TABLE OF CONTENTS

1. PROJECT/ERSST [PROJECTS]

[Top] [PROJECTS]

NAME

```
ersstv3b_oper_situ_only_col.sh
```

LOCATION

$**ERSST**/script/ersstv3b_oper_situ_only_col.sh

PURPOSE

To generate the analyzed Extended Reconstruction Sea Surface Temperature (**ERSST**) on a 2 deg
grid from in situ data (ship and buoy, NOT satellite: v3b uses in situ only),
and transfer to distribution directories.

DESCRIPTION

This is the main script that launches a series of fortran programs for computing
ERSST for a specific month and year (determined from the current machine date).
The operational runs will affect values in recent past years due the long-term averaging
Also, the program uses output from a one-time climatological run (1880
to around 1985). Most programs write output for all the years sequentially in one binary
file. However, depending on the program, the month processed may just be added to the
the pre-exisitng file, or the entire file may be rewritten from 1985 onward.

The processing is as follows:
First, in situ data (ship and buoy) is ftp'd from source locations. Adjustments
are made for distance of point obs from grid center, difference in dependability of ship
and buoy data, etc. and other quality checks are made. The data is placed on a 2-deg grid,
and anomalies are computed. Adjustments are also made for sea ice presence. The
sea ice data comes from the daily OISST analysis. Statistical analysis is done in 2 steps:
1)The decadal or low frequency component is determined from the anomalies and then the
residuals are computed
2)The high frequency analysis is performed on the residuals.
The **ERSST** is then computed from the sum of the two components and error variance is estimated.
After the **ERSST** computation, other programs are run to update related products
(land and merged land-ocean SST) that use **ERSST**.
These other products are continually
updated on a different schedule, external to this script. Areal averages are computed for the
Climate Monitoring group, and plots are made to check the **ERSST** output.
Comparisons with v2 and the v3 (satellite) are also made, that are produced separately.

AUTHOR

Chunying Liu

CREATION DATE

04/01/2008

COPYRIGHT

MODIFICATION HISTORY

04/30/2008 - Chunying modified from /raid2/**ERSST**/ftn/ersstv3b_oper_situ_only_col.sh
to remove satellite data

```
    08/28/2009 - Viva Banzon added comments
    08/17/2010 - Viva Banzon removed Land and merged comments after Liu removed related codes
                 The conditions for writing ascii for previous decade were put in but left
  commented
                 since that was not in the original script
```

INPUTS

```
    buoyship_quarter/nqyyyymm.Z - ftp ship and buoy data

    Outputs from the Fortran programs are passed to other Fortran programs
    with each program building/modifying the data for the next program
```

OUTPUTS

```
    Updated ERSST integer and data files
      ERSST/datat/ERSST-v3b/situ/ERSST.v3b.yr1.yr2.asc
      ERSST/datat/ERSST-v3b/situ/ERSST.esd.v3b.yr1.yr2.asc
    NetCDF formated ERSST file
      ERSST/data/netcdf-v3b/situ/ERSST.yyyymm.nc
```

PARAMETERS

```
     smult  = 4 - standard deviation multiplier (range 2-6) for QC of in situ data
```

VARIABLES

```
     $chyr  = two digit year
     $chmon = two digit month
```

SUBPROGRAMS

monice1d-med-oper.f
gtsqc.situ.v3b.f
ice1t2.f
ssta.merg.situ.v3b.f
lfsst.situ.v3b.f
hfsst.situ.v3b.f
sst2d.situ.v3b.f
err.norm.map2.upd.situ.v3b.f
dati2.upd.situ.v3b.f
ersst_netcdf.situ.v3b.f

LIBRARY

```
     netcdf bin library at: /usr/local/netcdf-3.6.1/bin
     netcdf modules at:/usr/local/netcdf-3.6.1/include
     date function at: /lib/w3lib
```

LANGUAGE

```
    Linux Bourne shell script
```

1.1. ERSST/dati2.upd.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

dati2.upd.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**dati2.upd.situ.v3b.f**

PURPOSE

To write monthly SST and normalized sampling error variance
into ASCII files for distribution. Only writes out the decade
that contains the input year.

DESCRIPTION

The binary files are read and written as intergers (deg c* 100) in
ASCII format. Land is -9999. ASCII files are in decadal sets,
i.e., 1854 to 1859, 1860-1869....

AUTHOR

Thomas M Smith

CREATION DATE

unknown

COPYRIGHT

MODIFICATION HISTORY

2006 Jan - Chunying Liu modifyed from dati2.upd.f to make it work at NCDC and linke it
with the shell script.
2009 Jul - Viva Banzon added comments and put into robodoc format
and also changed paths to versst directory

INPUTS

```
   iyr1    ..... latest year
2-deg grids from 1985 onwards
   unit 21 ..... $ersst_DAT_DIR/output/sst2d/sst2d.situ.YYYYMM.v3b.dat
                (updated reconstructed SST)
   unit 21 ..... $ersst_DAT_DIR/output/err2d/err.norm.map.upd.situ.1985.last.v3b.dat
                 (updated error variance)
```

OUTPUTS

```
2-deg monthly data in decadal sets; cy1 and cy2 updated by program
   unit 51 ..... $ersst_DAT_DIR/output/ascii/ERSST.v3b.cy1.cy2.asc          (SST)
```

```
      unit 52 ..... $ersst_DAT_DIR/output/ascii/ERSST.esd.v3b.cy1.cy2.asc      (standard dev)
```

PARAMETERS

```
      im, jm =xsize and ysize of 2 degree grid
```

VARIABLES

```
      iy1 ... start of decade to write as ASCII
      iy2 ... end of decade to write as ASCII
      a2   = monthly reconstructed SST
      e2   = monthly error variance
      ierr = monthly std dev (after taking square root)
      isst = monthly SST *100 (as an integer)
```

SUBPROGRAMS

```
      none
```

LANGUAGE

```
      Fortran
```

1.2. ERSST/err.norm.map2.upd.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

err.norm.map2.upd.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**err.norm.map2.upd.situ.v3b.f**

PURPOSE

```
      To compute the normalized sampling error variance maps for ERSST
      from 1985 onwards
```

DESCRIPTION

```
      The total sampling error variance is estimated by computing the LF
      and HF variances on the 2 deg grid (88S-88N by 0E-358E).The two
      variances are then normalized and summed to produce the total.
      The LF sampling error variance is modeled from the annual sampling
      over 25-deg areas (5 X 5 deg grid) and the average damping of the error
      with sampling. The "reference" LF sampling variance is as static file
      created from model SST anomalies (1861-2000) that are first low-pass
      filtered .  The model is the GFDL Coupled Global Climate Model used
      for tuning and testing the reconstruction.  The CGCM results were
      averaged to 5 deg grid to match and evaluate the merged land -ocean
      product.  To evaluate the LF component on the 2-deg grid, the LF
      reference field is first regridded to 2 deg.  The HF sampling error
      variance is computed from the variance associated with each mode and
      how many modes are resolved. A residual HF error is added for variations
```

```
never resolved.  The reference HF variance field is computed from OI v2
monthly SST anomalies 1982-2005)
See: Smith and Reynolds (2004) for Error analysis details
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

```
February 2007
```

COPYRIGHT

PROGRAM HISTORY

```
03/03/2010 - C. Liu hardcoding
2009 Sep: V. Banzon added comments as part of documentation effort
Jan 2007  - Chunying Liu modified the code to run at NCDC
```

INPUTS

```
 passed interactively or by script
   iydo ........ user-specified year to do
   mondo ....... user-specified month to do
 land mask (land = 0, sea = 1)
   unit 30 ..... $ersst_DAT_DIR/input/static/mask2d.dat
   unit 21 ..... $ersst_DAT_DIR/output/anom2d/sst2d.ano.situ.YYYYMM.v3b.dat
   unit 21 ..... $ersst_DAT_DIR/input/static/varhf.ssta.dat (2-d high freq variances, from
T. Smith)
                  computed from detrended OI v2 monthly SST anomalies 1982-2005)
   unit 21 ..... $ersst_DAT_DIR/input/static/lfvar5d.mrg.dat (5-d low freq variances, from
T. Smith)
            computed from low pass filtered CGCM SSTanomalies 1861-2000 )
 program updates cyr
   unit 23 ..... $ersst_DAT_DIR/inter/situmerg/ssta.merg.situ.mon.v3b.cyr.dat
```

OUTPUTS

```
   unit 51 ..... $ersst_DAT_DIR/output/err2d/err.norm.map.upd.situ.1985.last.v3b.dat
```

PARAMETERS

```
 im, jm = x- and y-size of 2 deg grid
 ehmin  = 0.05
 nyav   = size of averaging window in years
 ntm    = size of averaging window in months
```

VARIABLES

```
Arrays that are on a 5 deg grid:
 vl5    = CGCM model full LF sampling variance
```

```
Arrays that are on the 2 deg grid:
 vlf    = regridded LF variance returned by int5t2
 vhf    = variance estimate for HF analysis
 a2     = reconstructed analysis monthly SST anomaly
        = HF std dev returned by getsda
 ac     = monthly merged buoy/ship SST anomaly
        = updated by lferr to hold annual LF sampling variance

Arrays on a 2 deg grid by ntm months (9 year window)
 ert    = monthly SST anomalies used in HF computation
        = retuned by detrnd as detrended monthly anomalies

Arrays containing a year of monthly 2 deg grids
 sstp   = monthly merged buoy/ship anomalies for 1 year
```

SUBPROGRAMS

```
int5t2
lferr
detrnd
getsda
```

LANGUAGE

```
Fortran
```

1.3. ERSST/ersst_netcdf.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

ersst_netcdf.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**ersst_netcdf.situ.v3b.f**

PURPOSE

```
To write monthly SST, anomalies and normalized sampling error variance
into netCDF format for distribution.  Only writes out the updated year.
```

DESCRIPTION

```
The program reads the input files for SST, anomalies and error variance,
and skips to most recent month. Values are converted to integer (deg C*100)
and written to the appropriate location in the netCDF file.
```

AUTHOR

```
presumably Thomas M Smith
```

CREATION DATE

```
unknown
```

COPYRIGHT

MODIFICATION HISTORY

```
undated   -from dati2.upd.f
2009 Sep -Viva Banzon added comments and put into robodoc format
```

INPUTS

```
 iydo ..... year to update
 mondo .... month to update

 Updated 2-deg grids from 1985 onwards
 unit 21 ..... sst2d.situ.YYYYMM.v3b.dat    (reconstructed SST)
 unit 22 ..... sst2d.ano.situ.YYYYMM.v3b.dat  (reconstructed anomalies)
 unit 23 ..... err.norm.map.upd.situ.1985.last.v3b.dat (error variance)
```

OUTPUTS

```
 2-deg monthly data in decadal sets; cy1 and cy2 updated by program
 netcdfpath ..... $ersst_DAT_DIR/output/netcdf/ERSST.YYYYMM.nc
                  the subroutine actually writes the SST and error
                  and main passes the name
```

PARAMETERS

```
 imx, imy = xsize and ysize of 2 degree grid
 iyrref   = reference year (beginning of entire time series)
 imonref  = reference month (beginning of entire time series)
 idayref  = reference day (beginning of entire time series)
 undef    = no data (-999.9) in input file
 undef2   = no data (-999) in output file
```

VARIABLES

```
 iy1  ..... start of decade to write as ASCII
 iy2  ..... end of decade to write as ASCII
 sst      = monthly reconstructed SST
 anom     = monthly reconstructed anomaly
 err      = monthly error variance
 sdate    = date string in yyyymmdd
 cdate    = date string in yyyy-mm-dd
 refdate  = reference date as yyyy-mm-dd
 cnetdate = to do date as yyyy-mm-dd
 path     = input path
 cdfpath  = output path (updated by year month)
 isst     = integerized monthly reconstructed SST * 100
 ianom    = integerized monthly reconstructed anomaly * 100
 ierr     = integerized monthly reconstructed std dev * 100
```

SUBPROGRAMS

```
timer
$ersst_SRC_DIR/put_cdf_ersst_situ_v3b.f
$ersst_SRC_DIR/check_err90.f
$ersst_LIB_DIR/w3lib/iw3jdn.f
```

```
$ersst_LIB_DIR/maxmin.f
$ersst_LIB_DIR/imaxmin2.f
```

LANGUAGE

```
Fortran
```

1.4. ERSST/gtsqc.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

gtsqc.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**gtsqc.situ.v3b.f**

PURPOSE

To compute monthly SST averages on a 2 deg grid based on single point observations from ships and buoys

DESCRIPTION

Computes monthly SST averages on a 2 deg grid for ship
and buoy data separately after a series of quality control checks.
Number of observations are also tallied on the grid and written out.
In situ data is read per line (=1 SST value) and can be from ship,
buoy or other sources (not used). For quality control of in situ
SSTs, the code is set up to use monthly ERSST and/or climatology,
but only the ERSST check is actually used. For the latest month,
there is no ERSST so the SST check uses the previous months ERSST plus
the climatological difference between current and previous month.
Other QC checks skip data over land or ice, etc.

Notes: All processing is on the ERSST 2-deg grid

AUTHOR

Richard W. Reynolds

CREATION DATE

Jan 2008 - Richard W. Reynolds

COPYRIGHT

MODIFICATION HISTORY

```
08/08/2010 - V. Banzon changed buoyship  path to $ersst_FTP_DIR instead of DAT_DIR
03/03/2010 - C. Liu hardcoding
08/28/2009 - V. Banzon added comments
02/01/2008 - C. Liu modified from coadsqc.f
01/02/2007 - Chunying Liu modified the code to run at NCDC
```

INPUTS

```
passed by script
    iyre ......... user-specified end year
    imoend ....... user-specified end month
    smult ........ user-specified standard deviation multiplier
In situ data as point SST values (coordinates provided)
program substitutes in yy,  mm
    unit 31 ...... $ersst_FTP_DIR/buoyship/nqyy2mm
1 deg monthly avg SST climatology (1971-2000)COADS files
    unit 23 ...... $ersst_DAT_DIR/static/clim.71.00.gdat-fill contains averages
1 deg monthly std dev SST climatology (1950-1970)COADS files
    unit 24 ...... $ersst_DAT_DIR/static/stdev1d-coads3-fill contains std deviations
2 deg monthly ERSST  (1985-recent)
    unit 21 ...... $ersst_DAT_DIR/output/sst2d/sst2d.situ.YYYYMM.v3b.dat
2 deg land mask
    unit 3 ....... $ersst_DAT_DIR/static/mask2d.dat
```

OUTPUTS

```
program substitutes ciyear
2 deg monthly average SST and data counts
    unit 51 ...... $ersst_DAT_DIR/inter/situ/ship.avg2.mon.ciyear.dat
    unit 52 ...... $ersst_DAT_DIR/inter/situ/buoy.avg2.mon.ciyear.dat
2 deg monthly rejected SSTs based on climatology and reject counts
    unit 61 ...... $ersst_DAT_DIR/inter/situ/gts_climrej_ship.ciyear.dat
    unit 62 ...... $ersst_DAT_DIR/inter/situ/gts_climrej_buoy.ciyear.dat
2 deg monthly rejected SSTs based on ERSST and reject counts
    unit 71 ...... $ersst_DAT_DIR/inter/situ/gts_ersstrej_ship.ciyear.dat
    unit 72 ...... $ersst_DAT_DIR/inter/situ/gts_ersstrej_buoy.ciyear.dat
```

PARAMETERS

```
   imx, imy  = x and y dimension of 2 degree grid
   imxp      = x dim of padded grid (to repeat first column at end)
   imx1,imy1 = x and y parameters of 1 degree grid
   iyrs      = start year for averaging
```

VARIABLES

```
    xt, yt     = 1 deg lat and lon vectors
    alon, alat = 2 deg lat and lon vectors
    alonp      = 2 deg lon vector with first value repeated at end
    ERSST      = gridded 2 deg ERSST data for month, year
    wk1, wk2   = range-restrained 2 deg clim mean and sdev
    bigclm     = climatology avg on padded 2 deg grid
    bigsd      = climatology std dev on padded 2 deg grid
    mask       = 2 deg mask
    amask      = padded 2 deg mask
    cl1, sd1   = climatology on original 1 deg grid

   2 deg Grids where third dimension is month:
    clm        = SST climatology
    stdev      = std dev of climatology

    Grids where third dimension is data source (ship or buoy):
    dat        = avg in situ SST on 2 deg grid
    ct         = counts of valid in situ SST used to compute avg
    rejclm     = 2 deg grid containing rejected SSTs (based on clim)
    ctrejc     = 2 deg grid containing counts of clim-based rejects
```

```
rejinc     = 2 deg grid containing rejected SSTs (based on ERSST)
ctreji     = 2 deg grid containing counts of ERSST-based rejects

2-D Variables used for quality control of ship and buoy arrays
are explained when they occur:
ipos,iintp,irejc,ireji,irang,iok, izero, iland,isum,itot
aland,rejc,reji,rang
```

SUBPROGRAMS

```
intrpl
maxmin
```

LANGUAGE

```
Fortran
```

1.5. ERSST/hfsst.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

hfsst.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**hfsst.situ.v3b.f**

PURPOSE

To produce an updated high-frequency anomaly analysis using
updated merged SST anomalies for the period from 1985 to
the user-specified year-month.

DESCRIPTION

The high frequency (HF) analysis of the SST anomalies post-1984 is performed
on a 2-deg grid (lon: 0, 2E, ...2W) (lat: 88S,..,0, ...88N). Monthly analysis
is performed on the HF anomaly residuals (SST anomalies minus the LF anomalies).
For the quality screening prior to regression, results from the Optimal
Interpolation (OI) analysis are used. The OI anomalies and counts for a
reference period are used to compute std. dev. and variance. The screening
is meant to exclude poor quality data from the analysis. EOT modes used come from
a separate one-time analysis by T. Smith. For these updates only 1 month of anomalies
is used, because of the dense sampling. For each month, data in a three-month time
window are examined. At every location, if SST from the center month is available
then that is used. If not then SST from the adjacent months is used if available,
averaging if both adjacent months have an observation. Screening regression is used
to eliminate under-sampled modes from the analysis. Modes weights are written out,
with under-sampled modes flagged as missing (-999.9).
Note: The regression analysis is not performed on a grid since correlations cannot
be computed with missing data

AUTHOR

Thomas M. Smith

CREATION DATE

December 2006

COPYRIGHT

PROGRAM HISTORY

```
2010 Mar - Chunying Liu hardcoding.
2009 Sep - V. Banzon added comments as part of documentation effort
2008 Apr - C.Liu adapted from Tom's v3b
    Analysis uses 3 months of anomalies.dat3 dat3 dat3 dat3
    Read in the 2-d mask (land = 0, sea = 1)
    Compute the OI S.D. for checking, multiply it by fs
    sdf(i,j)=fs*sqrt(vv)
    if(sdf(i,j).lt.scm) sdf(i,j)=scm
2006 Jul - Chunying Liu modified the code to run at NCDC
```

INPUTS

```
passed interactively or by script
   iydo ......... user-specified year to do
   mondo ......... user-specified month to do
land mask (land = 0, sea = 1)
   unit 30 ....... $ersst_DAT_DIR/input/static/mask2d.dat
OI anomaly and counts used to compute std dev for quality screening
   unit 21 ....... $ersst_DAT_DIR/input/static/oiv2.ano2.1982.2002
Set of 130 EOTs for 2 deg grid
   unit 21 ....... $ersst_DAT_DIR/input/static/eo6.ev130.ano.dat
updated results of LF analysis
   unit 21 ....... $ersst_DAT_DIR/inter/analysis/lfsst.1978.situ.last.v3b.dat
in situ SST updated anomalies; yyyy updated by program
   unit 21 ....... $ersst_DAT_DIR/inter/situmerg/ssta.merg.situ.mon.v3b.yyyy.dat
```

OUTPUTS

```
updated HF anomaly weights, 1985-latest month
   unit 51 ....... $ersst_DAT_DIR/inter/analysis/hfsst.1985.situ.last.wgt.v3b.dat
```

PARAMETERS

```
 im, jm = x- and y-size of 2 deg grid
 nsm    = number of "sea" pixels in 2-deg grid
 nmo    = total number of EOT modes
 crit   = critical value below which data is not used in regression
 fs     = screening factor (multiplier for std dev for quality test)
 scm    = minimum std dev range accepted
```

VARIABLES

```
Main arrays on the 2 deg grid
 alf    = OI anomaly; then used to sum then average anomalies (std dev computation)
        = updated LF anomalies
 ac     = OI counts
        = used to average squares of anomalies (std dev computation)
 cn
 sdf
```

```
 blf    = updated lf anomalies
 mask   = 2-deg land mask
vectors with nsm elements (number of sea pixels)
 cj     = area (cosine latitude) weights for sea pixels
array containing number of modes by number of sea pixels
 gx     = EOT modes
vector with elements y number of sea pixels by 3 (time window)
 wt     = wieghts from fit
 dat3   =
```

SUBPROGRAMS

```
scrftl
lsfit
ludcmp
lubksb
$ersst_LIB_DIR/maxmin.f
```

LANGUAGE

```
Fortran
```

1.6. ERSST/ice1t2.f [Programs]

[Top] [ERSST] [Programs]

NAME

ice1t2.f

LOCATION

$ersst_SRC_DIR/**ice1t2.f**

PURPOSE

```
To average monthly sea-ice concentration data from the 1-deg grid
to the 2-deg grid.
```

DESCRIPTION

```
Values in the input 1-deg grid (0.5E-359.5E by 89.5S-89.5N) are
averaged to produce the 2-deg grid (0E-358E by 88S-88N).  GSFC ice
concentrations are used 1985-2004, while NCEP ice is used afterwards.
Prior to averaging, two adjustments are made:
1) To compensate for microwave biases (warm pools id'd as open water),
an ice-fraction-dependent adjustment factor is applied.
2) Data are weighted by the relative area of each superobservation.
See Reynolds et al. (2002 section 5b). The adjustment factors were
determined in a one-time analysis of several years of ice data by T. Smith
and codes are not at NCDC.  This strategy was adopted because ice data can
be delayed and therefore, are not complete or available at time of analysis.
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

December 2006

COPYRIGHT

MODIFICATION HISTORY

2010 Mar - Chunying Liu hardcoding.
2009 Jul - Viva Banzon added comments and put into robodoc format
2006 Jul - Chunying Liu modified the code to run at NCDC

INPUTS

```
  iyrend  ..... year to process
  imoend  ..... month to process
adjustment factors
  unit 21 ..... adj.gsfc_ice2.mon.cyc.dat  for GSFC sea ice (1985-2004)
  unit 21 ..... adj.ncep_ice2.mon.cyc.dat  for NCEP sea ice (2005 onward)
1-deg monthly sea ice (GSFC or NCEP depending on yr); cyr updated by program
  unit 21 ..... medmonice.ave-1d.cyr
  mon ......... the month of the year to do
  iy .......... the year to do.
```

OUTPUTS

```
2-deg monthly sea ice; cyr updated by program
  unit 51 ..... sice.avg2.mon.cyr.dat
```

PARAMETERS

```
  im1, jm1 = xsize and ysize of 1 degree grid
  im2, jm2 = xsize and ysize of 2 degree grid
```

VARIABLES

```
  a1    = monthly median sea ice conc on 1 deg grid
  a2    = sea ice conc on 2 deg grid
array of corrections for the microwave-based sea ice values
factors vary by month, hemisphere, and fraction of ice cover
  adjg  = adjustment factors for GSFC data (1985-2004)
  adjn  = adjustment factors for NCEP data (2005 onwards)
```

SUBPROGRAMS

```
adj1d
av1t2a
range1
range
```

LANGUAGE

Fortran

1.7. ERSST/lfsst.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

lfsst.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**lfsst.situ.v3b.f**

PURPOSE

To compute the low-frequency (decadal) component of the in situ-only SST anomalies from 1985 to the user-specified year-month, and update the output file.

DESCRIPTION

The low frequency (LF) analysis of the SST anomalies post-1984 is performed on a 2-deg grid (lon: 0, 2E, ...2W) (lat: 88S,..,0, ...88N). Parameter abmx is the maximum anomaly value allowed to be used in the LF analysis. It is reduced at high latitudes. The LF is performed on area-weighted anomalies by filtering spatially and temporally. The 2-deg monthly super-observations are weighted by both the number of observations in each super-observation and by the noise of the data type. Then the monthly values are spatially smoothed over moving 26-degree areas, for all areas where at least 3% of the area is defined. The areal averages are then averaged annually when at least 2 months are defined. The 15-year median of the annual averages is computed when at least 2 smoothed years are defined. At the end points the median time filter is truncated, so that there are only 8 years in the median at the extreme years. From a previous one-time analysis, the ICOADS LF values are used to fill values before 1985 for the 15-year filtering. Undefined areas are filled with zero anomaly and a spatial binomial filter is applied. Due to the truncated time window for the latest years, recent results will change in forthcoming years as more data are acquired.

AUTHOR

Thomas M. Smith

CREATION DATE

December 2006

COPYRIGHT

PROGRAM HISTORY

```
2010 March - Chunying Liu hardcoding.
2009 Sep: V. Banzon added comments as part of documentation effort
July 2006  - Chunying Liu modified the code to run at NCDC
```

INPUTS

```
passed interactively or by script
   iy ......... user-specified year to do
   mondo ...... user-specified month to do
land mask (land = 0, sea = 1)
   unit 30 ........ mask2d.dat
2-deg ICOADS annual-spatial yearly averages
values from 1970-1984 are used to initially populate the median averaging window
when the window is moved the next year, the merged in situ anomaly from 1985 is used
and so on
   unit 31 ........ saan.situ.1854.2006.dat
2-deg monthly merged ship-buoy updated anomalies; program substitutes in ciyear
current analysis begins in 1985
   unit 21 ........ $ersst_DAT_DIR/inter/situmerg/ssta.merg.situ.mon.v3b.cyr.dat
```

OUTPUTS

```
updated LF anomaly from 1978, with the latter part using a half-length truncated time
series for the end point.
   unit 61 ........ $ersst_DAT_DIR/inter/analysis/lfsst.1978.situ.last.v3b.dat
an optional output to print out intermediate array before median filtering
   unit 63 ........ $ersst_DAT_DIR/inter/analysis/saan.upd.1985.2006.v3b.dat
```

PARAMETERS

```
   im, jm = x- and y-size of 2 deg grid
   abmx   = maximum anomaly accepted by LF analysis
```

VARIABLES

```
 Arrays that are on the 2 deg grid
   a2     = represents different quantities in different parts of program
          = first contains the COADS annual average read for 1 year
          = monthly in situ avg merged SST anomaly
          = returned anomaly array from each subroutine that performs
              +annual averaging after spatial averaging of each monthly
              +Spatial binomial filtering of annual,then Polar damping
              +Median filtering within 15 year window  (LF output)
  co      = contains counts for COADS annual averages
  cn      = holds the monthly in situ avg merged SST anomaly counts
  mask    = 2-deg land mask
 Monthly time series of 2-deg gridded data
  sstp    = holds the 12 months of in situ merged anomalies
  ndp     = integerized monthly counts associated with sstp

 Annual time series of 2-deg gridded data
  sm      = different quantities in program
          = COADS annual averages from 1970-1984
          = modified to left shift time series and hold
            the 15 years data used for median filtering
 15 years data (or less for recent years) at one grid point
  wk      = holds valid data to passed on to median subroutine
```

SUBPROGRAMS

```
avgsa
spsmb2
median
damphl
```

LANGUAGE

Fortran

1.8. ERSST/monice1d-med-oper.f [Programs]

NAME

monice1d-med-oper.f

LOCATION

$ersst_SRC_DIR/**monice1d-med-oper.f**

PURPOSE

To generate monthly 1 deg ice concentrations from 1/4 deg daily median ice.

DESCRIPTION

Daily median ice concentrations on a 1/4 deg grid from OI processing
are averaged to produce the 1-deg monthly fields
The GSFC sea ice dataset is used from 1985 to 2004. Then the program
automatically switches from GSFC to NCEP ice in 2005

AUTHOR

Thomas M Smith

CREATION DATE

unknown

COPYRIGHT

MODIFICATION HISTORY

03/03/2010 - C. Liu hardcoding
08/28/2009 - V. Banzon Added comments in robodoc-compatible format
07/04/2008 - C. Liu commented out error message for limited ice data
July 2006 - Chunying Liu modified the code to run at NCDC

INPUTS

```
 iyrs,imos,idas ..... year month day to begin processing
 iyre,imoe,idae ..... year month day to end processing
Note that the series of ?  are placeholders that the program loop fills in with
 year (4 digits), month (01-12), and day (01-31), as needed
 unit 1 .....before 2005: $ersst_DAT_DIR/input/ice/gsfc/cice.YYYYMMDD
             soft linked to /raid2/sstday/????/obs/gsfc-med/cice.????????
 unit 2 .....after 2005: $ersst_DAT_DIR/input/ice/ncep/icecon.YYYYMMDD
             soft linked to /raid2/sstday/????/grads/ice-med/icecon.????????
```

OUTPUTS

```
Note that the yyyy are placeholders that are filled in with year to be processed.
Thus the output filename changes each year processed, but the file contains all 12 months
of output
 unit 61 ....... $ersst_DAT_DIR/inter/ice1d/medmonice.ave-1d.yyyy
```

PARAMETERS

```
imx, imy  = x and ysize of quarter deg grid
imx1,imy1 = x and ysize of 1 deg grid
```

VARIABLES

```
icemed    = 2-element vector holding filepath/name for GSFC and NCEP input
ivs, ive  = fixed positions in input filename string to begin/end update of year month day
            (2-element vector since values different for GSFC or NCEP)
cidat     = daily 1/4 deg sea ice data
cimon     = contains monthly sum of daily data, then once out of month loop, the average
ctmon     = counts for monthly sums
```

SUBPROGRAMS

```
maxmin
```

LANGUAGE

```
Fortran 77 modified for 90 compatibility
```

1.9. ERSST/sst2d.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

sst2d.situ.v3b.f

LOCATION

$ersst_SRC_DIR/**sst2d.situ.v3b.f**

PURPOSE

```
To combine the updated low- and high-frequency SST analysis
and add back on the climatology (taking into account updated sea ice)
to reform the reconstructed SST to the most recent month.
```

```
DESCIRPTION
 The LF analysis and HF mode weights are read in.  Missing values in
 the HF mode weights are first filled using the lag-1 autocorrelation
 to filter out the missing values using the surrounding defined values.
 If no values are defined for a long time the missing weight values are
 damped to zero.  The HF anomaly is then defined from the weighted sum
 of the EOT modes.  The LF anomaly is added onto the HF anomaly.
 The climatology (centered on the 1971-2000 base period) used to compute
 the original SST anomaly is added back on. Both the full and anomaly
 SST are written out after a linear adjustment to take into account
   ci = ice concentrations
   af = pivot point where ice begins affecting temp
   tf = freezing temperature
 As described in Smith and reynolds (2004), when:
   ci=<af, then no SST adjustment
   ci>=0.9, then SST'=tf
   af<ci<0.9, then linear adjustment: SST' = SST + (ci-af)*(tf-SST)/(0.9-af).
```

AUTHOR

```
Programmer: Thomas M Smith
```

CREATION DATE

```
December 2007
```

COPYRIGHT

PROGRAM HISTORY

```
Mar 2010 - C. Liu removed hardcoding
Sep 2009 - V. Banzon added comments as part of documentation effort
Jan 2008 - C. Liu added ntm for operational run to avoid processing other years
Jul 2006 - Chunying Liu modified the code to run at NCDC
```

INPUTS

```
passed interactively or by script
  mondo, iydo ... the month and year to do
  unit 20 .... $ersst_DAT_DIR/input/static/clim.even.1971.2000.dat
               (2-deg monthly climatology: even gridpoints from T. Smith)
  unit 20 .... $ersst_DAT_DIR/inter/analysis/lfsst.1978.situ.last.v3b.dat
               (2-deg LF analysis SST anomalies from 1985 center)
  unit 21 .... $ersst_DAT_DIR/input/static/eot6.ev130.ano.dat
               (EOTs modes for HF analysis from T. Smith)
  unit 22 .... $ersst_DAT_DIR/inter/analysis/hfsst.1985.situ.last.wgt.v3b.dat
               (2-deg HF analysis weights from 1985)
  unit 23 .... $ersst_DAT_DIR/input/static/ice_mask2d.dat
               (2-deg ice mask to exclude caspian Sea and Great Lakes from T.Smith)
program replaces cyr
  unit 22 .... $ersst_DAT_DIR/inter/ice2d/sice.avg2.mon.cyr.dat
```

OUTPUTS

```
2 deg grids (updated 1985-latest month)
  unit 51 ......... $ersst_DAT_DIR/output/sst2d/sst2d.situ.YYYYMM.v3b.dat
                        (analysis SST)
  unit 52 ......... $ersst DAT DIR/output/anom2d/sst2d.ano.situ.YYYYMM.v3b.dat
```

```
                              (SST anomaly)
```

PARAMETERS

```
      im, jm = x,y size of 2 deg grid
      iy1    = year to begin updating
      ntm2   = number of months for analysis period
      iy2    = end year to estimate ntm2
      nmo    = numer of EOT modes
      af     = minimum ice conc. when ice begins affecting temp
      afd    = difference bet 0.9 and actual ice concentration
```

VARIABLES

```
      ntm    = total number of months to reconstruct from 1985

    2-D arrays (2 deg grids):
      a2     = in situ avg SST
             = reused to hold in situ SSTs (weighted)
             = reused to hold SST anomaly that is written to output
      t2     = in situ data counts
             = reused to hold full reconstructed SST
             = and then ice-adjusted SST that is written to output
      ci     = monthly sea ice for each year
      mask2d = ice mask
      mask   = land/sea mask (land=0, sea=1)
      alf    = LF SST anomalies

    3-D arrays (2 deg grids, by 12 months):
      clim   = climatology for 1971-2000 to be added back

    3-D arrays (2 deg grids, by 130 modes):
      gx     = eot modes

    2-D arrays (130 modes by number of months analyzed)
      wt     = HF weights per mode per month
```

SUBPROGRAMS

```
     intts
     $ersst_LIB_DIR/maxmin.f
```

LANGUAGE

```
    Fortran
```

1.10. ERSST/ssta.merg.situ.v3b.f [Programs]

[Top] [ERSST] [Programs]

NAME

```
    ssta.merg.situ.v3b.0.f
```

LOCATION

```
    $ersst_SRC_DIR/ssta.merg.situ.v3b.f
```

PURPOSE

Computes 2-deg monthly SST anomalies from 2-deg gridded monthly averages for ship and buoy,
taking into account the differences in reliability and no. observations between the datasets

DESCRIPTION

Reads the gridded (2 deg) COADS ship and buoy average SSTs and counts.
Computes anomalies with respect to 30-yr climatology (1971-2000 on an even grid),
then merges the ship and bias-adjusted buoy data (Reynolds and Smith 1994, J. Clim).
The output 2-deg monthly super observations are weighted by both the
number of observations in each super observation and by the noise
of the data type.

AUTHOR

Thomas M Smith

CREATION DATE

12/01/2006

COPYRIGHT

MODIFICATION HISTORY

08/01/2009 - V. Banzon added comments

INPUTS

2-deg monthly ship, buoy with cyr replaced by program
   unit 21 .... $ersst_DAT_DIR/inter/situ/ship.avg2.mon.cyr.dat
   unit 22 .... $ersst_DAT_DIR/inter/situ/buoy.avg2.mon.cyr.dat

2-deg climatology (even gridpoints,1971-2000)
   unit 21 .... $ersst_DAT_DIR/input/static/clim.even.1971.2000.dat
   mondo, iyrend ... the month and year to do

OUTPUTS

One yearly output file, monthly avg and counts written sequentially.
2-deg gridded bias-adjusted SST anomalies from ship and buoys
   unit 61 .... $ersst_DAT_DIR/inter/situmerg/ssta.merg.situ.mon.v3b.cyr.dat

PARAMETERS

   im, jm = x,y size of 2 deg grid
   abmx   = largest SST anomaly acceptable

VARIABLES

```
   su1    = sum of avg weighted SSTs
   su2    = counts of avg weighted SSTs

2-D arrays (2 deg grids):
   a2     = in situ (ship or buoy) avg SST
            reused to hold merged SSTs (weighted)
   co     = in situ data counts
   c2     = output weighted counts of merged data

3-D arrays (2 deg grids, and data type):
   sa     = SST from buoy or ship
   sc     = counts of buoy ship data
```

SUBPROGRAMS

```
range
maxmin
```

LANGUAGE

```
Fortran
```

1.11. ERSST/err.norm.map2.upd.situ.v3b.f/detrnd [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
detrnd
```

LOCATION

```
inside $ersst_SRC_DIR/err.norm.map2.upd.situ.v3b.f
```

PURPOSE

```
To detrend the monthly data.
```

DESCRIPTION

```
The monthly reconstructed anomalies are detrended using a
multi-year averaging window (specified in Main program).
The temporal correlation is computed using a least squares
fit using only data within the time window.
The detrended anomalies are returned.
```

AUTHOR

```
Thomas M. Smith
```

CREATION DATE

```
Feb 2007
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

PROGRAM HISTORY

```
2009 Oct: V. Banzon added comments as part of documentation effort
```

INPUTS

```
      at      = reconstructed SST anomalies on 2 deg grid
      mask    = sea mask (land=0, sea=1)
      ntm     = averaging window size in months
```

RETURNED VALUE

```
      at      = detrended anomalies
```

PARAMETERS

```
      im,jm   = xsize, ysize of 2 deg grid
```

VARIABLES

```
      x1      = sum of x
      x2      = sum of squared x
      y1      = sum of y (anomalies)
      rn      = number of valid SST data (real)
      vx      = variance of x
      cx      = covariance
      sl      = slope
      b0      = intercept
      fl      = linear fit
```

LANGUAGE

```
Fortran
```

1.12. ERSST/err.norm.map2.upd.situ.v3b.f/getsda [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
getsda
```

LOCATION

```
inside $ersst_SRC_DIR/err.norm.map2.upd.situ.v3b.f
```

PURPOSE

To compute the all-month s.d. from the detrended data.

DESCRIPTION

This is a straightforward standard deviation calculation. The
variance is computed from the sum squared and the sum of squares.
The square root of the variance is the standard deviation.

AUTHOR

Thomas M. Smith

CREATION DATE

Feb 2007

COPYRIGHT

PROGRAM HISTORY

2009 Oct: V. Banzon added comments as part of documentation effort

INPUTS

```
at      = in situ SST anomalies on 2 deg grid
mask    = sea mask (land=0, sea=1)
```

OUTPUTS

```
sd      = standard deviation
```

PARAMETERS

```
im,jm   = xsize, ysize of 2 deg grid
vvmin   = floor limit for variance
```

VARIABLES

```
s1      = sum
s2      = sum of squarese
kn      = number of valid data (interger)
rn      = number of valid data (real)
```

LANGUAGE

Fortran

1.13. ERSST/err.norm.map2.upd.situ.v3b.f/int5t2 [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

int5t2

LOCATION

inside $ersst_SRC_DIR/err.norm.map2.upd.situ.v3b.f

PURPOSE

To interpolate from a 5-deg grid to a 2-deg grid.

DESCRIPTION

The 5 deg data is regridded to 2 deg by first creating a 1 deg grid
consisting of each 5 deg value repeated 5 times on an axis. The
1 deg values are then averaged every 2 deg.
The 5-d grid: 2.5E-357.5E, 87.5S-87.5N.
The 2-d grid: 0E-358E,   88S-88N.
Use the intermediate 1-d grid: 0.5E-359.5E, 89.5S-89.5N.

AUTHOR

Thomas M. Smith

CREATION DATE

Feb 2007 (presumed)

COPYRIGHT

PROGRAM HISTORY

2009 Oct: V. Banzon added comments as part of documentation effort

INPUTS

a5 = data on 5 deg grid

OUTPUTS

```
a2 = data on 2 deg grid
```

PARAMETERS

```
im5,jm5 = xsize, ysize of 5 deg grid
im2,jm2 = xsize, ysize of 2 deg grid
im1,jm1 = xsize, ysize of 1 deg grid
```

VARIABLES

```
a1       = data on 1 deg grid
jls,jle  = start and end y-index of 1 deg boxes to match single 5 deg box
ils,ile  = start and end x-index of 1 deg boxes to match single 5 deg box
jls,jle, ils, ile are used again to for 1 deg boxes to average to 2 deg
```

LANGUAGE

```
Fortran
```

1.14. ERSST/err.norm.map2.upd.situ.v3b.f/lferr [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
lferr
```

LOCATION

```
inside $ersst_SRC_DIR/err.norm.map2.upd.situ.v3b.f
```

PURPOSE

```
To compute the LF sampling error.
```

DESCRIPTION

```
The LF sampling error is computed based on the availability of in situ data.
A static file containing the full LF variance from the GFDL CGCM
anomalies(1861-2000) is required.
First the adequacy of the monthly spatial sampling within the
26 deg box about the center is checked (<3%  are considered undersampled).
This monthly data count is then applied to check the annual sampling.
For each gridpoint, the full LF error from the models is used but
it is adjusted using a factor df.
  when months <3, df is forced to be 0.9
  when 2<month<12, df exponentially approaches zero
  with 12 months sampling, df is force to 0.
Thus the error is forced to zero when 12 months of data are available.
Theoretically, df =1 when there is no data, but instead this boxes
are already flagged with a -999.99.
```

AUTHOR

```
Thomas M. Smith
```

CREATION DATE

```
Feb 2007
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

PROGRAM HISTORY

```
2009 Oct: V. Banzon added comments as part of documentation effort
```

INPUTS

```
all on a 2 deg grid:
 sstp  = in situ SST anomalies
 mask  = sea mask (land=0, sea=1)
 vlf   = regridded "reference" low frequency variance from detrended OI
```

OUTPUTS

```
 elf   = low frequency analysis error
```

PARAMETERS

```
 im,jm = xsize, ysize of 2 deg grid
```

VARIABLES

```
 cj    = area weights for 2 deg grid
 sstp  = first contains the in situ SST anomalies
       = then contains the sampling adequacy score from elf
         (1.0=OK, -999.9=inadequate)
 vlf   = full low frequency variance from models
 elf   = first contains the sampling adequacy score
       = on output, contains the low frequency analysis error
```

LANGUAGE

```
Fortran
```

1.15. ERSST/ersst_netcdf.situ.v3b.f/put_cdf_ersst_situ_v3b.f [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

put_cdf_ersst_situ_v3b.f

LOCATION

/ERSST/src/put_cdf_ersst_situ_v3b.f

PURPOSE

To write out data (daily SSTs) in NetCDF format

DESCRIPTION

Monthly data fields (SST, anomalies, and error)are passed from the main program
and written out in NetCDF format to a file with name also passed from Main.
Fortran NetCDF functions are used to format the output. Scaling and other
attributes are hardcoded in.

AUTHOR

Chunying Liu

CREATION DATE

Unknown

COPYRIGHT

MODIFICATION HISTORY

2009 Sept - Viva Banzon added comments and put into robodoc format

INPUTS

```
 fname   = path and filename of netCDF output
Integerized data*100 in 2-Degree grids (dimensions are lon_len, lat_len):
 sst2d   = reconstructed SST on 2 deg grid
 anom2d  = ERSST anomaly on 2 deg grid
 err2d   = ERSST error on 2 deg grid
Dates in various formats:
 cnetdate = data date expressed as YYYY-MM-DD
 sdate    = reference date in YYYYMMDD format
 refdate  = reference date in YYYY-MM-DD format
 iday     = data date expressed as julian day number from reference day
```

OUTPUT

writes out data in netCDF format to fname (from Main)

PARAMETERS

```
    lat_len    = 89 (2 deg grid xsize; no of latitude cells)
    lon_len    = 180 (2 deg grid ysize; no of longitude cells)c* (zlev_len = 1)
    time_len   = 1 (time records in entire time series)
    time_nr    = 1 (number of time records in data)
    fillval    =-999 (fill for missing/bad values)
```

VARIABLES

```
    timeunit = string stating days from reference date to put in netCDF attributes

  Variable IDs as integers from nf_def_var :  sstID, latID, lonID, zlevID, timeID, errID,
anomID
  Variable Dimension ID's from nf_def_att : latDimID, lonDimID, zlevDimID, timeDimID

  Scaling parameters for data to write in attributes:
   min     = minimum value for parameter range        (changes by parameter)
   max     = maximum value for parameter range        (changes by parameter)
   offset  = bias to add
   scale   = slope to multiply data with

  Control variables:
   iret    = value returned by netCDF functions

  Data coordinates:
   lat(lat_len)   = lat gridpoints for 2 deg grid
   lon(lon_len    = lon gridpoints 2 deg grid
   zlev(zlev_len) = height level data
   time(time_nr)  = time expressed in days from reference date

  4-element vectors containing 4-D array dimensions
   sstDimIDs  = SST field dimensions
   errDimIDs  = error field dimensions
   anomDimIDs = anomaly field dimensions

  4-D arrays (lon_len, lat_len,zlev_len,time_nr):
   sst   = sst data in 4-D array expected by netCDF
   anom  = anomaly data in 4-D array expected by netCDF
   err   = error data in 4-D array expected by netCDF
```

SUBPROGRAMS

```
    /lib/check_err90.f
```

LIBRARY

```
    /netcdf/netcdf-3.6.0-p1

  FUNCTIONS
    nf90_create    creates the netCDF file
    nf90_put_att   defines attributes (global and parameter)in netCDF file
    nf90_def_dim   defines variable dimensions  in netCDF file
    nf90_def_var   defines variables in netCDF file
    nf90_enddef    ends define mode in netCDF file
    nf90_put_var   writes data array in netCDF file

  MODULES
    netcdf
    typesizes
```

LANGUAGE

```
    Fortran
```

1.16. ERSST/gtsqc.situ.v3b.0.f/intrpl [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
intrpl
```

LOCATION

```
$ersst_SRC_DIR/gtsqc.situ.v3b.0.f
```

PURPOSE

```
 To interpolate the value taking into account position within the grid cell
```

DESCRIPTION

```
In order to average multiple observations at differnt locations within the
grid cell, the values have to be adjusted taking into account the their
relative position in the cell.  This subroutine uses the known corner values
of the cell weighted by area (computed using delta degrees,not distance), to
interpolate the value of a point within a grid cell
```

AUTHOR

```
Richard W. Reynolds
```

CREATION DATE

```
Unknown -pre-2009
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

MODIFICATION HISTORY

```
2009 Sept -Viva Banzon added comments and put into robodoc format
```

INPUTS

```
cn  = gridded reference SST
imc = 2 deg x-grid size (nlons) padded, i.e. with start lon repeated at end
ic  = 2 deg x-grid size (nlons)
jc  = 2 deg y-grid size (nlats)
cx  = lons array padded
cy  = lats array
fx  = point lon
fy  = point lat
```

RETURNED VALUE

```
fn   = point SST (interpolated)
ierr = error message
```

VARIABLES

```
cn = gridded reference SST
cx = lons array padded
cy = lats array
```

LANGUAGE

```
Fortran
```

1.17. ERSST/gtsqc.situ.v3b.f/maxmin [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
maxmin
```

LOCATION

```
$ersst_SRC_DIR/gtsqc.situ.v3b.f
```

PURPOSE

```
To compute maximum, minium and average of input field fld and print to screen
```

DESCRIPTION

```
The minimum value holder is first set to a very large number and
the maximum value holder is first set to a very small number.  Then
the current value replaces the value in the min holders if the current
value is smaller.  The maximum is determined the same way. The data is
summed and counted within the loop, then the average is computed upon
exiting the loop. The max, min and average are displayed on the screen.
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

```
Unknown
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
```

```
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

MODIFICATION HISTORY

```
2009 Sep - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
fld     = data to be examined for statistics
im,jm   = x and y size of array
undef   = code for missing data
name    = name for input data field
```

RETURNED VALUE

```
none
```

PARAMETERS

```
im1, jm1 = xsize and ysize of 1 degree grid
im2, jm2 = xsize and ysize of 2 degree grid
```

VARIABLES

```
fldmin  = minimum of field
fldmax  = maximum of field
fld     = data field
ave     = average of field
inum    = number of valid data in field
```

LANGUAGE

```
Fortran
```

1.18. ERSST/hfsst.situ.v3b.f/lsfit [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
lsfit
```

LOCATION

```
inside $ersst_SRC_DIR/hfsst.situ.v3b.f
```

PURPOSE

```
To get the least-squared weights for observed data fitted to
the given number of spatial EOT patterns.
```

DESCRIPTION

```
The pre-screened data is used as input for the regression of data
to the EOT modes.  The system of linear regression equations is
is treated as a matrix relation: A w = b, solved by using known
methods, LU decomposition and backward substitution, by calls to
the subroutines ludcmp and lubksb.
```

AUTHOR

```
Thomas M. Smith
```

CREATION DATE

```
December 2006
```

COPYRIGHT

MODIFICATION HISTORY

```
2009 Sep - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
cj     = area weights for 2 deg grid
gx     = EOT modes (used to form matrix A)
tsinc  = data (goes into vector b)
nspace = 11566 (maximum number of sea values allowed)
lspace = 11074 (number of ocean "pixels"; passed from scrfit1)
```

RETURNED VALUE

```
wt     = weight for EOT modes (unknown vector w)
```

PARAMETERS

```
maxx   = maximum number of EOT modes allowed
```

VARIABLES

```
a      = elements of matrix A (weighted cross product of input)
b      = solution (fitted weights for each EOT mode)
indx   =
```

SUBPROGRAMS

```
ludcmp
lubksb
```

LANGUAGE

```
Fortran
```

1.19. ERSST/hfsst.situ.v3b.f/lubksp [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
lubksp
```

LOCATION

```
inside $ersst_SRC_DIR/hfsst.situ.v3b.f
```

PURPOSE

```
This solves the system Ax=b, where here A is the LU decomposition of
the matrix A that was passed into ludcmp()
```

DESCRIPTION

```
This solves the system Ax=b, where here A is the LU decomposition of
the original matrix A that was passed into ludcmp()
COMMENTS from Numerical Recipes:
Implements forward and backward substitution
Solves the set on n linear equations A . X = B
```

AUTHOR

```
Thomas M. Smith
```

CREATION DATE

```
December 2006
```

COPYRIGHT

MODIFICATION HISTORY

```
2009 Sep - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
        a       = the LU decomposition of A
        indx    = the permutation vector
        b(1:n)  = the right-hand side of vector B
        n       = number of EOT modes
        np      = maximum number of EOT modes allowed
        indx    = vector that records the permutation effected by partial pivoting
                        from subroutine ludcmp
```

RETURNED VALUE

```
        b       = the solution vector X
```

PARAMETERS

```
        None
```

VARIABLES

```
        ll      = index of current b
```

LANGUAGE

```
    Fortran
```

1.20. ERSST/hfsst.situ.v3b.f/ludcmp [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
    ludcmp
```

LOCATION

```
    inside $ersst_SRC_DIR/hfsst.situ.v3b.f
```

PURPOSE

```
    This does an LU decomposition on the matrix A, size n x n.  The
    output is returned in A.  This is Crout's method with partial
    pivoting, described in Numerical Recepies, sec 2.3.
```

DESCRIPTION

```
    The LU decomposition with partial pivoting has the form:
    A = LUP where L has only zeroes above the diagonal (lower triangular)
                  U has only zeroes below the diagonal (upper triangular)
                  P is a permutation matrix (i.e.,
                    contains 1s and 0s with only one 1 per column)
    However, in this case, the solution is done "in place"
    Thus, A will also contain the solution (see below)

    Comments from Numerical Recipes:
    Given a matrix a(1:n, 1:n) with physical dimension np by np, this routine
    replaces a by the LU decomposition of a row-wise premutation of itself.
```

```
    The solution U and L values can be placed in the input matrix because those
    values will not be used anymore once a solution is determined for that element
    and the replacement element is needed for the solution of the next element.
```

AUTHOR

```
    Thomas M. Smith
```

CREATION DATE

```
    December 2006
```

COPYRIGHT

MODIFICATION HISTORY

```
    2009 Sep -Viva Banzon added comments and put into robodoc format
```

INPUTS

```
        a       = input matrix
        n       = size of matrix side
```

RETURNED VALUE

```
        a       = arrangment: upper triangular matrix values up to the diagonal,
                  and the lower triangular matrix values below the diagonal)
        indx    = vector that records the permutation effected by partial pivoting
        d       = +/-1 depending on whether # of row interchanges was even or odd
```

PARAMETERS

```
        nmax    = 200 is Largest expected n
        tiny    = 1.0e-20) is a very small number
```

VARIABLES

```
        aamax   = minimum value for row
        vv      = scaling for row
```

SUBPROGRAMS

```
    none
```

LANGUAGE

```
    Fortran
```

1.21. ERSST/hfsst.situ.v3b.f/scrftl [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
scrft1
```

LOCATION

```
inside $ersst_SRC_DIR/hfsst.situ.v3b.f
```

PURPOSE

```
To get the best fit using forward stepwise screening regression.
```

DESCRIPTION

```
For each mode, the data is screened to determine if the mode is
adaquately supported by spatial sampling.  This is done by
computing what fraction of mode's variance is accounted for
(Smith and Reynolds 2003 Appendix B).  First, modes with <3 data
values are excluded. Only EOT modes supported with fraction
above a critical value (0.2) are used for the fit. The valid data
is passed to subroutine lsfit that performs the regression, and
returns the computed weights for each mode.  The full fitted value
is then computed, and returned to the main program.
```

AUTHOR

```
Thomas M. Smith
```

CREATION DATE

```
December 2006
```

COPYRIGHT

MODIFICATION HISTORY

```
2009 Sep -Viva Banzon added comments and put into robodoc format
```

INPUTS

```
nspace......Number of spatial points
max.........Maximum number of modes to use
crit........critical fraction var of mode supported
dat().......1-D Array of data (anomalies)
```

```
cj().......1-D array relative area weights
 gx(,).......2-D Array of spatial modes
```

RETURNED VALUE

```
 ft().......On output this has the best fit
wt().......weights for each mode (-999.9 if not used).
nfit.......Number of modes used in the final fit.
To reconstruct later sum over max: gx(n,m)*(wt(m)).
```

PARAMETERS

```
 nsmax...maximum possible number of spatial points (> 11074 used)
maxx....maximum possible number of modes (> 130 used)
```

VARIABLES

```
e2c....area weighted square of EOT mode
sum1...sum of weighted EOT modes squared for all sea gridpoints
sum2...sum of weighted EOT modes squared for gridpoint with data
kn.....number of data available for EOT mode
wf.....weights of fit for each EOT returned by lsfit
gxf....2-D array of spatial modes  passed on to lsfit
```

SUBPROGRAMS

```
lsfit
```

LANGUAGE

```
Fortran
```

1.22. ERSST/ice1t2.f/adj1d [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
adj1d
```

LOCATION

```
inside $ersst_SRC_DIR/ice1t2.f
```

PURPOSE

```
To adjust the ice concentrations on a 1-deg grid using the a set of factors
passed from the main program.
```

DESCRIPTION

```
Adjustments are for each month, hemisphere: adj(kf,kh,mon), where kh=1 is SH,
kh=2 is NH, kf=1,11 for fractions = 0 to 1 by 0.1. No adjustmnet is made
for low latitudes (30S-30N). These factors were computed by examining biases
```

```
in microwave-based sea ice estimates due to the presence of shallow pools.
Thus, the correction is dependent on geography (hemisphere), ice fraction (ice
pools more likely to form when not completely frozen or melted), and season.
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

```
December 2006 (presumed)
```

COPYRIGHT

MODIFICATION HISTORY

```
2009 Jul - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
 a1  = unadjusted monthly ice on 1 deg grid
mon = month
adj = adjustment factors
```

RETURNED VALUE

```
 a1  = adjusted ice data on 1 deg grid
```

PARAMETERS

```
 im1, jm1 = xsize and ysize of 1 degree grid
```

VARIABLES

```
 kf  = index for adjustment factor based on ice conc
```

LANGUAGE

```
Fortran
```

1.23. ERSST/ice1t2.f/av1t2a [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

av1t2a

LOCATION

inside $ersst_SRC_DIR/ice1t2.f

PURPOSE

To average from the 1-deg grid (0.5E-359.5E by 89.5S-89.5N centers)
to the 2-deg grid (0E-358E by 88S-88N centers).

DESCRIPTION

For each 2-deg gridpoint, the 1-deg grid indices of the values to be
averaged are first determined. Then the 1-deg area weights are applied
to compute and 2-deg area average.

AUTHOR

Thomas M Smith

CREATION DATE

December 2006 (presumed)

COPYRIGHT

MODIFICATION HISTORY

2009 Jul - Viva Banzon added comments and put into robodoc format

INPUTS

a1 = adjusted monthly ice conc on 1 deg grid

RETURNED VALUE

a2 = ice conc on 2 deg grid

PARAMETERS

im1, jm1 = xsize and ysize of 1 degree grid
im2, jm2 = xsize and ysize of 2 degree grid
cj   = latitudinally varying area weights

VARIABLES

```
 s1    = sum of ice conc weighted by area
 s2    = sum of area weights
 is,ie = x-indices of 1-deg grid of start and end for computing 2 deg avg
 js,je = y-indices of 1-deg grid of start and end for computing 2 deg avg
```

LANGUAGE

```
Fortran
```

1.24. ERSST/ice1t2.f/range [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
range
```

LOCATION

```
inside $ersst_SRC_DIR/ice1t2.f
```

PURPOSE

```
To compute the array range for 2 deg grid.
```

DESCRIPTION

```
Minimum variable is initialized as a very large number and maximum
variable is set to a very small number.  Each value is compared to the min or
max, and replaces the value in the variable if it is smaller or larger,
respectively.
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

```
December 2006 (presumed)
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

MODIFICATION HISTORY

```
    2009 Jul - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
     a2  = array on 2 deg grid
```

RETURNED VALUE

```
     amn = minimum value of array
     amx = maximum value of array
```

PARAMETERS

```
     im, jm = xsize and ysize of 2 degree grid
```

VARIABLES

```
     a2  = array on 2 deg grid
     i,j = indices for 2-deg grid
```

LANGUAGE

```
    Fortran
```

1.25. ERSST/ice1t2.f/range1 [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
    range1
```

LOCATION

```
    inside $ersst_SRC_DIR/ice1t2.f
```

PURPOSE

```
    To compute the array rangefor 1 deg grid.
```

DESCRIPTION

```
    Minimum variable is initialized as a very large number and maximum
    variable is set to a very small number.  Each value is compared to the min or
    max, and replaces the value in the variable if it is smaller or larger,
    respectively.
```

AUTHOR

```
    Thomas M Smith
```

CREATION DATE

```
December 2006 (presumed)
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

MODIFICATION HISTORY

```
2009 Jul - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
 a2  = array on 1 deg grid
```

RETURNED VALUE

```
 amn = minimum value of array
 amx = maximum value of array
```

PARAMETERS

```
 im, jm = xsize and ysize of 1 degree grid
```

VARIABLES

```
 a2  = array on 1 deg grid
 i,j = indices for 1-deg grid
```

LANGUAGE

```
Fortran
```

1.26. ERSST/lfsst.situ.v3b.f/avgsa [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
avgsa
```

LOCATION

```
inside $ERSST_SRC_DIR/lfsst.situ.v3b.f
```

PURPOSE

To compute an annual spatial average field from 12 months of data on a 2 deg grid.

DESCRIPTION

The averaging on a 2 deg grid is performed in two steps. 1) From the monthly values, the moving
average (window =26 deg width) of area-weighted input values is computed. The corresponding
areal coverage is determined averages computed with less than 3% spatial coverage are screened out.
2) The annual average per grid cell is then computed if there is at least 2 months of data.

AUTHOR

Thomas M. Smith

CREATION DATE

December 2006 (presumed)

COPYRIGHT

PROGRAM HISTORY

2009 Sep: V. Banzon added comments as part of documentation effort

INPUTS

```
    sstp    = monthly data on 2 deg grid to average
    ndp     = monthly counts of valid data on 2 deg grid
    mask    = 2 deg mask land/ice is 0; water is 1

RETURNED  VALUE
    sa      = 2 deg grid with spatially smoothed annual averages
```

PARAMETERS

```
    im,jum  = xsize, ysize of 2 deg grid
    cj              =areal weights that vary with latitude
```

VARIABLES

```
    js,je   = indices for start and end of y-average spatial window
    ww      = weighted sea pixel (0 for land pixel)
    sus     = sum of weights for ocean grid cells with data present
    sut     = sum of weights for all ocean grid cells
    rn      = relative number of data (max=10)
    su1     = sum of area and count weighted data
```

```
        su2     = sum of area- relative count weights
```

LANGUAGE

```
    Fortran
```

1.27. ERSST/lfsst.situ.v3b.f/damphl [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
    damphl
```

LOCATION

```
    inside $ersst_SRC_DIR/lfsst.situ.v3b.f
```

PURPOSE

```
    To damp high-lat anoms to go to 0 at the poles.
```

DESCRIPTION

```
    The data is forced to go to 0 at the poles, but this is done differently for S and N.
    For the Antarctic, values at latitudes below 50 S decay to zero and are explicitly set to
  0 below 80S.
    For the Arctic, values at latitudes above 60N decay to zero, and effectivey reach 0 at 80
  N.
```

AUTHOR

```
    Thomas M. Smith
```

CREATION DATE

```
    December 2006 (presumed)
```

COPYRIGHT

PROGRAM HISTORY

```
    2009 Sep - V. Banzon added comments as part of documentation effort
```

INPUTS

```
a2      = data on 2 deg grid to be damped
mask    = sea mask (land=0, sea=1)
```

OUTPUTS

```
a2      = damped data on 2 deg grid
```

PARAMETERS

```
im,jm   = xsize, ysize of 2 deg grid
```

VARIABLES

```
lat     = latitude
fd      = damping factor
```

LANGUAGE

```
Fortran
```

1.28. ERSST/lfsst.situ.v3b.f/median [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
median
```

LOCATION

```
inside $ersst_SRC_DIR/lfsst.situ.v3b.f
```

DESCRIPTION

```
The input array contains 15 elements (annual means) for a gridpoint. The number of values
are counted and if less than 2, returns a missing value.  Data are rearranged from largest
to smallest.  If the number of valid data is odd, then the center value is selected.  If
the number
of valid data is even, the two center values are averaged.
```

AUTHOR

```
Thomas M. Smith
```

CREATION DATE

```
December 2006 (presumed)
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

PROGRAM HISTORY

```
2009 Sep - V. Banzon added comments as part of documentation effort
```

INPUTS

```
      ts      = 15 years data for single point
      ntm     = number of years with data
```

OUTPUTS

```
      sm      = median
```

PARAMETERS

```
 None
```

VARIABLES

```
      ktm     = counter for valid data
      wk      = holds data, before and during reordering by magnitude
      tmp     = temporarily holds relatively smaller value during re-ordering
      sm      = median value
```

LANGUAGE

```
Fortran
```

1.29. ERSST/lfsst.situ.v3b.f/spsmb2 [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
spsmb2
```

LOCATION

```
inside $ersst_SRC_DIR/lfsst.situ.v3b.f
```

PURPOSE

```
To spatially smooth 2 deg gridded data and slightly fill using a binomial filter.
```

DESCRIPTION

```
  Within a 3 element window, binomial weights are applied to data to compute a smoothed
average,
  first along the x axis, then along the y-axis.  This also does some filling in if there
  is at least 1 data value within the window.
```

AUTHOR

```
  Thomas M. Smith
```

CREATION DATE

```
  December 2006 (presumed)
```

COPYRIGHT

```
  THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
  THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
  AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
  AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
  SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
  THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
  TO USERS.
```

PROGRAM HISTORY

```
  2009 Sep - V. Banzon added comments as part of documentation effort
```

INPUT

```
      f       = averaged anomaly field
      mask    = land is 0 so marks places not to fill

 RETURNED VARIABLE:
      f      = filtered anomaly field
```

PARAMETERS

```
      im,jm   = xsize and ysize of grid
```

VARIABLES

```
      cj      = latitudinally varying areas
      wgt     = binomial filter weights
      su1     = sum of weighted anomalies
      su2     = sum of weights
```

LANGUAGE

```
  Fortran
```

1.30. ERSST/monice1d-med-oper.f/maxmin [Subroutines]

NAME

maxmin

LOCATION

inside $ersst_SRC_DIR/monice1d-med-oper.f

PURPOSE

To compute maximum, minium and average of input field fld and print to screen

DESCRIPTION

The minimum value holder is first set to a very large number and
the maximum value holder is first set to a very small number. Then
the current value replaces the value in the min holders if the current
value is smaller. The maximum is determined the same way. The data is
summed and counted within the loop, then the average is computed upon
exiting the loop. The max, min and average are displayed on the screen.

AUTHOR

Thomas M Smith

CREATION DATE

Unknown

COPYRIGHT

MODIFICATION HISTORY

2009 Sept -Viva Banzon added comments and put into robodoc format

INPUTS

```
fld     = data to be examined for statistics
im,jm   = x and y size of array
undef   = code for missing data
name    = name for input data field
```

RETURNED VALUE

none

PARAMETERS

```
im1, jm1 = xsize and ysize of 1 degree grid
im2, jm2 = xsize and ysize of 2 degree grid
```

VARIABLES

```
fldmin  = minimum of field
fldmax  = maximum of field
fld     = data field
ave     = average of field
inum    = number of valid data in field
```

LANGUAGE

```
Fortran
```

1.31. ERSST/sst2d.situ.v3b.f/intts [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
intts
```

LOCATION

```
inside $ersst_SRC_DIR//sst2d.situ.v3b.f
```

PURPOSE

```
To use the temporal lag-1 autocorrelation to fill in missing
values of the weights.
```

DESCRIPTION

```
The weights are filled using autocorrelation in both the
forwards and reverse directions, and the two are then
averaged.  Defined modes are not affected.  The AC3 values
come from T. Smith.
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

```
December 2007
```

COPYRIGHT

```
THIS SOFTWARE AND ITS DOCUMENTATION ARE CONSIDERED TO BE IN THE PUBLIC DOMAIN AND
```

```
THUS ARE AVAILABLE FOR UNRESTRICTED PUBLIC USE.  THEY ARE FURNISHED "AS IS." THE
AUTHORS, THE UNITED STATES GOVERNMENT, ITS INSTRUMENTALITIES, OFFICERS, EMPLOYEES,
AND AGENTS MAKE NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE USEFULNESS OF THE
SOFTWARE AND DOCUMENTATION FOR ANY PURPOSE. THEY ASSUME NO RESPONSIBILITY (1) FOR
THE USE OF THE SOFTWARE AND DOCUMENTATION; OR (2) TO PROVIDE TECHNICAL SUPPORT
TO USERS.
```

PROGRAM HISTORY

```
2009 Sep: V. Banzon added comments as part of documentation effort
```

INPUTS

```
ts1     = time series of mode weights with missing values
ntm     = number of months in time series
nm      = mode number
```

RETURNED VALUE

```
ts1     = time series of mode weights with missing values filled in
```

PARAMETERS

```
nmo     = number of modes
```

VARIABLES

```
ts1     = time series of mode weights
w1      = weights
ac1     = autocorrelation for 3m weights
```

LANGUAGE

```
Fortran
```

1.32. ERSST/ssta.merg.situ.v3b.f/range [Subroutines]

[Top] [ERSST] [Subroutines]

NAME

```
range
```

LOCATION

```
inside $ersst_SRC_DIR/ssta.merg.situ.v3b_robo.f
```

PURPOSE

```
To compute the array rangefor 2 deg grid.
```

DESCRIPTION

```
Minimum variable is initialized as a very large number and maximum
variable is set to a very small number.  Each value is compared to the min or
max, and replaces the value in the variable if it is smaller or larger,
respectively.
```

AUTHOR

```
Thomas M Smith
```

CREATION DATE

```
December 2006 (presumed)
```

COPYRIGHT

MODIFICATION HISTORY

```
2009 Jul - Viva Banzon added comments and put into robodoc format
```

INPUTS

```
a2    = array on 2 deg grid
```

RETURNED VALUE

```
amn   = minimum value of array
amx   = maximum value of array
```

PARAMETERS

```
im,jm = xsize and ysize of 2 degree grid
```

VARIABLES

```
a2     = array on 2 deg grid
i,j    = indices for 2-deg grid
```

LANGUAGE

```
Fortran
```