Information about Level 1 – Basic ENSO diagnostics

At this level, POD calculates simple seasonal averages, composites, regression and correlations.

Based on a reference ENSO index (e.g., area-averaged SST anomalies over Nino3.4 region), seasonal composites of variables relevant to MSE budget are constructed for the entire 2-year life-cycle of ENSO. Here, Y (0) refers to the developing, and Y (1) the decaying phase of ENSO.

To execute this level, data need to be preprocessed to calculate monthly climatologies and anomalies for all the required input variables listed below. It is executed only once at the beginning of a new diagnostic run (e.g., when a new model dataset is considered). The preprocessing is switched on by setting PREPROCESS = 1 in mdtf.py file. Then to turn off preprocessing, set PREPROCESS = 0 in mdtf.py file.

To perform composites set COMP = 1 in the mdtf.py file.   Note CCSM4 solutions are considered as an example here.

The code files related to this Level 1 are stored in the ~/var_code/ENSO_MSE/COMPOSITE directory.   All input data should be under ~/{case_name} (for instance ~/CCSM4/mon), the intermediate output data are in: ~/wkdir/MDTF_{case_name}/COMPOSITE/model/netCDF, while graphics is under ~/wkdir/MDTF_{case_name}/COMPOSITE/model.

The required input variables are:

$Z(x,y,z,t)$	geopotential height,
$U(x,y,z,t)$, $V(x,y,z,t)$	u and v wind components
$T(x,y,z,t)$	temperature
$Q(x,y,z,t)$	specific humidity
$OMG(x,y,z,t)$	vertical velocity
$PR(x,y,t)$	precipitation
$SST(x,y,t)$	surface temperature
$SHF(x,y,t)$	sensible heat flux
$LHF(x,y,t)$	latent heat flux
$RSDT(x,y,t)$	top of the atmosphere shortwave down
$RSUT(x,y,t)$	top of the atmosphere shortwave up
$RLUT(x,y,t)$	top of the atmosphere longwave up
$RSDS(x,y,t)$	surface shortwave down
$RSUS(x,y,t)$	surface shortwave up
$RLUS(x,y,t)$	surface longwave up
$RLDS(x,y,t)$	surface longwave down

The individual options at the Level 1 are set in
~/var_code/ENSO_MSE/COMPOSITE/parameters.txt file.
The selectable switches in the ~/var_code/ENSO_MSE/COMPOSITE/parameters.txt are as follows:

Instructions for composite calculation

lon1, lon2, lat1, lat2 - lat/lon coordinates for ENSO reference index (e.g., Nino3.4). Reference index is used in selection of ENSO years.

sigma - Threshold for reference index. For example, **sigma** = 1 selects years with SST anomaly > 1.0 std. of the reference index.

imindx1, imindx2 - Calendar months used in the construction of ENSO reference index (e.g. Nino3.4 boreal winter (DJF) index: imindx1 = 12 , imindx2 = 2)

composite - El Niño/La Nina composites:
 0 : off [no composite output]
 1 : on [composite output]

composite24 - to construct for 2-year life cycle of ENSO monthly composites:
 0 : off [no 2-year life cycle output]
 1 : on [2-year life cycle output]

im1, im2 - Calendar months for user preferred seasonal composites (e.g., DJF, JJA).
 DJF: im1 = 12, im2 = 2
 JJA: im1 = 6 , im2 = 8

Instructions for plotting

season - "Figure label". For example, plotting composite for boreal winter season set **season =** DJF

seasonindx - designator used in plotting routines. If a user selects boreal winter reference index (e.g. imindx1 = 12 and imindx2 = 2), then **seasonindx** = DJF (footnote in the figures).

Instructions for regression/correlation

regression -   switch to calculate and plot regressions:
                               0 : off [no regression output]
                               1 : on [regression output]
                             Based on Nino3.4 reference index POD calculates and plots
                             the simultaneous regression for the following variables:
                                       precipitation
                                       sensible heat flux
                                       latent heat flux
                                       net shortwave radiative flux
                                       net longwave radiative flux

correlation -   switch to calculate and plot correlations:
                               0 : off [no correlation output]
                               1 : on [correlation output]
                             Based on Nino3.4 reference index POD calculates and plots
                             simultaneous correlations for the following variables: .
                                       precipitation
                                       sensible heat flux
                                       latent heat flux
                                       net shortwave radiative flux
                                       net longwave radiative flux

Final output directories:

Based on setup in the parameters.txt the output files and corresponding graphics are
generated. The output files are under ~/wkdir/MDTF_{case_name}/
{diag_name}/model/netCDF. diag_name = COMPOSITE

The composites for El Niño/La Nina are under ~/wkdir/MDTF_{case_name}/
{diag_name}/model/netCDF/ELNINO
 or ~/wkdir/MDTF_{case_name}/{diag_name}/model/netCDF/LANINA.

Similarly 2-year life cycle ENSO composite results are under :
~/wkdir/MDTF_{case_name}/{diag_name}/model/netCDF/24MONTH_ELNINO
or ~/wkdir/MDTF_{case_name}/{diag_name}/model/netCDF/24MONTH_LANINA

Graphical output is now set to be all global and for all surface variables. The actual files are
in ~/wkdir/MDTF_{case_name}/{diag_name}/model