\_mask - $OISST\_DATA/oisst\_in/static/quarter-mask-extend

file\_half\_ice\_grib2 - $OISST\_DATA/oisst\_in/obs/yyyy/ice/ice.yyyymmdd

OUTPUTS:

file\_half\_ice - $OISST\_DATA/oisst\_out/sobs/yyyy/ice/grads/icecon720x360.yyyymmdd

file\_quarter\_ice - $OISST\_DATA/oisst\_out/sobs/yyyy/ice/grads/icecon.yyyymmdd

cat <<- oiEOF > $TMP/ice\_read.parm

$quarterMaskIn

$iceGlobeReplaced

$iceCon720x360Replaced

$iceCon1440x720Replaced

$curYear00 $curMonth00 $curDay00

$iwget

oiEOF

[lgchen@cheyenne1 Tmp]% cat ice\_read.parm

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/ice/2016/ice.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con/2016/icecon720x360.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con/2016/icecon.20160117

2016 01 17

0 ! INTEGER iwget

READ (\*, FILE\_PATH\_FMT, IOSTAT = iostat\_val) file\_quarter\_mask, file\_half\_ice\_grib2, file\_half\_ice, file\_quarter\_ice, analysis\_year, analysis\_mon, analysis\_day, iwget

$quarterMaskIn # see above, mask

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

$iceGlobeReplaced, file\_half\_ice\_grib2

! Formatted ASCII file, /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/obs/ice/2016/ice.20160117

! 720 360 0.97 … 1 1.57 …

OPEN(UNIT = ICE\_INPUT\_UNIT, FILE = file\_half\_ice\_grib2, IOSTAT = iostat\_val, STATUS = 'old')

READ (ICE\_INPUT\_UNIT, \*, IOSTAT = iostat\_val ) head1, head2 ! CHARACTER(20) head1, head2

! read ice from ftp wgrib. Ice is from north to south, read it to S to N to matach the ice land mask file

READ (ICE\_INPUT\_UNIT, \*, IOSTAT = iostat\_val ) ice (:, HALF\_DEG\_LAT\_DIM:1: - 1) ! REAL :: ice(HALF\_DEG\_LON\_DIM=720, HALF\_DEG\_LAT\_DIM=360)

! basic QC process

$iceCon720x360Replaced

! grided file, /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con/2016/icecon720x360.20160117

! then write out the 1/2 degree ice in grid format

OPEN (UNIT = ICE\_HALF\_UNIT, FILE = file\_half\_ice, STATUS = 'unknown', IOSTAT=iostat\_val, FORM = 'unformatted')

WRITE (UNIT = ICE\_HALF\_UNIT) analysis\_year, analysis\_mon, analysis\_day, ((ice (i, j), i = 1, HALF\_DEG\_LON\_DIM), j = 1, HALF\_DEG\_LAT\_DIM)

! then do the interpolation; then use quarter-degree mask to mask land values.

$iceCon1440x720Replaced

! grided file, /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con/2016/icecon.20160117

OPEN (UNIT = ICE\_QUARTER\_UNIT, FILE = file\_quarter\_ice, STATUS = 'unknown', IOSTAT=iostat\_val, FORM = 'unformatted')

WRITE (UNIT = ICE\_QUARTER\_UNIT ) analysis\_year, analysis\_mon, analysis\_day, ( (ice4 (i, j), i = 1, QUART\_DEG\_LON\_DIM), j = 1, QUART\_DEG\_LAT\_DIM)

Avhrr\_dataprep.sh -> convertMedianToSST

$BIN/convert\_median\_ice\_to\_sst.x -Wl,-T < $TMP/ice2sst.parm

! read in 7 days 0.25 degree ice, using the median ice concentration of the 7 days to generate SST

INPUTS:

file\_quarter\_mask - $OISST\_DATA/oisst\_in/static/quarter-mask-extend

file\_quarter\_ice\_in - $OISST\_DATA/oisst\_out/sobs/yyyy/ice/grads/icecon.yyyymmdd

OUTPUTS:

file\_ice\_sobs\_out - $OISST\_DATA/oisst\_out/sobs/yyyy/ice/icesst.yyyymmdd

cat <<- sstEOF > $TMP/ice2sst.parm

$quarterMaskExtend

$iceMask

$iceFrzPnt.$curMonth$curDay

$iceCon7day

$iceConMed

$iceSSTGrads

$iceSobsOut

$covNameIce

$curYear $curMonth $curDay $iceConDays

$covIce # 6.0

$covIce2 # 0.0

sstEOF

[lgchen@cheyenne3 Tmp]% cat ice2sst.parm

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/ice\_flags\_mask.dat

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/fzsst/daily-fzsst.0117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con/2016/icecon7.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con-med/2016/icecon-med.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/ice-sst/2016/icesst.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/ice/2016/icesst.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/Tmp/cover\_ice.txt

2016 01 17 7 # kdays=7

6.0

0.0

READ (\*,FILE\_PATH\_FMT, IOSTAT = iostat\_val) file\_quarter\_mask, file\_ice\_mask, file\_frzpnt, file\_quarter\_ice\_in, file\_icecon\_med\_out, file\_ice\_grads\_out, file\_ice\_sobs\_out, file\_cov\_ice\_out

analysis\_year, analysis\_mon, analysis\_day, kdays, cov\_mid, cov\_min

$quarterMaskExtend ! see above

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

$iceMask

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/ice\_flags\_mask.dat

OPEN (UNIT = MASK\_ICE\_INPUT\_UNIT, FILE = file\_ice\_mask, IOSTAT=iostat\_val, FORM = 'unformatted')

READ (MASK\_ICE\_INPUT\_UNIT, IOSTAT = iostat\_val) cmask ! REAL :: cmask (QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM)

$iceFrzPnt.$curMonth$curDay

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/fzsst/daily-fzsst.0117

OPEN (UNIT = frzpnt\_unit, FILE = file\_frzpnt, IOSTAT=iostat\_val, FORM = 'unformatted')

read(frzpnt\_unit, IOSTAT = iostat\_val) kkdy,kkmo,kkda,frzpnt ! integer :: kkdy, kkmo, kkda; real :: frzpnt(QUART\_DEG\_LON\_DIM,QUART\_DEG\_LAT\_DIM) !freeze point

$iceCon7day

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con/2016/icecon7.20160117

OPEN (UNIT = QUARTER\_ICE\_INPUT\_UNIT, FILE = file\_quarter\_ice\_in, IOSTAT = iostat\_val, STATUS = 'old',FORM = 'unformatted')

! read in 7 days ice

DO k = 1, kday

READ (UNIT = QUARTER\_ICE\_INPUT\_UNIT, IOSTAT = iostat\_val ) kyr, kmo, kda, cidat ! integer kyr, kmo, kda; REAL :: cidat (QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM)

! basic QC, and cidatx (i, j, k) = cidat (i, j) ! REAL :: cidatx (QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM, DAYS\_IN\_WEEK) !ice concentration array

END DO

$iceConMed

! /glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/con-med/2016/icecon-med.20160117

OPEN (UNIT = MEDIAN\_ICE\_COV\_UNIT, FILE = file\_icecon\_med\_out, IOSTAT = iostat\_val, FORM = 'unformatted')

WRITE (UNIT = MEDIAN\_ICE\_COV\_UNIT) analysis\_year, analysis\_mon, analysis\_day, cidat ! integer analysis\_year, analysis\_mon, analysis\_day; REAL :: cidat (QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM)

CALL super\_obs\_ice(ICE\_SOBS\_UNIT, analysis\_year, analysis\_mon, analysis\_day, cidat, bmask, frzpnt, sea\_ict, cov\_min, cov\_mid)

sst(i,j) = frzpnt(i,j) + adj\_coef\*(1.0-cidat(i, j)) # cidat(i, j) is the average of two days in the middle, for 17th, it is actually the 14th value;

$iceSSTGrads

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/grid/ice/ice-sst/2016/icesst.20160117

OPEN (UNIT = ICE\_GRADS\_UNIT, FILE = file\_ice\_grads\_out, IOSTAT = iostat\_val, FORM = 'unformatted')

WRITE (ICE\_GRADS\_UNIT) analysis\_year, analysis\_mon, analysis\_day, sst

$iceSobsOut

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/ice/2016/icesst.20160117

OPEN (UNIT = ICE\_SOBS\_UNIT, FILE = file\_ice\_sobs\_out, IOSTAT = iostat\_val, FORM = 'unformatted')

! write out super obs

WRITE (sobs\_unit) analysis\_year, analysis\_mon, analysis\_day, ctype

! then similar to buoy, ship satellite sobs write out,

$covNameIce ! 17.2%

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/Tmp/cover\_ice.txt

sh build/script/oisst.sh --part=eotwt --when=20160114,20160115 interim

runEOTWT() {

eotWeighting $curDate $satADayWeights $satADaySuperobs

eotWeighting $curDate $satANightWeights $satANightSuperobs

eotWeighting $curDate $satBDayWeights $satBDaySuperobs

eotWeighting $curDate $satBNightWeights $satBNightSuperobs

}

From eot\_analysis.sh,

eotWeighting() {…… $BIN/eotbias-wt4-col.x -Wl,-T < $paramCatFile } # Procedure to run the EOT weight Fortran routines.

eotCorrection() {…... $BIN/eotbias-cor4-col.x -Wl,-T < $paramCatFile} # Runs the EOT correction Fortran routines.

# The 1st eotwt4 input record is 5 minz,njj,minob,ioff,joff

# The 2nd eotwt4 input record is 5 parameters: nby,nsh,nst,ndays,nmodes

# The 3rd record is 3 parameters: yrbuoy yrship yrsat

# The 4th record is 3 parameters: daybuoy dayship daysat

# The 5th record is 3 paramters: drej crit

# The 6th input record is the date

# All remaining records are input and output file names which must be in order

# The 1st file name is the two-degree land/sea mask

# The 2nd file name is the monthly climate (1-deg)

# The 3rd file name is the input EOT modes (filled over land with 0)

# The 4th file name is the analyzed weights (output)

# The 5th file name is the input buoy data

# The 6th file name is the input ship data

# The 7th file name is the input satellite data

# Multitple dates are read in and the complete file names

# for these last 3 files are computed in the fortran code

# \*Note all satellite fields, weights differ for day and night

cat <<- inxEOF > $paramCatFile

$ndays

$yrbuoy $yrargo $yrship $yrsat

$wtDate

$useFutureSuperobs

$twoDegMask

$twoDegClim

$filledModes

$wtsFile

$buoySuperobsPathFormat

$argoSuperobsPathFormat

$shipObsCorrectedPathFormat

$satFile

inxEOF

$BIN/eotbias-wt4-col.x -Wl,-T < $paramCatFile

(NPL) [lgchen@cheyenne3 Tmp]% cat eotWtParam

7 # num\_anomaly\_days

83 83 83 81 # path\_year\_start\_positions

20160117 # analysis\_date

0 # use\_future\_superobs

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/lstags.twodeg.dat

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/clim.71.00.gdat

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/eot6.damp-zero.ev130.ano.dat

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotwt/metopb/2016/nwt.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.yyyyMMdd

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.yyyyMMdd

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.yyyyMMdd

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopb/2016/nsobs.20160117

eotbias-wt4-col.f90 ! Compute empirical orthogonal teleconnection (EOT) weights.

CALL set\_arguments(num\_anomaly\_days, path\_year\_start\_positions, analysis\_date, use\_future\_superobs, arg\_files, error\_flag)

READ (UNIT=\*, IOSTAT=iostat\_val, FMT=\*) num\_anomaly\_days, path\_year\_start\_positions, analysis\_date, future\_superobs\_flag

DO i=1, SIZE(arg\_files)

READ (UNIT=\*, IOSTAT=iostat\_val, FMT=FILE\_PATH\_FMT) arg\_files(i)

END DO

Integer :: num\_anomaly\_days,

INTEGER, DIMENSION(4) :: path\_year\_start\_positions

CHARACTER(LEN=8) :: analysis\_date

LOGICAL :: use\_future\_superobs

CHARACTER(LEN=FILENAME\_LEN), DIMENSION(8) :: arg\_files # land\_sea\_file, climatology\_file, mode\_file, weight\_file, buoy\_file, argo\_file, ship\_file, sat\_file

$twoDegMask

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/lstags.twodeg.dat

CALL create\_ls\_mask(land\_sea\_file, raw\_land\_sea\_mask, land\_sea\_mask, lon\_expanded\_lsm, outlying\_bias\_weights,&

EXPANDED\_GRID\_LON\_DIM=182, EXTRA\_LON\_GRID\_PT=1, START\_EXPANDED\_GRID\_LOCATIONS=1+1, END\_EXPANDED\_GRID\_LOCATIONS=1+180, error\_flag)

SUBROUTINE create\_ls\_mask(land\_sea\_file, raw\_land\_sea\_mask, ls, lsp, outlying\_bias\_weights, imxp, iadd, imin, imax, error\_flag)

REAL, DIMENSION(GRID\_LON\_DIM=180, GRID\_LAT\_DIM=90) :: raw\_land\_sea\_mask

INTEGER, DIMENSION(GRID\_LON\_DIM=180, GRID\_LAT\_DIM=90) :: land\_sea\_mask

INTEGER, DIMENSION(EXPANDED\_GRID\_LON\_DIM=180+2x1, GRID\_LAT\_DIM=90) :: lon\_expanded\_lsm # (1<=181, 2-181, 182<=1)

REAL, DIMENSION(GRID\_LON\_DIM=180, GRID\_LAT\_DIM=90) :: outlying\_bias\_weights

OPEN (UNIT = MASK\_UNIT, FILE=land\_sea\_file, STATUS='OLD', IOSTAT=iostat\_val, FORM='unformatted')

! first field is the land sea mask

READ (UNIT=MASK\_UNIT, IOSTAT=iostat\_val) raw\_land\_sea\_mask

! this blank read is intentional

READ (UNIT=MASK\_UNIT, IOSTAT=iostat\_val)

READ (UNIT=MASK\_UNIT, IOSTAT=iostat\_val) outlying\_bias\_weights

! reset mask to original to remove damping

outlying\_bias\_weights(:,:) = raw\_land\_sea\_mask(:,:)

$twoDegClim

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/clim.71.00.gdat

OPEN (UNIT=CLIMATOLOGY\_UNIT, FILE=climatology\_file, IOSTAT=iostat\_val, FORM='unformatted')

DO month = 1, 12

READ (UNIT=CLIMATOLOGY\_UNIT, IOSTAT=iostat\_val) clim\_year, clim\_month, sea\_surface\_temps ! REAL, DIMENSION(ONE\_DEG\_LON\_DIM=360, ONE\_DEG\_LAT\_DIM=180) :: sea\_surface\_temps

…..

climatologies(i, j, month) = raw\_land\_sea\_mask(i, j) = high\_val / low\_val ! (i, j) <= (2\*i-1:2\*I, 2\*j-1:2\*j) ! REAL, DIMENSION(GRID\_LON\_DIM=180, GRID\_LAT\_DIM=90, 12) :: climatologies, 1-deg to 2-deg;

END DO

$filledModes

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/eot6.damp-zero.ev130.ano.dat

CALL get\_modes(mode\_file, land\_sea\_mask, lat\_cosines, ocean\_spatial\_modes, ocean\_lat\_cosines, error\_flag)

! REAL, DIMENSION(GRID\_LAT\_DIM=90) :: lat\_cosines; REAL, DIMENSION(NUM\_OCEAN\_PTS=11506, MAX\_EOT\_MODES=130) :: ocean\_spatial\_modes;

! NUM\_OCEAN\_PTS=11506 is the number of ocean points in the (180,90) grid

! REAL, DIMENSION(NUM\_OCEAN\_PTS) :: ocean\_lat\_cosines

! Reads the 2-degree eot modes. These modes have been filled with zero over land. This will reduce biases near the coast.

SUBROUTINE get\_modes(mode\_file, land\_sea\_mask, lat\_cosines, ocean\_spatial\_modes, ocean\_lat\_cosines, error\_flag)

OPEN (UNIT=MODES\_UNIT, FILE=mode\_file, IOSTAT=iostat\_val, FORM='UNFORMATTED', STATUS='OLD')

n = 1

DO WHILE(n <= MAX\_EOT\_MODES(=130) .AND. error\_flag == 0)

READ (UNIT=MODES\_UNIT, IOSTAT=iostat\_val) modes ! REAL, DIMENSION(GRID\_LON\_DIM=180, GRID\_LAT\_DIM=90) :: modes

……

ocean\_spatial\_modes(anomaly\_cnt, n) = modes(i, j) ! anomaly\_cnt is the count of ocean grid points; here convert 2D ocean to 1D anomaly\_cnt;

……

ocean\_lat\_cosines(anomaly\_cnt) = lat\_cosines(j)

END DO

$wtsFile

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotwt/metopb/2016/nwt.20160117

write\_weights\_file(weight\_file, analysis\_year, analysis\_month, analysis\_day, eot\_weights, supported\_modes, smoothed\_zonal\_biasses) ! output EOT weights...

! integer analysis\_year, analysis\_month, analysis\_day; REAL, DIMENSION(MAX\_EOT\_MODES=130, NUM\_ANOMALIES=2) :: eot\_weights; INTEGER, DIMENSION(MAX\_EOT\_MODES=130) :: supported\_modes;

! REAL, DIMENSION(GRID\_LAT\_DIM=90) :: smoothed\_zonal\_biasses

FUNCTION write\_weights\_file(weight\_file, analysis\_year, analysis\_month, analysis\_day, eot\_weights, supported\_modes, smoothed\_zonal\_biasses) RESULT(error\_flag)

OPEN (UNIT=WEIGHTS\_UNIT, FILE=weight\_file, IOSTAT=iostat\_val, FORM='unformatted')!, STATUS='REPLACE')

WRITE (UNIT=WEIGHTS\_UNIT, IOSTAT=iostat\_val) analysis\_year, analysis\_month, analysis\_day, eot\_weights, supported\_modes, smoothed\_zonal\_biasses

$buoySuperobsPathFormat, $argoSuperobsPathFormat, $shipObsCorrectedPathFormat, $satFile # see above.

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.yyyyMMdd

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.yyyyMMdd

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.yyyyMMdd

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopb/2016/nsobs.20160117

# The 1st eotbias-cor4 input record has 2 parameters: nmodes, nuse

# The 2nd eotbias-cor4 input record depends on nuse and has 1-9 parameters: dwf1,dwf2,...

# The next input record is the date: computed by script 8 digits

# All remaining records are input and output file names which must be in order

# The 1st file name is the two-degree land/sea mask

# The 2nd file name is the input EOT modes (filled over land with 0)

# The 3rd file name is the variance of each of the 130 modes

# Nuse (1-9) now determines the number of files read. They will be weighted by dwf

# The weighting smoothing factors are applied in order: dwf1, ...

# The next file name is the input uncorrected satellite data

# The next file name is the analyzed weights

# The next file name is the output bias error estimate

# The final file name is the output bias corrected satellite data

#

# Note all satellite fields, weights and biases differ for day and night

cat <<- inxEOF > $paramCatFile # eotCorrParam

$modes $nuse # integer :: num\_eot\_modes, num\_weights\_used

$weightsSmoothingFactors # REAL, DIMENSION(:), ALLOCATABLE :: weight\_smoothing\_factors

$eotCorDate

$twoDegMask

$filledModes

$modeVariance

$satInFile

inxEOF

# append all of the WTS files

for wtsFile in "${wtsFiles[@]}"; do

cat <<- inxEOF >> $paramCatFile

$wtsFile

inxEOF

done

cat <<- inxEOF >> $paramCatFile

$analysisFile

$satCorrFile

inxEOF

cat $paramCatFile

130 1 # integer :: num\_eot\_modes, num\_weights\_used

1.0 # REAL, DIMENSION(:), ALLOCATABLE :: weight\_smoothing\_factors

20160117 # CHARACTER(LEN=8) date

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/lstags.twodeg.dat # CHARACTER(LEN=FILENAME\_LEN) land\_sea\_mask\_file

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/eot6.damp-zero.ev130.ano.dat # mode\_file

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/var-mode # variance\_file

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/1G # satellite\_file

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotwt/metopb/2016/nwt.20160117 # weight\_file

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopb/2016/nbias.20160117 # analysis\_file

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopb/2016/nsobsc.20160117 # sat\_correction\_file

$BIN/eotbias-cor4-col.x -Wl,-T < $paramCatFile

checkStopcode eotbias-cor4-col.x $?

CALL read\_inputs(date, land\_sea\_mask\_file, mode\_file, variance\_file, satellite\_file, weight\_files, analysis\_file, sat\_correction\_file, error\_flag)

REAL, DIMENSION (num\_eot\_modes, NUM\_ANOMALIES, MAX\_SMOOTHING\_FACTORS) :: eot\_weights

eot\_weights(:, :, :) = OISST\_UNDEF

CALL read\_weight\_file(weight\_files(ll), ll, num\_eot\_modes, num\_weights\_used, smoothing\_factors\_weights, supported\_modes, eot\_weights, smoothed\_zonal\_biases, error\_flag)

$twoDegMask # converted, see above

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/lstags.twodeg.

$filledModes # converted, see above, (130, 90, 180)

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/eot6.damp-zero.ev130.ano.dat

$modeVariance

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/var-mode ! the file is already there, Mar. 2020

CALL read\_mode\_variance(variance\_file, mode\_variances, error\_flag) ! Reads the expected variance of each of the 130 eot modes. REAL, DIMENSION(num\_eot\_modes) :: mode\_variances

OPEN (UNIT=MODE\_VARIANCE\_UNIT, IOSTAT=iostat\_val, FILE=mode\_variance\_file, FORM='UNFORMATTED', STATUS='OLD')

READ (UNIT=MODE\_VARIANCE\_UNIT, IOSTAT=iostat\_val) mode\_variances

Mode\_variance = [0.04045915 0.01313138 0.0120157 0.00434736 0.00967972 0.00722672, 0.0096891 0.00905081 0.00628093 0.00638855 0.00643446 0.00633721, ……], decreasing.

$satInFile # converted, see above,

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/metopb/2016/nsobs.20160117

$wtsFile # converted, see above,

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotwt/metopb/2016/nwt.20160117

$analysisFile

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopb/2016/nbias.20160117

error\_flag = write\_bias(analysis\_file, bias\_corrections, avg\_situ\_super\_obs, smoothed\_avg\_sat\_super\_obs, variance\_errors, year, month, day) ! write out EOT analysis

! Write out dates, bias, anomalies and variance bias error

FUNCTION write\_bias(bias\_file, bias\_corrections, avg\_situ\_super\_obs, smoothed\_avg\_sat\_super\_obs, variance\_errors, year, month, day) RESULT (io\_error)

OPEN (UNIT=BIAS\_UNIT, IOSTAT=iostat\_val, FILE=bias\_file, FORM='unformatted')

WRITE (UNIT=bias\_unit, IOSTAT=iostat\_val) year, month, day, bias\_corrections ! REAL, DIMENSION(GRID\_LON\_DIM=180, GRID\_LAT\_DIM=90) :: bias\_corrections

WRITE (UNIT=bias\_unit, IOSTAT=iostat\_val) year, month, day, avg\_situ\_super\_obs ! average weighted ship and buoy anomalies, REAL, DIMENSION(GRID\_LON\_DIM, GRID\_LAT\_DIM) :: avg\_situ\_super\_obs

WRITE (UNIT=bias\_unit, IOSTAT=iostat\_val) year, month, day, smoothed\_avg\_sat\_super\_obs ! average satellite anomalies for ndays, REAL, DIMENSION(GRID\_LON\_DIM, GRID\_LAT\_DIM) :: smoothed\_avg\_sat\_super\_obs

WRITE (UNIT=bias\_unit, IOSTAT=iostat\_val) year, month, day, variance\_errors ! variance bias error, REAL, DIMENSION(GRID\_LON\_DIM, GRID\_LAT\_DIM) :: variance\_errors

$satCorrFile

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopb/2016/nsobsc.20160117

CHARACTER(LEN=FILENAME\_LEN) sat\_correction\_file

error\_flag = bias\_interpolation(biasp, satellite\_file, sat\_correction\_file, lon\_expanded\_lsm, lon\_expand\_points, lat\_points)

! The subroutine reads in the original satellite data, interpolates the bias correction to the data location and applies the correction. The corrected data is then written to the output file.

FUNCTION bias\_interpolation(biasp, sat\_file, bias\_corrected\_file, lon\_expanded\_lsm, lon\_expand\_points, lat\_points) RESULT(error\_flag)

OPEN (UNIT=bias\_corrected\_unit, IOSTAT=iostat\_val, FILE=bias\_corrected\_file, FORM='unformatted')

WRITE (UNIT=bias\_corrected\_unit) year, month, day, obs\_type

DO WHILE(iostat\_val == 0 .AND. block\_size > 0)

WRITE (UNIT=bias\_corrected\_unit, IOSTAT=iostat\_val) block\_size

……

DO i = 1, block\_size

sea\_surface\_temps(i) = sea\_surface\_temps(i) - interp\_point

END DO

error\_flag = write\_corrected\_bias\_file(bias\_corrected\_unit, obs\_cnts, sea\_surface\_temps, latitudes, longitudes, block\_size)

……

END DO

CLOSE(UNIT=bias\_corrected\_unit)

FUNCTION write\_corrected\_bias\_file(bias\_corrected\_unit, obs\_cnts, sea\_surface\_temps, latitudes, longitudes, ict) RESULT(error\_flag)

WRITE (UNIT=bias\_corrected\_unit, IOSTAT=iostat\_val) (obs\_cnts(ii), ii = 1, ict)

WRITE (UNIT=bias\_corrected\_unit, IOSTAT=iostat\_val) (sea\_surface\_temps(ii), ii = 1, ict)

WRITE (UNIT=bias\_corrected\_unit, IOSTAT=iostat\_val) (latitudes(ii), ii = 1, ict)

WRITE (UNIT=bias\_corrected\_unit, IOSTAT=iostat\_val) (longitudes(ii), ii = 1, ict)

runOI() {

cat <<- inxEOF > $TMP/oiInterimParam

$oiTitle

$curDate

$rmax $nmax $ifil $rej $nbias $nsat $iwarn # 400.0 22 1 5.0 4 1 20

$cor4smStat

$pathIncrVar

$errorCorStat

$fgOisst

$quarterMaskExtend

$clim4

$oisst

$residualStat

$satADayAnalysis

$satANightAnalysis

$satBDayAnalysis

$satBNightAnalysis

$buoyNSR

$buoySuperobs

$argoNSR

$argoSuperobs

$shipNSR

$shipObsCorrected

$satADayNSR

$satADayCorrected

$satANightNSR

$satANightCorrected

$satBDayNSR

$satBDayCorrected

$satBNightNSR

$satBNightCorrected

$iceNSR

$iceSuperobs

inxEOF

cat $TMP/oiInterimParam

$BIN/calc\_oisst.x -Wl,-T < $TMP/oiInterimParam

checkStopcode calc\_oisst.x $?

}

[lgchen@cheyenne2 Tmp]% cat oiInterimParam

NOAA/NCEI 1/4 Degree Daily Optimum Interpolation Sea Surface Temperature (OISST) Analysis, Version 2.1 - Interim

20160117

400.0 22 1 5.0 4 1 20 # $rmax $nmax $ifil $rej $nbias $nsat $iwarn, see doc in the code;

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/cor4sm-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/path-incr-var-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/error-cor-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160116

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/oiclm4.mon

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/residual-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopa/2016/dbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopa/2016/nbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopb/2016/dbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopb/2016/nbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/buoy4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/buoy4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/ship4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/day-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopa/2016/dsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/nte-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopa/2016/nsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/day-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopb/2016/dsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/nte-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopb/2016/nsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/cice4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/ice/2016/icesst.20160117

READ (SCRIPT\_INPUT\_UNIT, FILE\_PATH\_FMT, IOSTAT=iostatus) oi\_title

READ (SCRIPT\_INPUT\_UNIT, '(i4,2i2)', IOSTAT=iostatus) analysis\_year, analysis\_month, analysis\_day

READ (SCRIPT\_INPUT\_UNIT, \*, IOSTAT=iostatus) grid\_box\_search\_dist, max\_obs\_used, num\_times\_to\_smooth, super\_obs\_reject\_threshold, num\_bias\_files, indep\_bias\_datasets, sst\_pct\_thold

DO this\_input\_file = 1, num\_input\_files - 1 !have to stop before last input file because order in input file is goofy, num\_input\_files = 7

CALL OPEN\_DATA\_FILE(SCRIPT\_INPUT\_UNIT, input\_unit\_array(this\_input\_file), data\_type\_array(this\_input\_file), 'old', exit\_info)

ENDDO ! Open input files for reading

CALL OPEN\_DATA\_FILE (SCRIPT\_INPUT\_UNIT, OI\_OUTPUT\_UNIT, 'oi sst output SST file', 'unknown', exit\_info) ! Open output file for writing

! Now open residual bias variance input file, which is listed after the output file

CALL OPEN\_DATA\_FILE(SCRIPT\_INPUT\_UNIT, input\_unit\_array(num\_input\_files), data\_type\_array(num\_input\_files), 'old', exit\_info)

$cor4smStat

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/cor4sm-stat-v2

! Read in autocorrelation data

READ (FIRST\_GUESS\_AUTOCORR\_INPUT\_UNIT, IOSTAT=iostatus) data\_type ! CHARACTER(20) data\_type

READ (FIRST\_GUESS\_AUTOCORR\_INPUT\_UNIT, IOSTAT=iostatus) lon\_scale ! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: lon\_scale

READ (FIRST\_GUESS\_AUTOCORR\_INPUT\_UNIT, IOSTAT=iostatus) data\_type

READ (FIRST\_GUESS\_AUTOCORR\_INPUT\_UNIT, IOSTAT=iostatus) lat\_scale ! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: lat\_scale

READ (FIRST\_GUESS\_AUTOCORR\_INPUT\_UNIT, IOSTAT=iostatus) data\_type

READ (FIRST\_GUESS\_AUTOCORR\_INPUT\_UNIT, IOSTAT=iostatus) first\_guess\_autocorr ! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: first\_guess\_autocorr

$pathIncrVar

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/path-incr-var-stat-v2

! Read in first guess variances

READ (FIRST\_GUESS\_VARIANCE\_INPUT\_UNIT, IOSTAT=iostatus) data\_type ! ! CHARACTER(20) data\_type

READ (FIRST\_GUESS\_VARIANCE\_INPUT\_UNIT, IOSTAT=iostatus) first\_guess\_error\_variance ! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: first\_guess\_error\_variance

$errorCorStat ! all 1.

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/error-cor-stat-v2 ! FIRST\_GUESS\_CORRECT\_INPUT\_UNIT

READ (FIRST\_GUESS\_CORRECT\_INPUT\_UNIT, IOSTAT=iostatus) data\_type

READ (FIRST\_GUESS\_CORRECT\_INPUT\_UNIT, IOSTAT=iostatus) first\_guess\_correction ! Read in first guess corrections

$fgOisst ! already converted, see above

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160116 ! FIRST\_GUESS\_INPUT\_UNIT

$quarterMaskExtend ! already converted, see above

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/quarter-mask-extend

$clim4

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/oiclm4.mon ! CLIMATOLOGY\_INPUT\_UNIT

! Read in monthly climatologies and create year\_clim array

DO this\_month = 1, MONTHS\_IN\_YEAR

! integer climatology\_year, climatology\_month; REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: work\_array

READ (CLIMATOLOGY\_INPUT\_UNIT, IOSTAT=iostatus) climatology\_year, climatology\_month, work\_array

year\_clim(:,:,this\_month) = work\_array(:,:)

ENDDO

$oisst ! the output OI: this is the only output file, converted the previous day results as the first guess.

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/out/oiout/2016/sst4-metopab-eot-intv2.20160117

$residualStat ! The 8th file name is the residual bias (variance), ranges from 0.1 to 0.3

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/residual-stat-v2 ! RESIDUAL\_BIAS\_INPUT\_UNIT

READ (RESIDUAL\_BIAS\_INPUT\_UNIT, IOSTAT=iostatus) data\_type

READ (RESIDUAL\_BIAS\_INPUT\_UNIT, IOSTAT=iostatus) residual\_bias ! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: residual\_bias

$satADayAnalysis ; $satANightAnalysis ; $satBDayAnalysis ; $satBNightAnalysis ! converted before,

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopa/2016/dbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopa/2016/nbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopb/2016/dbias.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotbias/metopb/2016/nbias.20160117

$buoyNSR ! noise to signal ratio

$buoySuperobs ! super obs, paired till end of the file

$argoNSR

$argoSuperobs

$shipNSR

$shipObsCorrected

$satADayNSR # same file as $satBDayNSR

$satADayCorrected

$satANightNSR # same file as $satBNightNSR

$satANightCorrected

$satBDayNSR

$satBDayCorrected

$satBNightNSR

$satBNightCorrected

$iceNSR

$iceSuperobs

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/buoy4sm-nsr-stat-v2 ! 0.33 ~ 0.5

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/buoy4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/ship4sm-nsr-stat-v2 ! 1.8 ~ 2.02 etc.

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/day-path4sm-nsr-stat-v2 # 0.33 ~ 0.5, looks exactly the same as buoy4sm-nsr-stat-v2, NORMAL???

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopa/2016/dsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/nte-path4sm-nsr-stat-v2 # 0.33 ~ 0.5, looks exactly the same as the day-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopa/2016/nsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/day-path4sm-nsr-stat-v2 # 0.33 ~ 0.5

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopb/2016/dsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/nte-path4sm-nsr-stat-v2 # 0.33 ~ 0.5, looks exactly the same as the day-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/eotcor/metopb/2016/nsobsc.20160117

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/cice4sm-nsr-stat-v2 # 0.33 ~ 0.5, seems exactly the same as the day-path4sm-nsr-stat-v2

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/ice/2016/icesst.20160117

$buoyNSR ! noise to signal ratio

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/buoy4sm-nsr-stat-v2

! In file calc\_oisst.f90

! Read in and store noise to signal ratio input data and super obs input data, ignoring data from more than ANALYSIS\_DAY\_INTVERVAL days away

! initially pixel\_sst\_sum is the combined SST for the grid \* xbh, work\_array = the sum of the 1./noise\_to\_signal\_stddev\*\*2, initially pixel\_stddev\_sum = number of obs

previous\_total\_super\_obs = num\_total\_super\_obs

exit\_info = SUCCESS

DO WHILE (exit\_info == SUCCESS)

CALL OPEN\_DATA\_FILE (SCRIPT\_INPUT\_UNIT, NOISE\_TO\_SIGNAL\_INPUT\_UNIT, 'noise to signal ratio data file', 'old', exit\_info)

CALL OPEN\_DATA\_FILE (SCRIPT\_INPUT\_UNIT, SUPER\_OBS\_INPUT\_UNIT, 'super obs data file', 'old', exit\_info)

! OPEN (data\_unit\_num, FILE = filename, FORM = 'unformatted', STATUS = file\_status, IOSTAT=iostat\_val), in SUBROUTINE open\_data\_file (script\_unit\_num, data\_unit\_num, file\_type\_string, file\_status, exit\_info)

num\_super\_obs\_files = num\_super\_obs\_files + 1

CALL get\_super\_obs(NOISE\_TO\_SIGNAL\_INPUT\_UNIT, SUPER\_OBS\_INPUT\_UNIT, num\_total\_super\_obs, super\_obs\_reject\_threshold, first\_guess\_sst, pixel\_obs\_count, pixel\_min\_error)

num\_added\_super\_obs = num\_total\_super\_obs - previous\_total\_super\_obs

previous\_total\_super\_obs = num\_total\_super\_obs

……

ENDDO

$buoySuperobs

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/buoy.20160117

REAL, DIMENSION(size(pixel\_sst\_sum,1),size(pixel\_sst\_sum,2)) :: noise\_to\_signal\_stddev

lon\_dim = size(pixel\_sst\_sum,1) ; lat\_dim = size(pixel\_sst\_sum,2); ! integer lon\_dim, lat\_dim

! READ IN THE array of expected stand dev of noise to signal ratios

READ (noise\_to\_signal\_input\_unit, IOSTAT = iostat\_val) super\_obs\_data\_type ! CHARACTER(20) super\_obs\_data\_type

READ (noise\_to\_signal\_input\_unit, IOSTAT = iostat\_val) noise\_to\_signal\_stddev ! REAL, DIMENSION(size(pixel\_sst\_sum,1)=1440,size(pixel\_sst\_sum,2)=720) :: noise\_to\_signal\_stddev,

! Read in super obs date, making sure it matches analysis date

READ (super\_obs\_input\_unit, IOSTAT=iostat\_val) super\_obs\_year, super\_obs\_month, super\_obs\_day, input\_data\_label ! integer super\_obs\_year, super\_obs\_month, super\_obs\_day, CHARACTER(8) input\_data\_label

! Read data from super obs files

DO

READ (super\_obs\_input\_unit, IOSTAT = iostat\_val) num\_obs\_to\_read

READ (super\_obs\_input\_unit, IOSTAT=iostat\_val) (num\_data\_super\_obs(obs\_count), obs\_count = 1, num\_obs\_to\_read) ! REAL, DIMENSION(MAX\_NUM\_BLOCK\_OBS=10000):: num\_data\_super\_obs

READ (super\_obs\_input\_unit, IOSTAT=iostat\_val) (sst\_super\_obs(obs\_count), obs\_count = 1, num\_obs\_to\_read) ! REAL, DIMENSION(MAX\_NUM\_BLOCK\_OBS=10000):: sst\_super\_obs

READ (super\_obs\_input\_unit, IOSTAT=iostat\_val) (lats\_super\_obs(obs\_count), obs\_count = 1, num\_obs\_to\_read) ! REAL, DIMENSION(MAX\_NUM\_BLOCK\_OBS=10000):: lats\_super\_obs

READ (super\_obs\_input\_unit, IOSTAT=iostat\_val) (lons\_super\_obs(obs\_count), obs\_count = 1, num\_obs\_to\_read) ! REAL, DIMENSION(MAX\_NUM\_BLOCK\_OBS=10000):: lons\_super\_obs

！ then process & analysis each obs

DO this\_obs = 1, num\_obs\_to\_read

num\_read\_super\_obs = num\_read\_super\_obs + 1

! find closest grid point to get analysis increment and data noise to signal. no need to linear interpolate because values are smoothed

this\_lon = nint(intervals\_per\_degree \* (lons\_super\_obs(this\_obs) - grid\_lons(1))) + 1

lon\_diff = lons\_super\_obs(this\_obs) - grid\_lons(this\_lon)

this\_lat = nint(intervals\_per\_degree \* (lats\_super\_obs(this\_obs) - grid\_lats(1))) + 1

lat\_diff = lats\_super\_obs(this\_obs) - grid\_lats(this\_lat)

IF (land\_mask(this\_lon, this\_lat) == 1) THEN

analysis\_increment = sst\_super\_obs(this\_obs) - first\_guess\_sst(this\_lon, this\_lat)

**this\_noise\_stddev = noise\_to\_signal\_stddev(this\_lon, this\_lat)**

IF (abs(analysis\_increment) <= super\_obs\_reject\_threshold) THEN ! super\_obs\_reject\_threshold=5

num\_total\_super\_obs = num\_total\_super\_obs + 1

num\_accepted\_file\_super\_obs = num\_accepted\_file\_super\_obs + 1

this\_noise\_stddev\_squared = this\_noise\_stddev\*\*2

! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: pixel\_sst\_sum, pixel\_stddev\_sum,

! REAL, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: pixel\_min\_error,

! INTEGER, DIMENSION(QUART\_DEG\_LON\_DIM, QUART\_DEG\_LAT\_DIM) :: pixel\_obs\_count

pixel\_sst\_sum(this\_lon, this\_lat) = pixel\_sst\_sum(this\_lon, this\_lat) + (analysis\_increment / this\_noise\_stddev\_squared)

pixel\_stddev\_sum(this\_lon, this\_lat) = pixel\_stddev\_sum(this\_lon, this\_lat) + 1. / this\_noise\_stddev\_squared

pixel\_min\_error(this\_lon, this\_lat) = amin1 (pixel\_min\_error(this\_lon, this\_lat), this\_noise\_stddev)

pixel\_obs\_count(this\_lon, this\_lat) = pixel\_obs\_count(this\_lon, this\_lat) + 1

ELSE

num\_rejected\_file\_super\_obs = num\_rejected\_file\_super\_obs + 1

ENDIF

ELSE

num\_land\_obs = num\_land\_obs+1

ENDIF

ENDDO ! end of “DO this\_obs = 1, num\_obs\_to\_read”

ENDDO ! end of “DO”

$argoNSR ! same as buoy4sm\_nsr

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/buoy4sm-nsr-stat-v2

$argoSuperobs

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/argo.20160117 # 0.33 ~ 0.5

$shipNSR

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/common/static/ship4sm-nsr-stat-v2 # 1.8 ~ 2.02 etc.

$shipObsCorrected

/glade/work/lgchen/project/OISST\_NOAA/oisst.v2.1-master/prelim/work/sobs/buoyship/2016/shipc.20160117

# oi\_subroutines.f90

! Ligang: day\_clim() is the analysis\_day\_climatology, first\_guess\_autocorr() is 0.98 everywhere, applys on the diff of fg and clim, if it's 1, it's the same as fg

first\_guess\_sst(this\_lon, this\_lat) = first\_guess\_autocorr(this\_lon, this\_lat) \* ( first\_guess\_sst(this\_lon, this\_lat) - day\_clim(this\_lon, this\_lat) ) + day\_clim(this\_lon, this\_lat)

# oi\_subroutines.f90, SUBROUTINE get\_super\_obs

IF (land\_mask(this\_lon, this\_lat) == 1) THEN

analysis\_increment = sst\_super\_obs(this\_obs) - first\_guess\_sst(this\_lon, this\_lat)

this\_noise\_stddev = noise\_to\_signal\_stddev(this\_lon, this\_lat) ! what exactly is this?

IF (abs(analysis\_increment) <= super\_obs\_reject\_threshold) THEN ! 5 for threshold

num\_total\_super\_obs = num\_total\_super\_obs + 1

num\_accepted\_file\_super\_obs = num\_accepted\_file\_super\_obs + 1

this\_noise\_stddev\_squared = this\_noise\_stddev\*\*2

pixel\_sst\_sum(this\_lon, this\_lat) = pixel\_sst\_sum(this\_lon, this\_lat) + & ! Ligang: (1440, 720), initialized to 0, from oi\_common\_variables.f90

& (analysis\_increment / this\_noise\_stddev\_squared) ! Ligang: ?

pixel\_stddev\_sum(this\_lon, this\_lat) = pixel\_stddev\_sum(this\_lon, this\_lat) + 1. / this\_noise\_stddev\_squared ! Ligang: (1440, 720), initialized to 0, from oi\_common\_variables.f90

pixel\_min\_error(this\_lon, this\_lat) = amin1 (pixel\_min\_error(this\_lon, this\_lat), this\_noise\_stddev) ! Ligang: defined in calc\_oisst.f90, (1440, 720), initialized to 9999. ??

pixel\_obs\_count(this\_lon, this\_lat) = pixel\_obs\_count(this\_lon, this\_lat) + 1 ! Ligang: (1440, 720), defined in calc\_oisst.f90, init to 0, count of super obs "belong to" this analysis grid point;

ELSE

num\_rejected\_file\_super\_obs = num\_rejected\_file\_super\_obs + 1

ENDIF

ELSE

num\_land\_obs = num\_land\_obs+1

ENDIF

! local latitude loop

DO WHILE ((this\_local\_lat <= lat\_grid\_bound\_north) .AND. (num\_grid\_box\_data\_points <= max\_num\_data\_points)) ! 200\*20=4000

IF (NINT(pixel\_sst\_sum(this\_wrapped\_lon, this\_local\_lat)) /= NINT(OISST\_UNDEF)) THEN !Ligang: i.e. has valid combined sst increment

num\_grid\_box\_data\_points = num\_grid\_box\_data\_points + 1

IF (num\_grid\_box\_data\_points <= max\_num\_data\_points) THEN

grid\_box\_lons(num\_grid\_box\_data\_points) = adjusted\_grid\_lon

grid\_box\_lats(num\_grid\_box\_data\_points) = grid\_lats(this\_local\_lat)

grid\_box\_sst(num\_grid\_box\_data\_points) = pixel\_sst\_sum(this\_wrapped\_lon, this\_local\_lat)

grid\_box\_stddev(num\_grid\_box\_data\_points) = pixel\_stddev\_sum(this\_wrapped\_lon, this\_local\_lat)

ENDIF

ENDIF

this\_local\_lat = this\_local\_lat + 1

END DO !this\_local\_lat

END DO !this\_local\_lon