

**This SAS program processes historical and future climate information to be used by the ICICLE Model.**

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**~June 2007~**

```
options macrogen mlogic source source2 symbolgen sortsize = 80M;
```

```
libname final 'D:\NCEP\Model\SAS';
```

```
*****Created by P.H. Larsen, 2006-2007*****;
```

```
*****Importing temp/precip data from UAF GI and NCAR*****;
```

```
*****Outputting histograms of future temp/precip projections by location,  
measure, season, and year *****;
```

```
*****Units: Fahrenheit, Inches*****;
```

```
*****OPTIONS FOR THIS PROGRAM BELOW*****;
```

```
%let spread = 0; *****0=Use historical standard deviation, 0.25 means this  
statement changes standard deviation to be 25% larger than history (for  
example);
```

```
%let draws = 50; *****Equals number of draws for Monte-carlo simulation.;
```

```
%let variate=MULTIVARIATE; *****or UNIVARIATE (case sensitive), tells program  
to conduct Monte-carlo based on historical covariances of precip/temp;
```

```
%let Season=ANNUAL; *****Only reports projections for ANNUAL, WINTER, SUMMER,  
FALL, SPRING;
```

```
filename loclog 'D:\NCEP\Import_Wx.log'; *****Outputs log file to D:\drive;
```

```
proc printto log=loclog;
```

```
run;
```

```
%macro imp (name1,name2);
```

```
data WORK.&name1. ;
```

```
infile "D:\NCEP\Model\NCAR\UAF\&name2..txt" delimiter='09'x MISSOVER DSD  
lrecl=32767 firstobs=2 ;
```

```
informat Year best32. ;
```

```
informat Jan best32. ;
```

```
informat Feb best32. ;
```

```
informat Mar best32. ;
```

```
informat Apr best32. ;
```

```
informat May best32. ;
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```
informat Jun best32. ;
```

```
informat Jul best32. ;
```

```
informat Aug best32. ;
```

```
informat Sep best32. ;
```

```
informat Oct best32. ;
```

```
informat Nov best32. ;
```

```
informat Dec best32. ;
```

```
informat Annual best32. ;
```

```
format Year best12. ;
```

```
format Jan best12. ;
```

```
format Feb best12. ;
```

```
format Mar best12. ;
```

```
format Apr best12. ;
```

```
format May best12. ;
```

```
format Jun best12. ;
```

```

format Jul best12. ;
format Aug best12. ;
format Sep best12. ;
format Oct best12. ;
format Nov best12. ;
format Dec best12. ;
format Annual best12. ;
input
    Year
    Jan
    Feb
    Mar
    Apr
    May
    Jun
    Jul
    Aug
    Sep
    Oct
    Nov
    Dec
    Annual
;
run;

data &name1.;
set &name1.;
if JAN = . then delete; *****Clearing out incomplete years;
if FEB = . then delete;
if MAR = . then delete;
if APR = . then delete;
if MAY = . then delete;
if JUN = . then delete;
if JUL = . then delete;
if AUG = . then delete;
if SEP = . then delete;
if OCT = . then delete;
if NOV = . then delete;
if DEC = . then delete;
run;

data &name1.;
retain ID;
set &name1.;
ID = "&name1.";
PREVDEC =lag(DEC);
WINTER = (PREVDEC+JAN+FEB); *****Agg. winter value;
SPRING = (MAR+APR+MAY); *****Agg. spring value;
SUMMER = (JUN+JUL+AUG); *****Agg. summer value;
FALL=(SEP+OCT+NOV); *****Agg. fall value;
run;

*****For variance/covariance matrices;
data &name1.2 (keep=year ANNUAL_P--SUMMER_P);
set &name1.;
ANNUAL_P = Annual;
WINTER_P = Winter;

```

```

        FALL_P = Fall;
        SPRING_P = Spring;
        SUMMER_P=Summer;
run;

*****Calculates annual and seasonal average values based on GCM base of 1980-
1999*****;
proc univariate noprint data =&name1.;
    var ANNUAL;
    where YEAR >= 1980 and YEAR <= 1999;
    output out = &name1._1
    mean=MEAN;
run;

proc univariate noprint data =&name1.;
    var WINTER;
    where YEAR >= 1980 and YEAR <= 1999;
    output out = &name1._2
    mean=MEAN;
run;

proc univariate noprint data =&name1.;
    var SPRING;
    where YEAR >= 1980 and YEAR <= 1999;
    output out = &name1._3
    mean=MEAN;
run;

proc univariate noprint data =&name1.;
    var SUMMER;
    where YEAR >= 1980 and YEAR <= 1999;
    output out = &name1._4
    mean=MEAN;
run;

proc univariate noprint data =&name1.;
    var FALL;
    where YEAR >= 1980 and YEAR <= 1999;
    output out = &name1._5
    mean=MEAN;
run;

data &name1._1;
    set &name1._1;
    ID = "&name1.";
    SEASON="ANNUAL";
run;

data &name1._2;
    set &name1._2;
    ID = "&name1.";
    SEASON="WINTER";
run;

data &name1._3;
    set &name1._3;
    ID = "&name1.";

```

```

        SEASON="SPRING";
run;

data &name1._4;
    set &name1._4;
    ID = "&name1.";
    SEASON="SUMMER";
run;

data &name1._5;
    set &name1._5;
    ID = "&name1.";
    SEASON="FALL";
run;

*****Calculates annual and seasonal sigma (ie std dev) values based on ALL
historical years*****;
proc univariate noprint data =&name1.;
    var ANNUAL;
    output out = &name1._6
    stdev=stdev;
run;

proc univariate noprint data =&name1.;
    var WINTER;
    output out = &name1._7
    stdev=stdev;
run;

proc univariate noprint data =&name1.;
    var SPRING;
    output out = &name1._8
    stdev=stdev;
run;

proc univariate noprint data =&name1.;
    var SUMMER;
    output out = &name1._9
    stdev=stdev;
run;

proc univariate noprint data =&name1.;
    var FALL;
    output out = &name1._10
    stdev=stdev;
run;

data &name1._1;
    set &name1._1;
    ID = "&name1.";
    SEASON="ANNUAL";
run;

data &name1._2;
    set &name1._2;
    ID = "&name1.";
    SEASON="WINTER";

```

```

run;

data &name1._3;
  set &name1._3;
  ID = "&name1.";
  SEASON="SPRING";
run;

data &name1._4;
  set &name1._4;
  ID = "&name1.";
  SEASON="SUMMER";
run;

data &name1._5;
  set &name1._5;
  ID = "&name1.";
  SEASON="FALL";
run;

data &name1._6;
  set &name1._6;
  ID = "&name1.";
  SEASON="ANNUAL";
run;

data &name1._7;
  set &name1._7;
  ID = "&name1.";
  SEASON="WINTER";
run;

data &name1._8;
  set &name1._8;
  ID = "&name1.";
  SEASON="SPRING";
run;

data &name1._9;
  set &name1._9;
  ID = "&name1.";
  SEASON="SUMMER";
run;

data &name1._10;
  set &name1._10;
  ID = "&name1.";
  SEASON="FALL";
run;

data &name1._AN;
  merge &name1._1 &name1._6;
  by ID SEASON;
run;

data &name1._WI;
  merge &name1._2 &name1._7;

```

```

        by ID SEASON;
run;

data &name1._SP;
    merge &name1._3 &name1._8;
    by ID SEASON;
run;

data &name1._SU;
    merge &name1._4 &name1._9;
    by ID SEASON;
run;

data &name1._FA;
    merge &name1._5 &name1._10;
    by ID SEASON;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name1._WINTER.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name1. noprint;
    var WINTER;
    title "Histogram of &name1.";
    histogram WINTER /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name1._SPRING.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name1. noprint;
    var SPRING;
    title "Histogram of &name1.";
    histogram SPRING /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name1._SUMMER.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name1. noprint;
    var SUMMER;
    title "Histogram of &name1.";
    histogram SUMMER /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name1._FALL.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name1. noprint;
    var FALL;
    title "Histogram of &name1.";
    histogram FALL /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

```

```

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name1._ANNUAL.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name1. noprint;
    var ANNUAL;
    title "Histogram of &name1.";
    histogram ANNUAL /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

%mend;
%imp (ANC_P,anc_avg_precip_fix);
%imp (BAR_P,bar_avg_precip_fix);
%imp (BET_P,bet_avg_precip_fix);
%imp (FAI_P,fair_avg_precip_fix);
%imp (JUN_P,jun_avg_precip_fix);
%imp (NOM_P,nom_avg_precip_fix);

%macro imp2 (name3,name4);

data WORK.&name3. ;
    infile "D:\NCEP\Model\NCAR\UAF\&name4..txt" delimiter='09'x MISSOVER DSD
    lrecl=32767 firstobs=2 ;
        informat Year best32. ;
        informat Jan best32. ;
        informat Feb best32. ;
        informat Mar best32. ;
        informat Apr best32. ;
        informat May best32. ;
        informat Jun best32. ;
        informat Jul best32. ;
        informat Aug best32. ;
        informat Sep best32. ;
        informat Oct best32. ;
        informat Nov best32. ;
        informat Dec best32. ;
        informat Annual best32. ;
        format Year best12. ;
        format Jan best12. ;
        format Feb best12. ;
        format Mar best12. ;
        format Apr best12. ;
        format May best12. ;
        format Jun best12. ;
        format Jul best12. ;
        format Aug best12. ;
        format Sep best12. ;
        format Oct best12. ;
        format Nov best12. ;
        format Dec best12. ;
        format Annual best12. ;
input
    Year
    Jan
    Feb
    Mar

```

```

                Apr
                May
                Jun
                Jul
                Aug
                Sep
                Oct
                Nov
                Dec
                Annual
            ;
run;

data &name3.;
    set &name3.;
    if JAN = . then delete; *****Clearing out incomplete years;
    if FEB = . then delete;
    if MAR = . then delete;
    if APR = . then delete;
    if MAY = . then delete;
    if JUN = . then delete;
    if JUL = . then delete;
    if AUG = . then delete;
    if SEP = . then delete;
    if OCT = . then delete;
    if NOV = . then delete;
    if DEC = . then delete;
run;

data &name3.;
    retain ID;
    set &name3.;
    ID = "&name3.";
    PREVDEC =lag(DEC);
    WINTER = (PREVDEC+JAN+FEB)/3; *****Average winter value;
    SPRING = (MAR+APR+MAY)/3; *****Average spring value;
    SUMMER = (JUN+JUL+AUG)/3; *****Average summer value;
    FALL=(SEP+OCT+NOV)/3; *****Average fall value;
run;

data &name3.2 (keep=year ANNUAL_T--SUMMER_T);
    set &name3.;
    ANNUAL_T = Annual;
    WINTER_T = Winter;
    FALL_T = Fall;
    SPRING_T = Spring;
    SUMMER_T=Summer;
run;

*****Calculates annual and seasonal average values based on GCM base of 1980-
1999*****;
proc univariate noprint data =&name3.;
    var ANNUAL;
    where YEAR >= 1980 and YEAR <= 1999;
    output out = &name3._1
    mean=MEAN;
run;

```

```

proc univariate noprint data =&name3.;
  var WINTER;
  where YEAR >= 1980 and YEAR <= 1999;
  output out = &name3._2
  mean=MEAN;
run;

proc univariate noprint data =&name3.;
  var SPRING;
  where YEAR >= 1980 and YEAR <= 1999;
  output out = &name3._3
  mean=MEAN;
run;

proc univariate noprint data =&name3.;
  var SUMMER;
  where YEAR >= 1980 and YEAR <= 1999;
  output out = &name3._4
  mean=MEAN;
run;

proc univariate noprint data =&name3.;
  var FALL;
  where YEAR >= 1980 and YEAR <= 1999;
  output out = &name3._5
  mean=MEAN;
run;

data &name3._1;
  set &name3._1;
  ID = "&name3.";
  SEASON="ANNUAL";
run;

data &name3._2;
  set &name3._2;
  ID = "&name3.";
  SEASON="WINTER";
run;

data &name3._3;
  set &name3._3;
  ID = "&name3.";
  SEASON="SPRING";
run;

data &name3._4;
  set &name3._4;
  ID = "&name3.";
  SEASON="SUMMER";
run;

data &name3._5;
  set &name3._5;
  ID = "&name3.";
  SEASON="FALL";

```

```

run;

*****Calculates annual and seasonal sigma (ie std dev) values based on ALL
historical years*****;
proc univariate noprint data =&name3.;
    var ANNUAL;
    output out = &name3._6
    std=stdev;
run;

proc univariate noprint data =&name3.;
    var WINTER;
    output out = &name3._7
    std=stdev;
run;

proc univariate noprint data =&name3.;
    var SPRING;
    output out = &name3._8
    std=stdev;
run;

proc univariate noprint data =&name3.;
    var SUMMER;
    output out = &name3._9
    std=stdev;
run;

proc univariate noprint data =&name3.;
    var FALL;
    output out = &name3._10
    std=stdev;
run;

data &name3._1;
    set &name3._1;
    ID = "&name3.";
    SEASON="ANNUAL";
run;

data &name3._2;
    set &name3._2;
    ID = "&name3.";
    SEASON="WINTER";
run;

data &name3._3;
    set &name3._3;
    ID = "&name3.";
    SEASON="SPRING";
run;

data &name3._4;
    set &name3._4;
    ID = "&name3.";
    SEASON="SUMMER";
run;

```

```

data &name3._5;
  set &name3._5;
  ID = "&name3.";
  SEASON="FALL";
run;

data &name3._6;
  set &name3._6;
  ID = "&name3.";
  SEASON="ANNUAL";
run;

data &name3._7;
  set &name3._7;
  ID = "&name3.";
  SEASON="WINTER";
run;

data &name3._8;
  set &name3._8;
  ID = "&name3.";
  SEASON="SPRING";
run;

data &name3._9;
  set &name3._9;
  ID = "&name3.";
  SEASON="SUMMER";
run;

data &name3._10;
  set &name3._10;
  ID = "&name3.";
  SEASON="FALL";
run;

data &name3._AN;
  merge &name3._1 &name3._6;
  by ID SEASON;
run;

data &name3._WI;
  merge &name3._2 &name3._7;
  by ID SEASON;
run;

data &name3._SP;
  merge &name3._3 &name3._8;
  by ID SEASON;
run;

data &name3._SU;
  merge &name3._4 &name3._9;
  by ID SEASON;
run;

```

```

data &name3._FA;
    merge &name3._5 &name3._10;
    by ID SEASON;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name3._WINTER.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name3. noprint;
    var WINTER;
    title "Histogram of &name3.";
    histogram WINTER /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name3._SPRING.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name3. noprint;
    var SPRING;
    title "Histogram of &name3.";
    histogram SPRING /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name3._SUMMER.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name3. noprint;
    var SUMMER;
    title "Histogram of &name3.";
    histogram SUMMER /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name3._FALL.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name3. noprint;
    var FALL;
    title "Histogram of &name3.";
    histogram FALL /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

filename gifgraph "D:\NCEP\Model\NCAR\UAF\Histo_&name3._ANNUAL.gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape;
proc univariate noprint data = &name3. noprint;
    var ANNUAL;
    title "Histogram of &name3.";
    histogram ANNUAL /cfill=ligr normal cframe=white cv=black;
    inset mean median std max min /pos=ne;
run;

%mend;
%imp2 (ANC_T,anc_avg_temp_fix);

```

```

%imp2 (BAR_T,bar_avg_temp_fix);
%imp2 (BET_T,bet_avg_temp_fix);
%imp2 (FAI_T,fair_avg_temp_fix);
%imp2 (JUN_T,jun_avg_temp_fix);
%imp2 (NOM_T,nom_avg_temp_fix);

%macro plar (a,b,c);

data &a._COV;
    merge &a._T2 &a._P2;
    by year;
run;

proc corr noprint data = &a._COV outp=sigma_&a._&c. cov;
    var &b._P &b._T;
run;

data sigma_&a._&c.;
    set sigma_&a._&c.;
    where _type_="COV";
    drop _type_ _name_;
run;
%mend plar;

%plar (ANC,ANNUAL,ANN);
%plar (ANC,WINTER,WIN);
%plar (ANC,FALL,FAL);
%plar (ANC,SPRING,SPR);
%plar (ANC,SUMMER,SUM);

%plar (BAR,ANNUAL,ANN);
%plar (BAR,WINTER,WIN);
%plar (BAR,FALL,FAL);
%plar (BAR,SPRING,SPR);
%plar (BAR,SUMMER,SUM);

%plar (FAI,ANNUAL,ANN);
%plar (FAI,WINTER,WIN);
%plar (FAI,FALL,FAL);
%plar (FAI,SPRING,SPR);
%plar (FAI,SUMMER,SUM);

%plar (BET,ANNUAL,ANN);
%plar (BET,WINTER,WIN);
%plar (BET,FALL,FAL);
%plar (BET,SPRING,SPR);
%plar (BET,SUMMER,SUM);

%plar (NOM,ANNUAL,ANN);
%plar (NOM,WINTER,WIN);
%plar (NOM,FALL,FAL);
%plar (NOM,SPRING,SPR);
%plar (NOM,SUMMER,SUM);

%plar (JUN,ANNUAL,ANN);
%plar (JUN,WINTER,WIN);
%plar (JUN,FALL,FAL);
%plar (JUN,SPRING,SPR);

```

```
%plar (JUN,SUMMER,SUM);
```

```
data UAF_GI_DATA;
```

```
set    ANC_P_AN
```

```
    ANC_P_WI  
    ANC_P_SP  
    ANC_P_SU  
    ANC_P_FA  
    ANC_T_AN  
    ANC_T_WI  
    ANC_T_SP  
    ANC_T_SU  
    ANC_T_FA
```

```
    BAR_P_AN  
    BAR_P_WI  
    BAR_P_SP  
    BAR_P_SU  
    BAR_P_FA  
    BAR_T_AN  
    BAR_T_WI  
    BAR_T_SP  
    BAR_T_SU  
    BAR_T_FA
```

```
    BET_P_AN  
    BET_P_WI  
    BET_P_SP  
    BET_P_SU  
    BET_P_FA  
    BET_T_AN  
    BET_T_WI  
    BET_T_SP  
    BET_T_SU  
    BET_T_FA
```

```
    FAI_P_AN  
    FAI_P_WI  
    FAI_P_SP  
    FAI_P_SU  
    FAI_P_FA  
    FAI_T_AN  
    FAI_T_WI  
    FAI_T_SP  
    FAI_T_SU  
    FAI_T_FA
```

```
    JUN_P_AN  
    JUN_P_WI  
    JUN_P_SP  
    JUN_P_SU  
    JUN_P_FA  
    JUN_T_AN  
    JUN_T_WI  
    JUN_T_SP  
    JUN_T_SU  
    JUN_T_FA
```

```

        NOM_P_AN
        NOM_P_WI
        NOM_P_SP
        NOM_P_SU
        NOM_P_FA
        NOM_T_AN
        NOM_T_WI
        NOM_T_SP
        NOM_T_SU
        NOM_T_FA;

run;

*****This dataset to be used by depreciating code/monte-carlo loop*****;
data final.UAF_WX (drop=X Y ID mean stdev);
    retain GCM_Region;
    set UAF_GI_DATA;
    X = substr(ID,1,3);
    Y = substr(ID,5,1);
    if X = "ANC" then GCM_Region = "ANCHORAGE";
    if X = "BET" then GCM_Region = "BETHEL";
    if X = "BAR" then GCM_Region = "BARROW";
    if X = "FAI" then GCM_Region = "FAIRBANKS";
    if X = "JUN" then GCM_Region = "JUNEAU";
    if X = "NOM" then GCM_Region = "NOME";
    if Y = "P" then Measure = "PRECIP";
    if Y = "T" then Measure = "TEMP";
    informat AVG_1980to1999 8.2;
    format AVG_1980to1999 8.2;
    informat SIGMA_AllYears 8.2;
    format SIGMA_AllYears 8.2;
    AVG_1980to1999 = MEAN; *****Average temp/precip by season based on
1980-1999 data;
    SIGMA_AllYears = (1+&spread.)*stdev; *****Standard deviation of
temp/precip by season based on all recorded data (for MC loop);
run;

*****Importing climate projections here*****;

%macro fromGIS (sheet, name);

PROC IMPORT OUT= WORK.&name.
    DATAFILE= "D:\NCEP\Model\NCAR\NCAR_CLEAN.xls"
    DBMS=EXCEL REPLACE;
    SHEET="&sheet.";
    GETNAMES=YES;
    MIXED=NO;
    SCANTEXT=YES;
    USEDATE=YES;
    SCANTIME=YES;
RUN;
%mend;
%fromGIS (Anchorage_2030$, ANCH_2030);
%fromGIS (Anchorage_2080$, ANCH_2080);
%fromGIS (Barrow_2030$, BARR_2030);
%fromGIS (Barrow_2080$, BARR_2080);

```

```

%fromGIS (Fairbanks_2030$,FAIR_2030);
%fromGIS (Fairbanks_2080$,FAIR_2080);
%fromGIS (Juneau_2030$,JUNE_2030);
%fromGIS (Juneau_2080$,JUNE_2080);
%fromGIS (Bethel_2030$,BETH_2030);
%fromGIS (Bethel_2080$,BETH_2080);
%fromGIS (Nome_2030$,NOME_2030);
%fromGIS (Nome_2080$,NOME_2080);

data NCAR_Data (drop=DP_Percent location);
    set ANCH_2030 ANCH_2080 BARR_2030 BARR_2080 FAIR_2030 FAIR_2080 JUNE_2030
JUNE_2080 BETH_2030 BETH_2080 NOME_2030 NOME_2080;
    informat Preferred_Model $10.;
    format Preferred_Model $10.;
    length Preferred_Model $10.;
    if GCMs = "csiro" then Preferred_Model = "Cooler";
    if GCMs = "gfdl0" then Preferred_Model = "Middle";
    if GCMs = "miroc.hires" then Preferred_Model = "Warmer";
    if DT_Celsius > 0 then do;
        DP = .;
        DP_Percent = .;
    end;
    informat DP_Percents percent6.2;
    format DP_Percents percent6.2;
    DT_Fahren = (9/5)*DT_Celsius;
    DP_Percents = (DP_Percent/100);
    if Time in ("December","January","February") then Season = "WINTER";
    if Time in ("March","April","May") then Season = "SPRING";
    if Time in ("June","July","August") then Season = "SUMMER";
    if Time in ("September","October","November") then Season = "FALL";
    if Time in ("Annual") then Season = "ANNUAL";
    GCM_Region = upcase(location);
run;

data NCAR_Data_TEMP (drop=dp dp_percents);
    set NCAR_Data;
    if Preferred_Model eq "" then delete;
    if DT_Celsius eq . then delete;
run;

data NCAR_Data_PREC (drop = DT_Celsius DT_Fahren dp);
    set NCAR_Data;
    if Preferred_Model eq "" then delete;
    if DT_Celsius ne . then delete;
run;

proc sort data=NCAR_Data_TEMP;
    by GCM_Region Season Forecast_Year GCMs;
run;

proc univariate noprint data =NCAR_Data_TEMP;
    var DT_Fahren;
    by GCM_Region Season Forecast_Year GCMs;
    output out = TEMP
    MEAN=MEAN;
run;

```

```

proc sort data=NCAR_Data_PREC;
    by GCM_Region Season Forecast_Year GCMs;
run;

proc univariate noprint data =NCAR_Data_PREC;
    var DP_Percents;
    by GCM_Region Season Forecast_Year GCMs;
    output out = PREC
    MEAN=MEAN;
run;

proc transpose data=PREC out=PREC_TRNS ;
    by GCM_Region Season Forecast_Year;
    var Mean ;
    id GCMs;
run;

data prec_trns (drop=_LABEL_ _NAME_);
    set prec_trns;
    Measure = "PRECIP";
run;

data prec2030 (drop=forecast_year rename=(csiro=csiro2030 miroc_hires=hires2030
gfdl0=gfd2030)) prec2080 (drop=forecast_year rename=(csiro=csiro2080
miroc_hires=hires2080 gfdl0=gfd2080));
    set prec_trns;
    if forecast_year = 2030 then output prec2030;
    if forecast_year = 2080 then output prec2080;
run;

data precdiff (keep=GCM_Region Season Measure csiro_diff miroc_hires_diff
gfd_diff) ;
    merge prec2030 prec2080;
    by GCM_Region Season Measure;
    csiro_diff=csiro2080-csiro2030;
    miroc_hires_diff=hires2080-hires2030;
    gfd_diff=gfd2080-gfd2030;
run;

data prec_trns;
    merge precdiff prec_trns;
    by GCM_Region Season Measure;
run;

proc transpose data=TEMP out=TEMP_TRNS ;
    by GCM_Region Season Forecast_Year;
    var Mean ;
    id GCMs;
run;

data temp_trns (drop=_LABEL_ _NAME_);
    set temp_trns;
    Measure = "TEMP";
run;

```

```

data temp2030 (drop=forecast_year rename=(csiro=csiro2030 miroc_hires=hires2030
gfdl0=gfd2030)) temp2080 (drop=forecast_year rename=(csiro=csiro2080
miroc_hires=hires2080 gfdl0=gfd2080));
    set temp_trns;
    if forecast_year = 2030 then output temp2030;
    if forecast_year = 2080 then output temp2080;
run;

data tempdiff (keep=GCM_Region Season Measure csiro_diff miroc_hires_diff
gfd_diff) ;
    merge temp2030 temp2080;
    by GCM_Region Season Measure;
    csiro_diff=csiro2080-csiro2030;
    miroc_hires_diff=hires2080-hires2030;
    gfd_diff=gfd2080-gfd2030;
run;

data temp_trns;
    merge tempdiff temp_trns ;
    by GCM_Region Season Measure;
run;

data final.NCAR_wx;
    set prec_trns temp_trns;
    if Forecast_Year=2030 then do;
        csiro_diff=.;
        miroc_hires_diff=.;
        gfd_diff=.;
    end;
run;

proc sort data=final.NCAR_wx;
    by GCM_Region Measure Season;
run;

*****Begin continuous timestep here*****;

data NCAR_wx;
    set final.NCAR_wx;
        csiro_lag=lag1(csiro);
        miroc_hires_lag=lag(miroc_hires);
        gfdl0_lag =lag(gfdl0);
run;

data NCAR_wx (drop=csiro_lag miroc_hires_lag gfdl0_lag) ;
    set NCAR_wx;
    if Forecast_Year = 2080 then do;
        csiro = csiro_lag;
        miroc_hires=miroc_hires_lag;
        gfdl0=gfdl0_lag;
    end;
run;

data NCAR_wx2;
    set NCAR_wx;
    do f_year=2007 to 2030 by 1;

```

```

2030;          csiro_ann1_2030=csiro/24;          *****24 years from 2007-
from 2007-2030;
                csiro_ann1_2080=csiro/24;
                miroc_hires_ann1_2030=miroc_hires/24;          *****24 years
2030;          miroc_hires_ann1_2080=miroc_hires/24;
                gfdl0_ann1_2030=gfdl0/24;          *****24 years from 2007-
                gfdl0_ann1_2080=gfdl0/24;
                output;          *****24 years from 2007-2030;
end;
if Forecast_Year=2080 then do;
    do f_year=2031 to 2080 by 1;
        csiro_ann1_2080=csiro_diff/50;
        miroc_hires_ann1_2080=miroc_diff/50;
        gfdl0_ann1_2080=gfdl0_diff/50;
        output;
    end;
end;
run;

proc sort data=NCAR_wx2;
    by GCM_Region Measure Season Forecast_Year;
run;

data NCAR_wx3;
    set NCAR_wx2;
    by GCM_Region Measure Season Forecast_Year;
    retain csiro_ann hires_ann gfdl0_ann 0;
    if first.forecast_year then do;
        csiro_ann = 0;
        hires_ann = 0;
        gfdl0_ann = 0;
    end;
    if f_year > 2007 and f_year < 2031 then do;
        csiro_ann=csiro_ann+csiro_ann1_2030;

        hires_ann=hires_ann+miroc_hires_ann1_2030;
        gfdl0_ann=gfdl0_ann+gfdl0_ann1_2030;
    end;
    else do;
        csiro_ann=csiro_ann+csiro_ann1_2080;
        hires_ann=hires_ann+miroc_hires_ann1_2080;
        gfdl0_ann=gfdl0_ann+gfdl0_ann1_2080;
    end;
run;

*****Left off here Sunday, Dec 17th;

proc sort data=final.UAF_wx;
    by GCM_Region Measure Season;
run;

data final.climate;
    merge final.NCAR_wx final.UAF_wx;
    by GCM_Region Measure Season;
    if Measure="PRECIP" then do;

```

```

        COOLER = (AVG_1980to1999)*(1+csiro);          *****These represent
actual precip. values for 2030 and 2080;
        MIDDLE = (AVG_1980to1999)*(1+gfdl0);
        WARMER = (AVG_1980to1999)*(1+miroc_hires);
    end;
    if Measure="TEMP" then do;
        COOLER = (AVG_1980to1999)+csiro;          *****These represent actual
temp. values for 2030 and 2080;
        MIDDLE = (AVG_1980to1999)+gfdl0;
        WARMER = (AVG_1980to1999)+miroc_hires;
    end;
    informat COOLER 8.2;
    format COOLER 8.2;
    informat MIDDLE 8.2;
    format MIDDLE 8.2;
    informat WARMER 8.2;
    format WARMER 8.2;
run;

*****This dataset contains the projected means for each year out to 2080 (as
opposed to only 2030 and 2080 above);
data final.climate_cont;
    merge NCAR_wx3 final.UAF_wx;
    by GCM_Region Measure Season;
    if Measure="PRECIP" then do;
        COOLER = (AVG_1980to1999)*(1+csiro_ann);  *****These represent
actual precip. values for 2030 and 2080;
        MIDDLE = (AVG_1980to1999)*(1+gfdl0_ann);
        WARMER = (AVG_1980to1999)*(1+hires_ann);
    end;
    if Measure="TEMP" then do;
        COOLER = (AVG_1980to1999)+csiro_ann;      *****These represent
actual temp. values for 2030 and 2080;
        MIDDLE = (AVG_1980to1999)+gfdl0_ann;
        WARMER = (AVG_1980to1999)+hires_ann;
    end;
    informat COOLER 8.2;
    format COOLER 8.2;
    informat MIDDLE 8.2;
    format MIDDLE 8.2;
    informat WARMER 8.2;
    format WARMER 8.2;
run;

****Computing base file;
%macro high (mods,mods2);

%do i=2007 %to 2030;
data means_mv_ANC_ANN_30_&mods._&i. (keep =&mods2.) ;
    set final.climate_cont;
    where GCM_Region="ANCHORAGE" and season="ANNUAL" and Forecast_Year=2030
and f_year=&i.;
run;

*****Multivariate drawing capability;
proc iml;

```

```

        use sigma_ANC_ANN;
        read all into sigma_ANC_ANN;
        use means_mv_ANC_ANN_30_&mods._&i.;
        read all into means_mv_ANC_ANN_30_&mods._&i.;
        CALL VNORMAL(et_ANC_ANN_30_&mods._&i.,
means_mv_ANC_ANN_30_&mods._&i., sigma_ANC_ANN, &draws.);      *****10000 draws;
        create draws_ANC_ANN_30_&mods._&i. from
et_ANC_ANN_30_&mods._&i.;
        append from et_ANC_ANN_30_&mods._&i.;
quit;

data draws_ANC_ANN_30_&mods._&i.;
        set draws_ANC_ANN_30_&mods._&i.;
        rename COL1=&mods._Draw_Precip;
        rename COL2=&mods._Draw_Temp;
        GCM_Region="ANCHORAGE";
        season="ANNUAL";
        Time_Step=&i.;
        Forecast_Year=2030;
        if COL1 < 0 then COL1 = 0;

        sample +1;
run;

data pcp_BASE_&mods._&i. (drop=&mods._Draw_Temp);
        set draws_ANC_ANN_30_&mods._&i.;
        Measure="PRECIP";
        rename &mods._Draw_Precip = &mods._Draw;
run;

data tmp_BASE_&mods._&i. (drop=&mods._Draw_Precip);
        set draws_ANC_ANN_30_&mods._&i.;
        Measure="TEMP";
        rename &mods._Draw_Temp = &mods._Draw;
run;

%end;

proc delete data=tmp_BASE_&mods.;
        run;

proc delete data=pcp_BASE_&mods.;
        run;

data tmp_BASE_&mods.;
        set tmp_BASE_&mods._2007
          tmp_BASE_&mods._2008
          tmp_BASE_&mods._2009
          tmp_BASE_&mods._2010
          tmp_BASE_&mods._2011
          tmp_BASE_&mods._2012
          tmp_BASE_&mods._2013
          tmp_BASE_&mods._2014
          tmp_BASE_&mods._2015
          tmp_BASE_&mods._2016
          tmp_BASE_&mods._2017
          tmp_BASE_&mods._2018
          tmp_BASE_&mods._2019

```

```

tmp_BASE_&mods._2020
tmp_BASE_&mods._2021
tmp_BASE_&mods._2022
tmp_BASE_&mods._2023
tmp_BASE_&mods._2024
tmp_BASE_&mods._2025
tmp_BASE_&mods._2026
tmp_BASE_&mods._2027
tmp_BASE_&mods._2028
tmp_BASE_&mods._2029
tmp_BASE_&mods._2030;
run;

data pcp_BASE_&mods.;
  set pcp_BASE_&mods._2007
    pcp_BASE_&mods._2008
    pcp_BASE_&mods._2009
    pcp_BASE_&mods._2010
    pcp_BASE_&mods._2011
    pcp_BASE_&mods._2012
    pcp_BASE_&mods._2013
    pcp_BASE_&mods._2014
    pcp_BASE_&mods._2015
    pcp_BASE_&mods._2016
    pcp_BASE_&mods._2017
    pcp_BASE_&mods._2018
    pcp_BASE_&mods._2019
    pcp_BASE_&mods._2020
    pcp_BASE_&mods._2021
    pcp_BASE_&mods._2022
    pcp_BASE_&mods._2023
    pcp_BASE_&mods._2024
    pcp_BASE_&mods._2025
    pcp_BASE_&mods._2026
    pcp_BASE_&mods._2027
    pcp_BASE_&mods._2028
    pcp_BASE_&mods._2029
    pcp_BASE_&mods._2030;
run;

%mend;
%high (cooler,cooler);
%high (middle,middle);
%high (warmer,warmer);

%macro tired (p,q,r,s,t,u,v,w);

%do j=2007 %to 20&w.;

****;
data means_mv_&p._&q._&w._&t._&j. (keep =&s.) ;
  set final.climate_cont;
  where GCM_Region="&v." and season="&u." and Forecast_Year=&r. and
f_year=&j.;
run;

****Multivariate drawing capability;

```

```

proc iml;

        use sigma_&p._&q.;
        read all into sigma_&p._&q.;
        use means_mv_&p._&q._&w._&t._&j.;
        read all into means_mv_&p._&q._&w._&t._&j.;
        CALL VNORMAL(et_&p._&q._&w._&t._&j.,
means_mv_&p._&q._&w._&t._&j., sigma_&p._&q., &draws.);      *****10000 draws;
        create draws_&p._&q._&w._&t._&j. from
et_&p._&q._&w._&t._&j.;
        append from et_&p._&q._&w._&t._&j.;

quit;

data draws_&p._&q._&w._&t._&j.;
        set draws_&p._&q._&w._&t._&j.;
        rename COL1=&t._Draw_Precip;
        rename COL2=&t._Draw_Temp;
        GCM_Region="&v.";
        season="&u.";
        Time_Step=&j.;
        Forecast_Year=&r.;
        if COL1 < 0 then COL1 = 0;

        sample +1;
run;

data pcp_&p._&q._&w._&t._&j. (drop=&t._Draw_Temp);
        set draws_&p._&q._&w._&t._&j.;
        Measure="PRECIP";
        rename &t._Draw_Precip = &t._Draw;
run;

%if "&t." ="cooler" %then %do;
        proc append base=pcp_BASE_cooler data=pcp_&p._&q._&w._&t._&j. FORCE;
        run;
%end;

%if "&t." ="middle" %then %do;
        proc append base=pcp_BASE_middle data=pcp_&p._&q._&w._&t._&j. FORCE;
        run;
%end;

%if "&t." ="warmer" %then %do;
        proc append base=pcp_BASE_warmer data=pcp_&p._&q._&w._&t._&j. FORCE;
        run;
%end;

data tmp_&p._&q._&w._&t._&j. (drop=&t._Draw_Precip);
        set draws_&p._&q._&w._&t._&j.;
        Measure="TEMP";
        rename &t._Draw_Temp = &t._Draw;
run;

%if "&t." ="cooler" %then %do;
        proc append base=tmp_BASE_cooler data=tmp_&p._&q._&w._&t._&j. FORCE;
        run;
%end;

%if "&t." ="middle" %then %do;

```

```

proc append base=tmp_BASE_middle data=tmp_&p._&q._&w._&t._&j. FORCE;
run;
%end;

%if "&t." ="warmer" %then %do;
proc append base=tmp_BASE_warmer data=tmp_&p._&q._&w._&t._&j. FORCE;
run;
%end;

%end; *****J loop;

%mend;
%tired (ANC,ANN,2080,cooler,cooler,ANNUAL,ANCHORAGE,80);
%tired (ANC,WIN,2030,cooler,cooler,WINTER,ANCHORAGE,30);
%tired (ANC,WIN,2080,cooler,cooler,WINTER,ANCHORAGE,80);
%tired (ANC,SPR,2030,cooler,cooler,SPRING,ANCHORAGE,30);
%tired (ANC,SPR,2080,cooler,cooler,SPRING,ANCHORAGE,80);
%tired (ANC,SUM,2030,cooler,cooler,SUMMER,ANCHORAGE,30);
%tired (ANC,SUM,2080,cooler,cooler,SUMMER,ANCHORAGE,80);
%tired (ANC,FAL,2030,cooler,cooler,FALL,ANCHORAGE,30);
%tired (ANC,FAL,2080,cooler,cooler,FALL,ANCHORAGE,80);
%tired (ANC,ANN,2080,middle,middle,ANNUAL,ANCHORAGE,80);
%tired (ANC,WIN,2030,middle,middle,WINTER,ANCHORAGE,30);
%tired (ANC,WIN,2080,middle,middle,WINTER,ANCHORAGE,80);
%tired (ANC,SPR,2030,middle,middle,SPRING,ANCHORAGE,30);
%tired (ANC,SPR,2080,middle,middle,SPRING,ANCHORAGE,80);
%tired (ANC,SUM,2030,middle,middle,SUMMER,ANCHORAGE,30);
%tired (ANC,SUM,2080,middle,middle,SUMMER,ANCHORAGE,80);
%tired (ANC,FAL,2030,middle,middle,FALL,ANCHORAGE,30);
%tired (ANC,FAL,2080,middle,middle,FALL,ANCHORAGE,80);
%tired (ANC,ANN,2080,warmer,warmer,ANNUAL,ANCHORAGE,80);
%tired (ANC,WIN,2030,warmer,warmer,WINTER,ANCHORAGE,30);
%tired (ANC,WIN,2080,warmer,warmer,WINTER,ANCHORAGE,80);
%tired (ANC,SPR,2030,warmer,warmer,SPRING,ANCHORAGE,30);
%tired (ANC,SPR,2080,warmer,warmer,SPRING,ANCHORAGE,80);
%tired (ANC,SUM,2030,warmer,warmer,SUMMER,ANCHORAGE,30);
%tired (ANC,SUM,2080,warmer,warmer,SUMMER,ANCHORAGE,80);
%tired (ANC,FAL,2030,warmer,warmer,FALL,ANCHORAGE,30);
%tired (ANC,FAL,2080,warmer,warmer,FALL,ANCHORAGE,80);

%tired (BAR,ANN,2030,cooler,cooler,ANNUAL,BARROW,30);
%tired (BAR,ANN,2080,cooler,cooler,ANNUAL,BARROW,80);
%tired (BAR,WIN,2030,cooler,cooler,WINTER,BARROW,30);
%tired (BAR,WIN,2080,cooler,cooler,WINTER,BARROW,80);
%tired (BAR,SPR,2030,cooler,cooler,SPRING,BARROW,30);
%tired (BAR,SPR,2080,cooler,cooler,SPRING,BARROW,80);
%tired (BAR,SUM,2030,cooler,cooler,SUMMER,BARROW,30);
%tired (BAR,SUM,2080,cooler,cooler,SUMMER,BARROW,80);
%tired (BAR,FAL,2030,cooler,cooler,FALL,BARROW,30);
%tired (BAR,FAL,2080,cooler,cooler,FALL,BARROW,80);
%tired (BAR,ANN,2030,middle,middle,ANNUAL,BARROW,30);
%tired (BAR,ANN,2080,middle,middle,ANNUAL,BARROW,80);
%tired (BAR,WIN,2030,middle,middle,WINTER,BARROW,30);
%tired (BAR,WIN,2080,middle,middle,WINTER,BARROW,80);
%tired (BAR,SPR,2030,middle,middle,SPRING,BARROW,30);
%tired (BAR,SPR,2080,middle,middle,SPRING,BARROW,80);
%tired (BAR,SUM,2030,middle,middle,SUMMER,BARROW,30);

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```

%tired (BAR,SUM,2080,middle,middle,SUMMER,BARROW,80);
%tired (BAR,FAL,2030,middle,middle,FALL,BARROW,30);
%tired (BAR,FAL,2080,middle,middle,FALL,BARROW,80);
%tired (BAR,ANN,2030,warmer,warmer,ANNUAL,BARROW,30);
%tired (BAR,ANN,2080,warmer,warmer,ANNUAL,BARROW,80);
%tired (BAR,WIN,2030,warmer,warmer,WINTER,BARROW,30);
%tired (BAR,WIN,2080,warmer,warmer,WINTER,BARROW,80);
%tired (BAR,SPR,2030,warmer,warmer,SPRING,BARROW,30);
%tired (BAR,SPR,2080,warmer,warmer,SPRING,BARROW,80);
%tired (BAR,SUM,2030,warmer,warmer,SUMMER,BARROW,30);
%tired (BAR,SUM,2080,warmer,warmer,SUMMER,BARROW,80);
%tired (BAR,FAL,2030,warmer,warmer,FALL,BARROW,30);
%tired (BAR,FAL,2080,warmer,warmer,FALL,BARROW,80);

%tired (FAI,ANN,2030,cooler,cooler,ANNUAL,FAIRBANKS,30);
%tired (FAI,ANN,2080,cooler,cooler,ANNUAL,FAIRBANKS,80);
%tired (FAI,WIN,2030,cooler,cooler,WINTER,FAIRBANKS,30);
%tired (FAI,WIN,2080,cooler,cooler,WINTER,FAIRBANKS,80);
%tired (FAI,SPR,2030,cooler,cooler,SPRING,FAIRBANKS,30);
%tired (FAI,SPR,2080,cooler,cooler,SPRING,FAIRBANKS,80);
%tired (FAI,SUM,2030,cooler,cooler,SUMMER,FAIRBANKS,30);
%tired (FAI,SUM,2080,cooler,cooler,SUMMER,FAIRBANKS,80);
%tired (FAI,FAL,2030,cooler,cooler,FALL,FAIRBANKS,30);
%tired (FAI,FAL,2080,cooler,cooler,FALL,FAIRBANKS,80);
%tired (FAI,ANN,2030,middle,middle,ANNUAL,FAIRBANKS,30);
%tired (FAI,ANN,2080,middle,middle,ANNUAL,FAIRBANKS,80);
%tired (FAI,WIN,2030,middle,middle,WINTER,FAIRBANKS,30);
%tired (FAI,WIN,2080,middle,middle,WINTER,FAIRBANKS,80);
%tired (FAI,SPR,2030,middle,middle,SPRING,FAIRBANKS,30);
%tired (FAI,SPR,2080,middle,middle,SPRING,FAIRBANKS,80);
%tired (FAI,SUM,2030,middle,middle,SUMMER,FAIRBANKS,30);
%tired (FAI,SUM,2080,middle,middle,SUMMER,FAIRBANKS,80);
%tired (FAI,FAL,2030,middle,middle,FALL,FAIRBANKS,30);
%tired (FAI,FAL,2080,middle,middle,FALL,FAIRBANKS,80);
%tired (FAI,ANN,2030,warmer,warmer,ANNUAL,FAIRBANKS,30);
%tired (FAI,ANN,2080,warmer,warmer,ANNUAL,FAIRBANKS,80);
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%tired (FAI,WIN,2080,warmer,warmer,WINTER,FAIRBANKS,80);
%tired (FAI,SPR,2030,warmer,warmer,SPRING,FAIRBANKS,30);
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%tired (FAI,SUM,2030,warmer,warmer,SUMMER,FAIRBANKS,30);
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%tired (BET,ANN,2080,cooler,cooler,ANNUAL,BETHEL,80);
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%tired (BET,SPR,2030,cooler,cooler,SPRING,BETHEL,30);
%tired (BET,SPR,2080,cooler,cooler,SPRING,BETHEL,80);
%tired (BET,SUM,2030,cooler,cooler,SUMMER,BETHEL,30);
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%tired (BET,ANN,2080,middle,middle,ANNUAL,BETHEL,80);

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%tired (BET,SPR,2030,middle,middle,SPRING,BETHEL,30);  
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%tired (JUN,ANN,2080,cooler,cooler,ANNUAL,JUNEAU,80);  
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%tired (JUN,WIN,2080,cooler,cooler,WINTER,JUNEAU,80);  
%tired (JUN,SPR,2030,cooler,cooler,SPRING,JUNEAU,30);  
%tired (JUN,SPR,2080,cooler,cooler,SPRING,JUNEAU,80);  
%tired (JUN,SUM,2030,cooler,cooler,SUMMER,JUNEAU,30);

```

%tired (JUN,SUM,2080,cooler,cooler,SUMMER,JUNEAU,80);
%tired (JUN,FAL,2030,cooler,cooler,FALL,JUNEAU,30);
%tired (JUN,FAL,2080,cooler,cooler,FALL,JUNEAU,80);
%tired (JUN,ANN,2030,middle,middle,ANNUAL,JUNEAU,30);
%tired (JUN,ANN,2080,middle,middle,ANNUAL,JUNEAU,80);
%tired (JUN,WIN,2030,middle,middle,WINTER,JUNEAU,30);
%tired (JUN,WIN,2080,middle,middle,WINTER,JUNEAU,80);
%tired (JUN,SPR,2030,middle,middle,SPRING,JUNEAU,30);
%tired (JUN,SPR,2080,middle,middle,SPRING,JUNEAU,80);
%tired (JUN,SUM,2030,middle,middle,SUMMER,JUNEAU,30);
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%tired (JUN,ANN,2030,warmer,warmer,ANNUAL,JUNEAU,30);
%tired (JUN,ANN,2080,warmer,warmer,ANNUAL,JUNEAU,80);
%tired (JUN,WIN,2030,warmer,warmer,WINTER,JUNEAU,30);
%tired (JUN,WIN,2080,warmer,warmer,WINTER,JUNEAU,80);
%tired (JUN,SPR,2030,warmer,warmer,SPRING,JUNEAU,30);
%tired (JUN,SPR,2080,warmer,warmer,SPRING,JUNEAU,80);
%tired (JUN,SUM,2030,warmer,warmer,SUMMER,JUNEAU,30);
%tired (JUN,SUM,2080,warmer,warmer,SUMMER,JUNEAU,80);
%tired (JUN,FAL,2030,warmer,warmer,FALL,JUNEAU,30);
%tired (JUN,FAL,2080,warmer,warmer,FALL,JUNEAU,80);

data cooler;
    set pcp_base_cooler tmp_base_cooler;
run;

proc sort data=cooler;
    by GCM_Region season Forecast_Year sample;
run;

data middle;
    set pcp_base_middle tmp_base_middle;
run;

proc sort data=middle;
    by GCM_Region season Forecast_Year sample;
run;

data warmer;
    set pcp_base_warmer tmp_base_warmer;
run;

proc sort data=warmer;
    by GCM_Region season Forecast_Year sample;
run;

data clima;
    merge cooler middle warmer;
    by GCM_Region season Forecast_Year sample;
    if Season ne "&Season." then delete;
run;

proc sort data=clima;
    by GCM_Region Forecast_Year Measure Season Time_Step sample;
run;

```

```

*****Need to get these into format so univariate can run like below, August 26,
PM;
*****;
*****;

*****This section only used for creating different shaped tables*****;
data climate2 (keep = GCM_Region measure season Forecast_Year COOLER_PCP--
SIGMA_AllYears_T);
    merge final.NCAR_wx final.UAF_wx;
    by GCM_Region Measure Season;
    if Measure="PRECIP" then do;
        COOLER_PCP = (AVG_1980to1999)*(1+csiro); *****These represent
actual precip. values for 2030 and 2080;
        MIDDLE_PCP = (AVG_1980to1999)*(1+gfdl0);
        WARMER_PCP = (AVG_1980to1999)*(1+miroc_hires);
        AVG_1980to1999_P =AVG_1980to1999;
        SIGMA_AllYears_P=SIGMA_AllYears;
    end;
    if Measure="TEMP" then do;
        COOLER_TMP = (AVG_1980to1999)+csiro; *****These represent
actual temp. values for 2030 and 2080;
        MIDDLE_TMP = (AVG_1980to1999)+gfdl0;
        WARMER_TMP = (AVG_1980to1999)+miroc_hires;
        AVG_1980to1999_T =AVG_1980to1999;
        SIGMA_AllYears_T=SIGMA_AllYears;
    end;
    informat COOLER_TMP 8.2;
    format COOLER_TMP 8.2;
    informat MIDDLE_TMP 8.2;
    format MIDDLE_TMP 8.2;
    informat WARMER_TMP 8.2;
    format WARMER_TMP 8.2;
    informat COOLER_PCP 8.2;
    format COOLER_PCP 8.2;
    informat MIDDLE_PCP 8.2;
    format MIDDLE_PCP 8.2;
    informat WARMER_PCP 8.2;
    format WARMER_PCP 8.2;
run;

data climate3 (drop=measure COOLER_pcp--SIGMA_AllYears_P) climate4 (drop=measure
measure COOLER_tmp--SIGMA_AllYears_T );
    set climate2;
    if measure ="TEMP" then output climate3;
    if measure="PRECIP" then output climate4;
run;

data climate5;
    merge climate3 climate4;
    by GCM_Region season Forecast_Year;
    if Season ne "&Season." then delete;
run;
*****End section;

*****Non-multivariate drawing occurring below*****;
*****Univariate drawing does not include continuous time step at this time;

```

```

data random_hist;
  set final.climate;
  do sample=1 to &draws. by 1;
    HIST_draw = AVG_1980to1999+(SIGMA_AllYears*rannor(0));
output;
  end;
run;

data random_COOLER;
  set final.climate;
  do sample=1 to &draws. by 1;
    COOLER_draw = COOLER+(SIGMA_AllYears*rannor(0)); output;
  end;
run;

data random_MIDDLE;
  set final.climate;
  do sample=1 to &draws. by 1;
    MIDDLE_draw = MIDDLE+(SIGMA_AllYears*rannor(0)); output;
  end;
run;

data random_WARMER;
  set final.climate;
  do sample=1 to &draws. by 1;
    WARMER_draw = WARMER+(SIGMA_AllYears*rannor(0)); output;
  end;
run;

proc sort data=random_COOLER;
  by GCM_Region Forecast_Year Measure Season sample;
run;

proc sort data=random_MIDDLE;
  by GCM_Region Forecast_Year Measure Season sample;
run;

proc sort data=random_WARMER;
  by GCM_Region Forecast_Year Measure Season sample;
run;

proc sort data=random_hist;
  by GCM_Region Forecast_Year Measure Season sample;
run;

data final.climate_postMC;
  merge random_COOLER random_MIDDLE random_WARMER random_hist;
  by GCM_Region Forecast_Year Measure Season sample;
  if Season ne "&Season." then delete;
run;

data multiv (keep=GCM_Region Forecast_Year Measure Season AVG_1980to1999
SIGMA_AllYears) ;
  *****This deletes out Univariate draws so multivariates
get used;
  set final.climate_postMC;
run;

```

```

*****This is the main file used by depreciator code;
data final.climate_postMC2;  *****Multivariate draws;
    merge multiv clima;
    by GCM_Region Forecast_Year Measure Season;
    rename cooler_draw = COOLER_draw;
    rename warmer_draw = WARMER_draw;
    rename MIDDLE_draw = MIDDLE_draw;
run;

*****The following loops generate PDFs of temp and precip using projected means
and historical sigmas BY LOCATION and YEAR*****;

%macro tmploop (var1,var2,var3,var4);

%if &variate. = MULTIVARIATE %then %do;
data loop1;
    set final.climate_postMC2;
    if GCM_Region = "&var1." and Season="&var2." and Time_Step in (2030,2080)
and Measure="TEMP" then output loop1;
run;

data loop1;
    set loop1;
    if Forecast_Year = 2080 and Time_Step=2030 then delete;
run;

%end;

%if &variate. = UNIVARIATE %then %do;
data loop1;
    set final.climate_postMC2;
    if GCM_Region = "&var1." and Season="&var2." and Measure="TEMP" then
output loop1;
run;
%end;

data loop1;
    set loop1;
    informat AVG_1980to1999 8.1;
    format AVG_1980to1999 8.1;
    if _n_ = 1 then do;
        call symput('mu',compress(put(AVG_1980to1999,8.1)));
    end;
run;
%put &mu.;

data annol;
    set loop1;
    length style text $ 200;
    retain xsys ysys hsys '3';
    x=60; y=7.5; text='NOTE: Distributions based on historical variability AND
do not reflect individual (or intra) model uncertainty. ';
    style='Swissb'; size=1.7; output;
    x=30; y=83; text='2030 ';
    style='Swissbi'; size=3; output;
    x=30; y=48; text='2080 ';
    style='Swissbi'; size=3; output;

```

```

run;

filename gifgraph "D:\NCEP\Model\SAS\Output\&var4..gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape font='Arial';

proc univariate noprint data = loop1 noprint;
  var &var3._Draw;
  class Forecast_Year;
  title1 font='Arial' height=1.75 "Likelihood of &&var1.'s Future &var2.
Temp. Variability (F)";
  %if &var3.=COOLER %then %do;
    title3 font='Arial' c=red height=1.5 "Cooler Model (Australia: CSIRO
Atmospheric Research)";
  %end;
  %if &var3.=MIDDLE %then %do;
    title3 font='Arial' c=red height=1.5 "Middle Model (US: NOAA Geophysical
Fluid Dynamics Laboratory)";
  %end;
  %if &var3.=WARMER %then %do;
    title3 font='Arial' height=1.5 c=red "Warmer Model (Japan: Center for
Climate System Research et al)";
  %end;
  histogram &var3._Draw / annotate=anno1 nobars normal nrows=2 cfill=grey
ncols=1 font="Arial" frontref href=&mu. hreflabel="20 Year Avg:&&mu.(F)"
HREFLABPOS=1 vaxislabel='Probability(%)' height=4 midpoints=0 to 50 by 5
/*cframe=white*/ cv=black;
  *inset mean='Projected Average:' (4.1) /pos=ne;
  label Forecast_Year = "Projected Year";
  %if &var3.=COOLER %then %do;
    label &var3._DRAW = "Temp (F)";
  %end;
  %if &var3.=MIDDLE %then %do;
    label &var3._DRAW = "Temp (F)";
  %end;
  %if &var3.=WARMER %then %do;
    label &var3._DRAW = "Temp (F)";
  %end;

run;
%mend;
%tmploop (ANCHORAGE,ANNUAL,COOLER,ANC_ANN_COOLER_TEMP);
%tmploop (ANCHORAGE,ANNUAL,MIDDLE,ANC_ANN_MIDDLE_TEMP);
%tmploop (ANCHORAGE,ANNUAL,WARMER,ANC_ANN_WARMER_TEMP);
%tmploop (ANCHORAGE,FALL,COOLER,ANC_FAL_COOLER_TEMP);
%tmploop (ANCHORAGE,FALL,MIDDLE,ANC_FAL_MIDDLE_TEMP);
%tmploop (ANCHORAGE,FALL,WARMER,ANC_FAL_WARMER_TEMP);
%tmploop (ANCHORAGE,WINTER,COOLER,ANC_WIN_COOLER_TEMP);
%tmploop (ANCHORAGE,WINTER,MIDDLE,ANC_WIN_MIDDLE_TEMP);
%tmploop (ANCHORAGE,WINTER,WARMER,ANC_WIN_WARMER_TEMP);
%tmploop (ANCHORAGE,SPRING,COOLER,ANC_SPR_COOLER_TEMP);
%tmploop (ANCHORAGE,SPRING,MIDDLE,ANC_SPR_MIDDLE_TEMP);
%tmploop (ANCHORAGE,SPRING,WARMER,ANC_SPR_WARMER_TEMP);
%tmploop (ANCHORAGE,SUMMER,COOLER,ANC_SUM_COOLER_TEMP);
%tmploop (ANCHORAGE,SUMMER,MIDDLE,ANC_SUM_MIDDLE_TEMP);
%tmploop (ANCHORAGE,SUMMER,WARMER,ANC_SUM_WARMER_TEMP);

```

```

%tmploop (BARROW, ANNUAL, COOLER, BAR_ANN_COOLER_TEMP);
%tmploop (BARROW, ANNUAL, MIDDLE, BAR_ANN_MIDDLE_TEMP);
%tmploop (BARROW, ANNUAL, WARMER, BAR_ANN_WARMER_TEMP);
%tmploop (BARROW, FALL, COOLER, BAR_FAL_COOLER_TEMP);
%tmploop (BARROW, FALL, MIDDLE, BAR_FAL_MIDDLE_TEMP);
%tmploop (BARROW, FALL, WARMER, BAR_FAL_WARMER_TEMP);
%tmploop (BARROW, WINTER, COOLER, BAR_WIN_COOLER_TEMP);
%tmploop (BARROW, WINTER, MIDDLE, BAR_WIN_MIDDLE_TEMP);
%tmploop (BARROW, WINTER, WARMER, BAR_WIN_WARMER_TEMP);
%tmploop (BARROW, SPRING, COOLER, BAR_SPR_COOLER_TEMP);
%tmploop (BARROW, SPRING, MIDDLE, BAR_SPR_MIDDLE_TEMP);
%tmploop (BARROW, SPRING, WARMER, BAR_SPR_WARMER_TEMP);
%tmploop (BARROW, SUMMER, COOLER, BAR_SUM_COOLER_TEMP);
%tmploop (BARROW, SUMMER, MIDDLE, BAR_SUM_MIDDLE_TEMP);
%tmploop (BARROW, SUMMER, WARMER, BAR_SUM_WARMER_TEMP);

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%tmploop (BETHEL, ANNUAL, MIDDLE, BET_ANN_MIDDLE_TEMP);
%tmploop (BETHEL, ANNUAL, WARMER, BET_ANN_WARMER_TEMP);
%tmploop (BETHEL, FALL, COOLER, BET_FAL_COOLER_TEMP);
%tmploop (BETHEL, FALL, MIDDLE, BET_FAL_MIDDLE_TEMP);
%tmploop (BETHEL, FALL, WARMER, BET_FAL_WARMER_TEMP);
%tmploop (BETHEL, WINTER, COOLER, BET_WIN_COOLER_TEMP);
%tmploop (BETHEL, WINTER, MIDDLE, BET_WIN_MIDDLE_TEMP);
%tmploop (BETHEL, WINTER, WARMER, BET_WIN_WARMER_TEMP);
%tmploop (BETHEL, SPRING, COOLER, BET_SPR_COOLER_TEMP);
%tmploop (BETHEL, SPRING, MIDDLE, BET_SPR_MIDDLE_TEMP);
%tmploop (BETHEL, SPRING, WARMER, BET_SPR_WARMER_TEMP);
%tmploop (BETHEL, SUMMER, COOLER, BET_SUM_COOLER_TEMP);
%tmploop (BETHEL, SUMMER, MIDDLE, BET_SUM_MIDDLE_TEMP);
%tmploop (BETHEL, SUMMER, WARMER, BET_SUM_WARMER_TEMP);

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%tmploop (FAIRBANKS, ANNUAL, MIDDLE, FAI_ANN_MIDDLE_TEMP);
%tmploop (FAIRBANKS, ANNUAL, WARMER, FAI_ANN_WARMER_TEMP);
%tmploop (FAIRBANKS, FALL, COOLER, FAI_FAL_COOLER_TEMP);
%tmploop (FAIRBANKS, FALL, MIDDLE, FAI_FAL_MIDDLE_TEMP);
%tmploop (FAIRBANKS, FALL, WARMER, FAI_FAL_WARMER_TEMP);
%tmploop (FAIRBANKS, WINTER, COOLER, FAI_WIN_COOLER_TEMP);
%tmploop (FAIRBANKS, WINTER, MIDDLE, FAI_WIN_MIDDLE_TEMP);
%tmploop (FAIRBANKS, WINTER, WARMER, FAI_WIN_WARMER_TEMP);
%tmploop (FAIRBANKS, SPRING, COOLER, FAI_SPR_COOLER_TEMP);
%tmploop (FAIRBANKS, SPRING, MIDDLE, FAI_SPR_MIDDLE_TEMP);
%tmploop (FAIRBANKS, SPRING, WARMER, FAI_SPR_WARMER_TEMP);
%tmploop (FAIRBANKS, SUMMER, COOLER, FAI_SUM_COOLER_TEMP);
%tmploop (FAIRBANKS, SUMMER, MIDDLE, FAI_SUM_MIDDLE_TEMP);
%tmploop (FAIRBANKS, SUMMER, WARMER, FAI_SUM_WARMER_TEMP);

%tmploop (JUNEAU, ANNUAL, COOLER, JUN_ANN_COOLER_TEMP);
%tmploop (JUNEAU, ANNUAL, MIDDLE, JUN_ANN_MIDDLE_TEMP);
%tmploop (JUNEAU, ANNUAL, WARMER, JUN_ANN_WARMER_TEMP);
%tmploop (JUNEAU, FALL, COOLER, JUN_FAL_COOLER_TEMP);
%tmploop (JUNEAU, FALL, MIDDLE, JUN_FAL_MIDDLE_TEMP);
%tmploop (JUNEAU, FALL, WARMER, JUN_FAL_WARMER_TEMP);
%tmploop (JUNEAU, WINTER, COOLER, JUN_WIN_COOLER_TEMP);
%tmploop (JUNEAU, WINTER, MIDDLE, JUN_WIN_MIDDLE_TEMP);
%tmploop (JUNEAU, WINTER, WARMER, JUN_WIN_WARMER_TEMP);

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```

%tmploop (JUNEAU,SPRING,COOLER,JUN_SPR_COOLER_TEMP);
%tmploop (JUNEAU,SPRING,MIDDLE,JUN_SPR_MIDDLE_TEMP);
%tmploop (JUNEAU,SPRING,WARMER,JUN_SPR_WARMER_TEMP);
%tmploop (JUNEAU,SUMMER,COOLER,JUN_SUM_COOLER_TEMP);
%tmploop (JUNEAU,SUMMER,MIDDLE,JUN_SUM_MIDDLE_TEMP);
%tmploop (JUNEAU,SUMMER,WARMER,JUN_SUM_WARMER_TEMP);

%tmploop (NOME,ANNUAL,COOLER,NOM_ANN_COOLER_TEMP);
%tmploop (NOME,ANNUAL,MIDDLE,NOM_ANN_MIDDLE_TEMP);
%tmploop (NOME,ANNUAL,WARMER,NOM_ANN_WARMER_TEMP);
%tmploop (NOME,FALL,COOLER,NOM_FAL_COOLER_TEMP);
%tmploop (NOME,FALL,MIDDLE,NOM_FAL_MIDDLE_TEMP);
%tmploop (NOME,FALL,WARMER,NOM_FAL_WARMER_TEMP);
%tmploop (NOME,WINTER,COOLER,NOM_WIN_COOLER_TEMP);
%tmploop (NOME,WINTER,MIDDLE,NOM_WIN_MIDDLE_TEMP);
%tmploop (NOME,WINTER,WARMER,NOM_WIN_WARMER_TEMP);
%tmploop (NOME,SPRING,COOLER,NOM_SPR_COOLER_TEMP);
%tmploop (NOME,SPRING,MIDDLE,NOM_SPR_MIDDLE_TEMP);
%tmploop (NOME,SPRING,WARMER,NOM_SPR_WARMER_TEMP);
%tmploop (NOME,SUMMER,COOLER,NOM_SUM_COOLER_TEMP);
%tmploop (NOME,SUMMER,MIDDLE,NOM_SUM_MIDDLE_TEMP);
%tmploop (NOME,SUMMER,WARMER,NOM_SUM_WARMER_TEMP);

*****The following loops generate PDFs of temp and precip using projected means
and historical sigmas BY LOCATION and YEAR*****;

goptions reset=all;
run;
quit;

%macro pcplloop (var5,var6,var7,var8);

%if &variate. = MULTIVARIATE %then %do;
data loop2;
    set final.climate_postMC2;
    if GCM_Region = "&var5." and Season="&var6." and Time_Step in (2030,2080)
and Measure="PRECIP" then output loop2;
run;

data loop1;
    set loop1;
    if Forecast_Year = 2080 and Time_Step=2030 then delete;
run;
%end;

%if &variate. = UNIVARIATE %then %do;
data loop2;
    set final.climate_postMC;
    if GCM_Region = "&var5." and Season="&var6." and Measure="PRECIP" then
output loop2;
run;
%end;

data loop2;
    set loop2;
    informat AVG_1980to1999 8.1;
    format AVG_1980to1999 8.1;

```

```

    if _n_ = 1 then do;
        call symput('mu2',compress(put(AVG_1980to1999,8.1)));
    end;
    if COOLER_Draw < 0 then COOLER_Draw = 0;          *****Clears out negative
draws, but does not fix graphing problem;
    if WARMER_Draw < 0 then WARMER_Draw = 0;          *****Clears out negative
draws, but does not fix graphing problem;
    if MIDDLE_Draw < 0 then MIDDLE_Draw = 0;          *****Clears out negative
draws, but does not fix graphing problem;
run;
%put &mu2.;

data anno2;
    set loop2;
    length style text $ 200;
    retain xsys ysys hsys '3';
    x=60; y=7.5; text='NOTE: Distributions based on historical variability AND
do not reflect individual (or intra) model uncertainty. ';
    style='Swissb'; size=1.7; output;
    x=30; y=83; text='2030 ';
    style='Swissbi'; size=3; output;
    x=30; y=48; text='2080 ';
    style='Swissbi'; size=3; output;
run;

filename gifgraph "D:\NCEP\Model\SAS\Output\&var8..gif";
goptions device=GIF gsfname=gifgraph gsfmode=replace;
options orientation=landscape font='Arial';

proc univariate noprint data = loop2 noprint;
    var &var7._Draw;
    class Forecast_Year;
    title1 font='Arial' height=1.75 "Likelihood of &&var5.'s Future &var6.
Precip. Variability (Inches)";
    %if &var7.=COOLER %then %do;
        title3 font='Arial' c=red height=1.5 "Cooler Model (Australia: CSIRO
Atmospheric Research)";
    %end;
    %if &var7.=MIDDLE %then %do;
        title3 font='Arial' c=red height=1.5 "Middle Model (US: NOAA Geophysical
Fluid Dynamics Laboratory)";
    %end;
    %if &var7.=WARMER %then %do;
        title3 font='Arial' height=1.5 c=red "Warmer Model (Japan: Center for
Climate System Research et al)";
    %end;
    histogram &var7._Draw /Annotate=anno2 nrows=2 nobars normal cfill=grey
ncols=1 font="Arial" frontref href=&mu2. hreflabel="20 Year Avg:&&mu2."
HREFLABPOS=1 vaxislabel='Probability(%)' height=4 midpoints=0 to 25 by 1
/*cframe=white*/ cv=black;
    *inset mean='Projected Average:' (4.1) /pos=ne;
    label Forecast_Year = "Projected Year";
    %if &var7.=COOLER %then %do;
        label &var7._DRAW = "Precip (Inches)";
    %end;
    %if &var7.=MIDDLE %then %do;
        label &var7._DRAW = "Precip (Inches)";
    %end;

```

```

    %end;
    %if &var7.=WARMER %then %do;
    label &var7._DRAW = "Precip (Inches)";
    %end;

run;
%mend;

%pcplloop (ANCHORAGE, ANNUAL, COOLER, ANC_ANN_COOLER_PCP);
%pcplloop (ANCHORAGE, ANNUAL, MIDDLE, ANC_ANN_MIDDLE_PCP);
%pcplloop (ANCHORAGE, ANNUAL, WARMER, ANC_ANN_WARMER_PCP);
%pcplloop (ANCHORAGE, FALL, COOLER, ANC_FAL_COOLER_PCP);
%pcplloop (ANCHORAGE, FALL, MIDDLE, ANC_FAL_MIDDLE_PCP);
%pcplloop (ANCHORAGE, FALL, WARMER, ANC_FAL_WARMER_PCP);
%pcplloop (ANCHORAGE, WINTER, COOLER, ANC_WIN_COOLER_PCP);
%pcplloop (ANCHORAGE, WINTER, MIDDLE, ANC_WIN_MIDDLE_PCP);
%pcplloop (ANCHORAGE, WINTER, WARMER, ANC_WIN_WARMER_PCP);
%pcplloop (ANCHORAGE, SPRING, COOLER, ANC_SPR_COOLER_PCP);
%pcplloop (ANCHORAGE, SPRING, MIDDLE, ANC_SPR_MIDDLE_PCP);
%pcplloop (ANCHORAGE, SPRING, WARMER, ANC_SPR_WARMER_PCP);
%pcplloop (ANCHORAGE, SUMMER, COOLER, ANC_SUM_COOLER_PCP);
%pcplloop (ANCHORAGE, SUMMER, MIDDLE, ANC_SUM_MIDDLE_PCP);
%pcplloop (ANCHORAGE, SUMMER, WARMER, ANC_SUM_WARMER_PCP);

%pcplloop (BARROW, ANNUAL, COOLER, BAR_ANN_COOLER_PCP);
%pcplloop (BARROW, ANNUAL, MIDDLE, BAR_ANN_MIDDLE_PCP);
%pcplloop (BARROW, ANNUAL, WARMER, BAR_ANN_WARMER_PCP);
%pcplloop (BARROW, FALL, COOLER, BAR_FAL_COOLER_PCP);
%pcplloop (BARROW, FALL, MIDDLE, BAR_FAL_MIDDLE_PCP);
%pcplloop (BARROW, FALL, WARMER, BAR_FAL_WARMER_PCP);
%pcplloop (BARROW, WINTER, COOLER, BAR_WIN_COOLER_PCP);
%pcplloop (BARROW, WINTER, MIDDLE, BAR_WIN_MIDDLE_PCP);
%pcplloop (BARROW, WINTER, WARMER, BAR_WIN_WARMER_PCP);
%pcplloop (BARROW, SPRING, COOLER, BAR_SPR_COOLER_PCP);
%pcplloop (BARROW, SPRING, MIDDLE, BAR_SPR_MIDDLE_PCP);
%pcplloop (BARROW, SPRING, WARMER, BAR_SPR_WARMER_PCP);
%pcplloop (BARROW, SUMMER, COOLER, BAR_SUM_COOLER_PCP);
%pcplloop (BARROW, SUMMER, MIDDLE, BAR_SUM_MIDDLE_PCP);
%pcplloop (BARROW, SUMMER, WARMER, BAR_SUM_WARMER_PCP);

%pcplloop (BETHEL, ANNUAL, COOLER, BET_ANN_COOLER_PCP);
%pcplloop (BETHEL, ANNUAL, MIDDLE, BET_ANN_MIDDLE_PCP);
%pcplloop (BETHEL, ANNUAL, WARMER, BET_ANN_WARMER_PCP);
%pcplloop (BETHEL, FALL, COOLER, BET_FAL_COOLER_PCP);
%pcplloop (BETHEL, FALL, MIDDLE, BET_FAL_MIDDLE_PCP);
%pcplloop (BETHEL, FALL, WARMER, BET_FAL_WARMER_PCP);
%pcplloop (BETHEL, WINTER, COOLER, BET_WIN_COOLER_PCP);
%pcplloop (BETHEL, WINTER, MIDDLE, BET_WIN_MIDDLE_PCP);
%pcplloop (BETHEL, WINTER, WARMER, BET_WIN_WARMER_PCP);
%pcplloop (BETHEL, SPRING, COOLER, BET_SPR_COOLER_PCP);
%pcplloop (BETHEL, SPRING, MIDDLE, BET_SPR_MIDDLE_PCP);
%pcplloop (BETHEL, SPRING, WARMER, BET_SPR_WARMER_PCP);
%pcplloop (BETHEL, SUMMER, COOLER, BET_SUM_COOLER_PCP);
%pcplloop (BETHEL, SUMMER, MIDDLE, BET_SUM_MIDDLE_PCP);
%pcplloop (BETHEL, SUMMER, WARMER, BET_SUM_WARMER_PCP);

%pcplloop (FAIRBANKS, ANNUAL, COOLER, FAI_ANN_COOLER_PCP);
%pcplloop (FAIRBANKS, ANNUAL, MIDDLE, FAI_ANN_MIDDLE_PCP);
%pcplloop (FAIRBANKS, ANNUAL, WARMER, FAI_ANN_WARMER_PCP);

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%pcplloop (FAIRBANKS,FALL,COOLER,FAI_FAL_COOLER_PCP);
%pcplloop (FAIRBANKS,FALL,MIDDLE,FAI_FAL_MIDDLE_PCP);
%pcplloop (FAIRBANKS,FALL,WARMER,FAI_FAL_WARMER_PCP);
%pcplloop (FAIRBANKS,WINTER,COOLER,FAI_WIN_COOLER_PCP);
%pcplloop (FAIRBANKS,WINTER,MIDDLE,FAI_WIN_MIDDLE_PCP);
%pcplloop (FAIRBANKS,WINTER,WARMER,FAI_WIN_WARMER_PCP);
%pcplloop (FAIRBANKS,SPRING,COOLER,FAI_SPR_COOLER_PCP);
%pcplloop (FAIRBANKS,SPRING,MIDDLE,FAI_SPR_MIDDLE_PCP);
%pcplloop (FAIRBANKS,SPRING,WARMER,FAI_SPR_WARMER_PCP);
%pcplloop (FAIRBANKS,SUMMER,COOLER,FAI_SUM_COOLER_PCP);
%pcplloop (FAIRBANKS,SUMMER,MIDDLE,FAI_SUM_MIDDLE_PCP);
%pcplloop (FAIRBANKS,SUMMER,WARMER,FAI_SUM_WARMER_PCP);

%pcplloop (JUNEAU,ANNUAL,COOLER,JUN_ANN_COOLER_PCP);
%pcplloop (JUNEAU,ANNUAL,MIDDLE,JUN_ANN_MIDDLE_PCP);
%pcplloop (JUNEAU,ANNUAL,WARMER,JUN_ANN_WARMER_PCP);
%pcplloop (JUNEAU,FALL,COOLER,JUN_FAL_COOLER_PCP);
%pcplloop (JUNEAU,FALL,MIDDLE,JUN_FAL_MIDDLE_PCP);
%pcplloop (JUNEAU,FALL,WARMER,JUN_FAL_WARMER_PCP);
%pcplloop (JUNEAU,WINTER,COOLER,JUN_WIN_COOLER_PCP);
%pcplloop (JUNEAU,WINTER,MIDDLE,JUN_WIN_MIDDLE_PCP);
%pcplloop (JUNEAU,WINTER,WARMER,JUN_WIN_WARMER_PCP);
%pcplloop (JUNEAU,SPRING,COOLER,JUN_SPR_COOLER_PCP);
%pcplloop (JUNEAU,SPRING,MIDDLE,JUN_SPR_MIDDLE_PCP);
%pcplloop (JUNEAU,SPRING,WARMER,JUN_SPR_WARMER_PCP);
%pcplloop (JUNEAU,SUMMER,COOLER,JUN_SUM_COOLER_PCP);
%pcplloop (JUNEAU,SUMMER,MIDDLE,JUN_SUM_MIDDLE_PCP);
%pcplloop (JUNEAU,SUMMER,WARMER,JUN_SUM_WARMER_PCP);

%pcplloop (NOME,ANNUAL,COOLER,NOM_ANN_COOLER_PCP);
%pcplloop (NOME,ANNUAL,MIDDLE,NOM_ANN_MIDDLE_PCP);
%pcplloop (NOME,ANNUAL,WARMER,NOM_ANN_WARMER_PCP);
%pcplloop (NOME,FALL,COOLER,NOM_FAL_COOLER_PCP);
%pcplloop (NOME,FALL,MIDDLE,NOM_FAL_MIDDLE_PCP);
%pcplloop (NOME,FALL,WARMER,NOM_FAL_WARMER_PCP);
%pcplloop (NOME,WINTER,COOLER,NOM_WIN_COOLER_PCP);
%pcplloop (NOME,WINTER,MIDDLE,NOM_WIN_MIDDLE_PCP);
%pcplloop (NOME,WINTER,WARMER,NOM_WIN_WARMER_PCP);
%pcplloop (NOME,SPRING,COOLER,NOM_SPR_COOLER_PCP);
%pcplloop (NOME,SPRING,MIDDLE,NOM_SPR_MIDDLE_PCP);
%pcplloop (NOME,SPRING,WARMER,NOM_SPR_WARMER_PCP);
%pcplloop (NOME,SUMMER,COOLER,NOM_SUM_COOLER_PCP);
%pcplloop (NOME,SUMMER,MIDDLE,NOM_SUM_MIDDLE_PCP);
%pcplloop (NOME,SUMMER,WARMER,NOM_SUM_WARMER_PCP);

*****Time series graphs below;

data projections;
    set final.climate_postmc2;
    if GCM_Region = "ANCHORAGE" and Season="ANNUAL" and Measure="TEMP" and
Forecast_Year=2080;
        label cooler_draw="Cooler Model";
        label middle_draw="Middle Model";
        label warmer_draw="Warmer Model";
run;

proc univariate noprint data =projections;

```

```

        var middle_draw;
        by time_step;
        output out = PROJ_MEANS
        MEAN=MEAN;
run;

data projections;
    merge projections PROJ_MEANS;
    by time_step;
    label mean="Average Projection";
    if SAMPLE ne 1 then delete;
run;

goptions reset=all;
run;
quit;

proc gplot data=projections;

/*format cooler_draw 8.2;
format middle_draw 8.2;
format warmer_draw 8.2;*/

filename gifgraph "D:\NCEP\Model\SAS\Output\projection.gif";
goptions device=GIF gsfname=gifgraph2 gsfname=replace;
run;

title1 height=2.2 color=black f=simplex "Precip Projections";
title2 height=1.8 color=black f=simplex "Bethel, Alaska USA";

axis1 value=(height=1.25)
    label=(f=simplex height=1.5 'Year')
    color=black
    order=(2007 to 2080 by 5);

axis2 value=(height=1.25)
    order=(0 to 75 by 5)
    label=(f=simplex height=1.5 angle=90 'Precip(In)')
    color=black;

symbol1 v=none line=1 h=.5 i=join color=blue;
symbol2 v=none line=20 h=.5 i=join color=black;

legend1 value=('Cooler Model' 'Avg 1980-1999') position=(bottom center outside);

plot
    mean*time_step=1
    AVG_1980to1999*time_step=2
    /*middle_draw*time_step=2
    warmer_draw*time_step=3*/

    /OVERLAY

    vaxis=axis2
    haxis=axis1
    caxis=red

```

```
noframe
legend=legend1
cframe=white
name='Climate Projections';
run;
quit;
```