Ensembles of Forecast Model Run Collections using pyFerret or Ferret
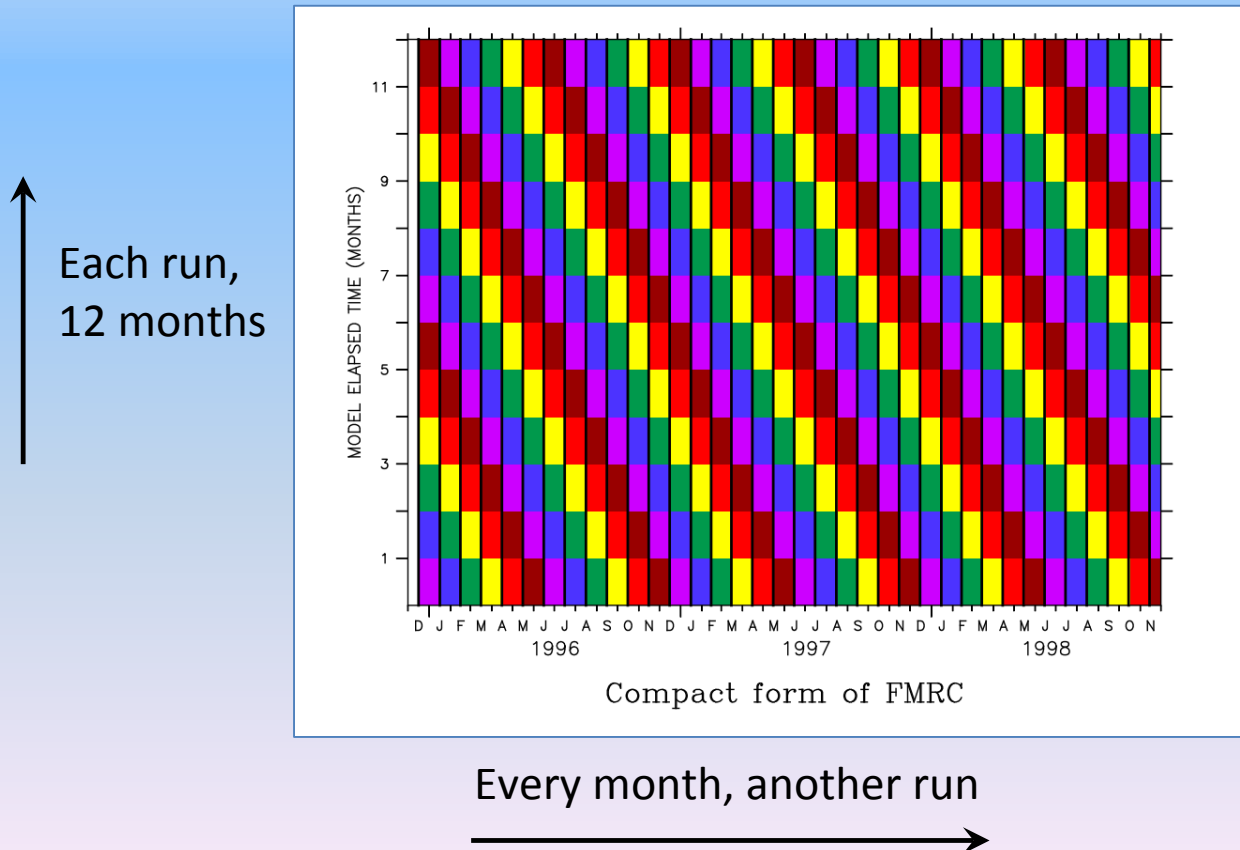
Steve Hankin
UW/JISAO
NOAA/PMEL/Sci.Dat.Integ.Grp.

April 2016
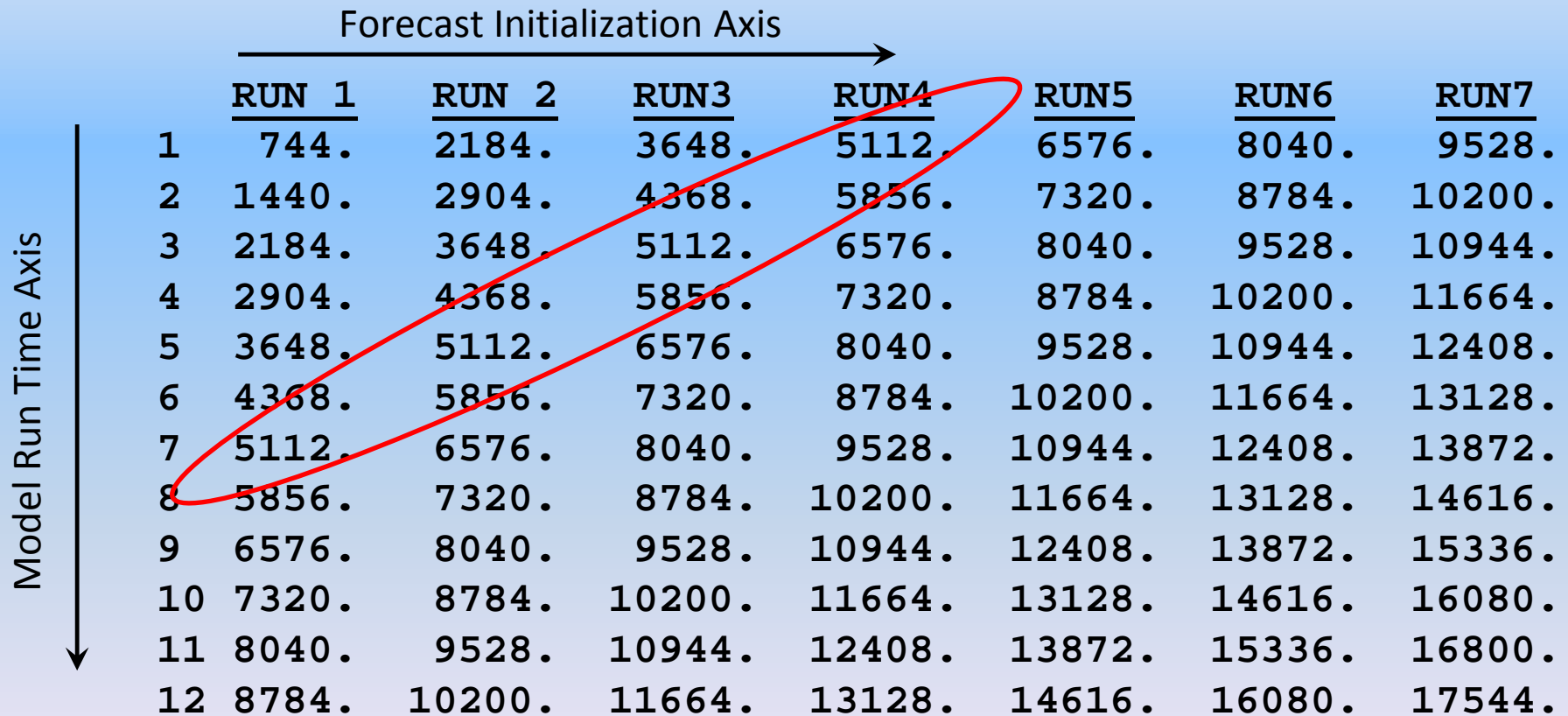
Ensembles of FMRCs

A Forecast Model Run Collection

Each run, 12 months →

Compact form of FMRC

Every month, another run →

The collected time axes are a 2D field

Forecast Initialization Axis →

Model Run Time Axis ↓

	RUN 1	RUN 2	RUN3	RUN4	RUN5	RUN6	RUN7
1	744.	2184.	3648.	5112.	6576.	8040.	9528.
2	1440.	2904.	4368.	5856.	7320.	8784.	10200.
3	2184.	3648.	5112.	6576.	8040.	9528.	10944.
4	2904.	4368.	5856.	7320.	8784.	10200.	11664.
5	3648.	5112.	6576.	8040.	9528.	10944.	12408.
6	4368.	5856.	7320.	8784.	10200.	11664.	13128.
7	5112.	6576.	8040.	9528.	10944.	12408.	13872.
8	5856.	7320.	8784.	10200.	11664.	13128.	14616.
9	6576.	8040.	9528.	10944.	12408.	13872.	15336.
10	7320.	8784.	10200.	11664.	13128.	14616.	16080.
11	8040.	9528.	10944.	12408.	13872.	15336.	16800.
12	8784.	10200.	11664.	13128.	14616.	16080.	17544.

Define FMRCs of each ensemble member(*):

yes? FMRC e1 = nmme_1_files
yes? FMRC e2 = nmme_2_files
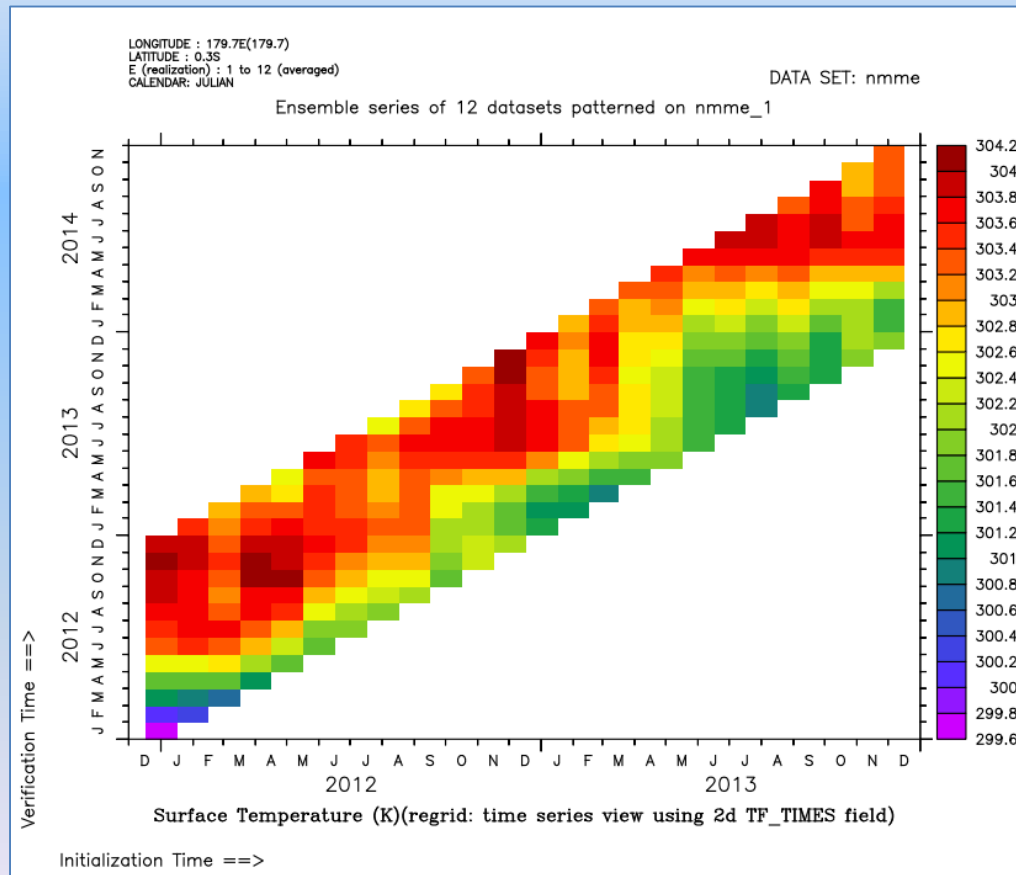yes? FMRC e3 = nmme_3_files
.
.
.
yes? FMRC e12 = nmme_12_files

… and then define the ensemble:

yes? ENSEMBLE nmme = e1, e2,e3, … ,e12

'Diagonal form' of the FMRCs; the ensemble average

yes? LET diag = ts[GT(time)=TF_CAL_T]
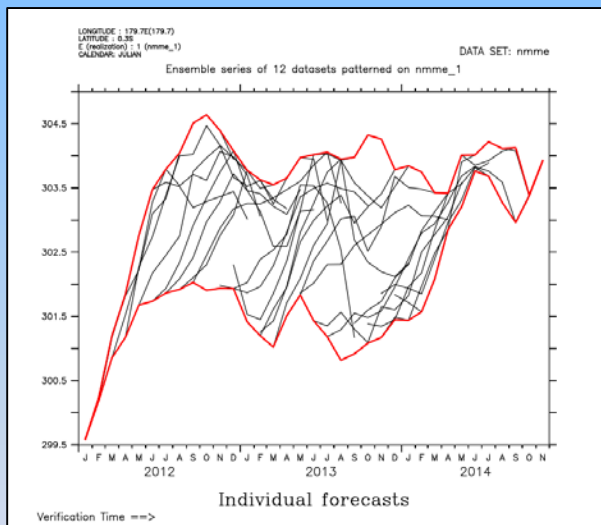yes? SHADE/X=180/Y=0   diag[M=@ave]

twelve ensemble members, averaged
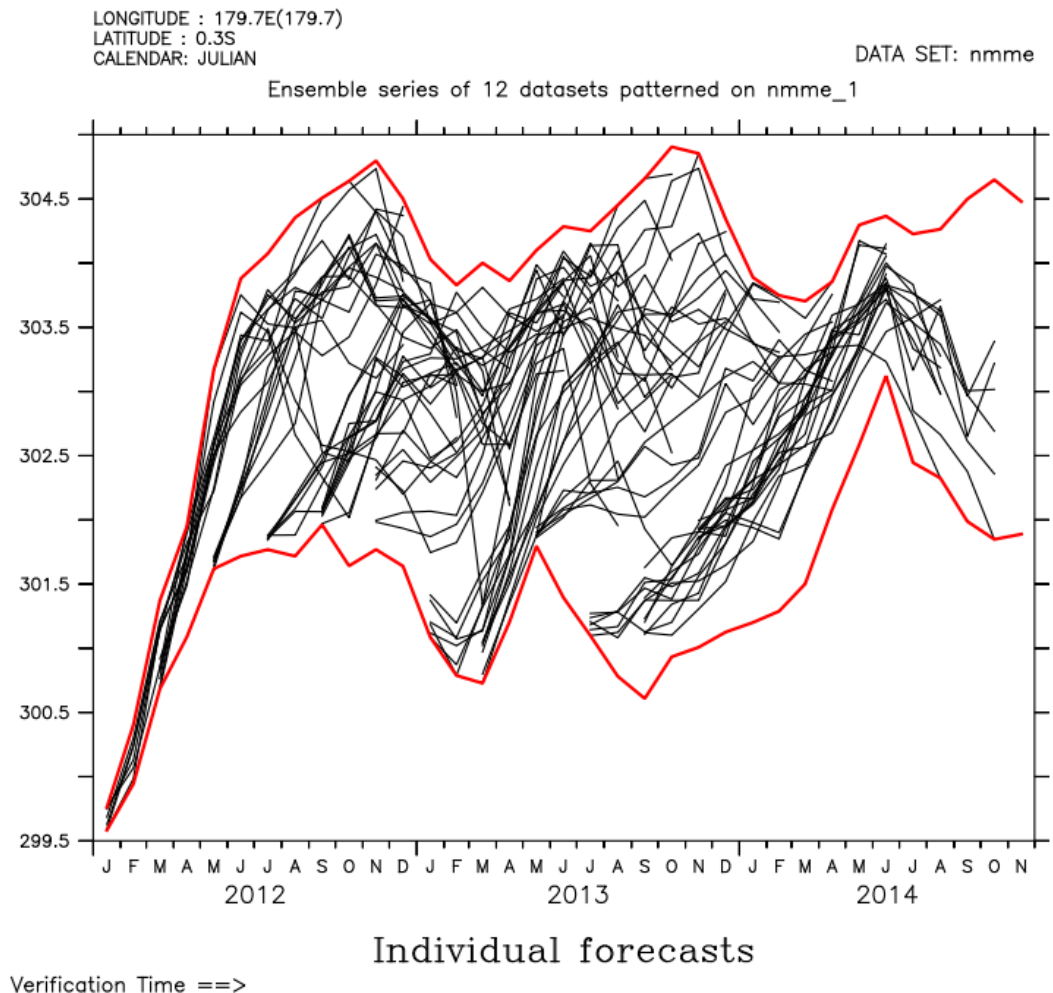
The individual forecast time series at this point

yes? SET REGION/x=180/y=0
yes? PLOT/ALONG=t/TITLE="Individual forecasts" diag
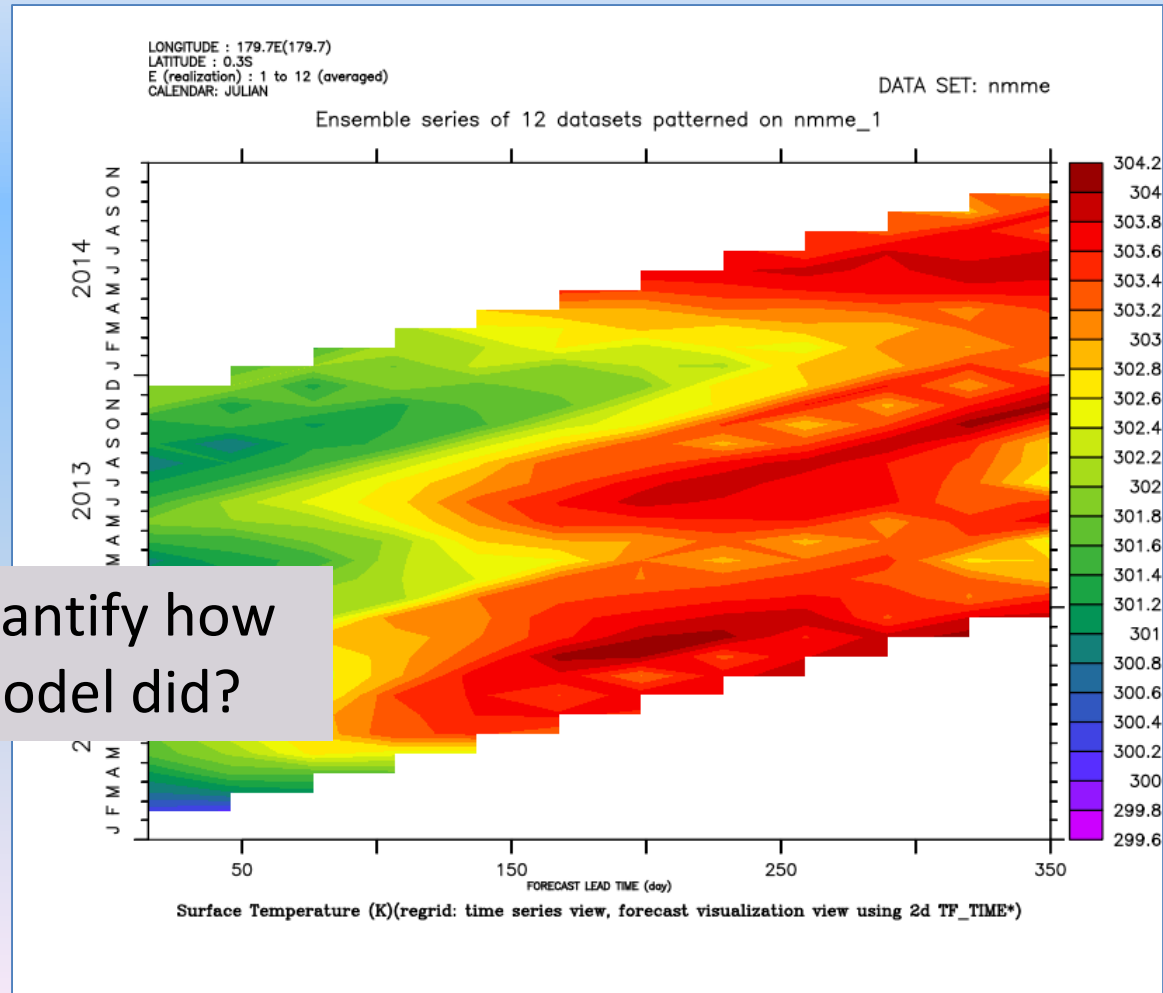yes? PLOT/OVER/COLOR=red diag[m=@min,n=@min],diag[m=@max,n=@max]
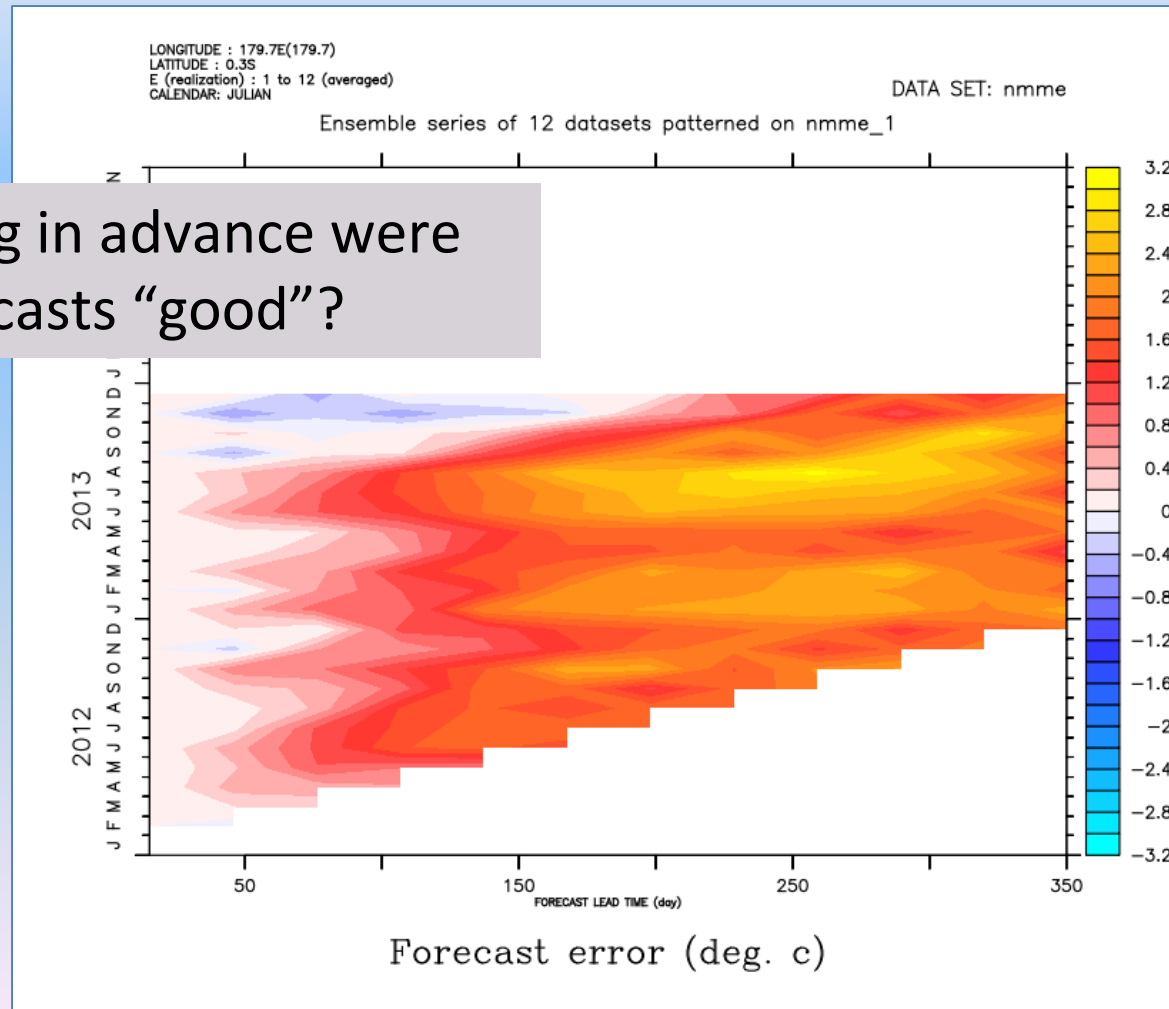

1st ensemble member, only

'Skill form' of the FMRCs

LET ts_lead_view = ts[gt(time)=TF_CAL_T,gf(time)=TF_LAG_F]
FILL/X=180/Y=0   ts_lead_view [m=@ave]

Can we quantify how well the model did?

LET ts_fe = ts_lead_view - ts_lead_view[N=1]
LET ts_stddev = ts_lead_view[N=1,L=@std]
LET/TITLE=… ts_nfe = ts_fe/ts_stddev
FILL/Y=180/Y=0 ts_nfe[m=@ave]

Normalized
forecast error

How long in advance were
our forecasts "good"?

Forecast error (deg. c)

Say, "good" == abs. val. of error within 0.5 std dev of 't_init' value
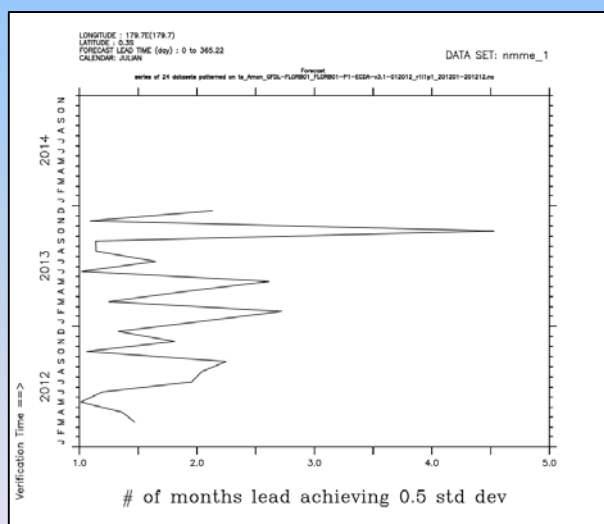
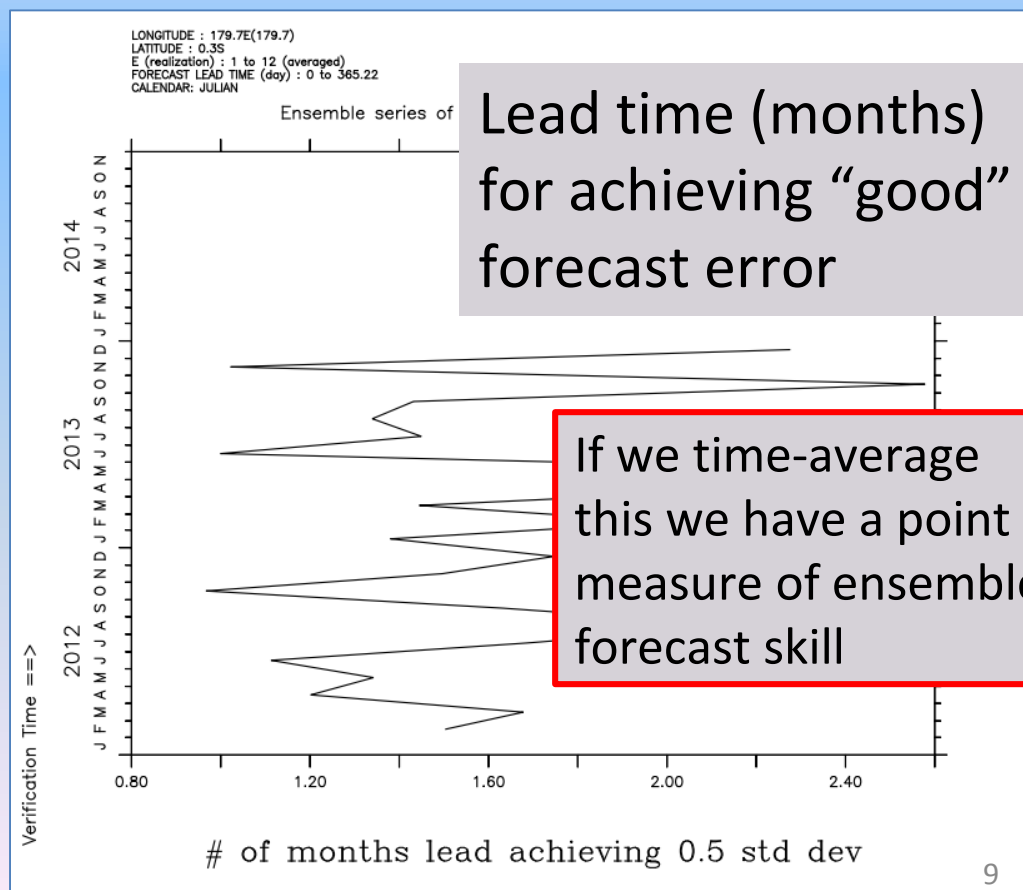LET ts_abs = ABS(ts_nfe)
LET ts_skill_day = ts_abs[F=@loc:.5]
LET/title="…" ts_skill = ts_skill_day/30.3
PLOT/X=180/Y=0   ts_skill[m=@ave]

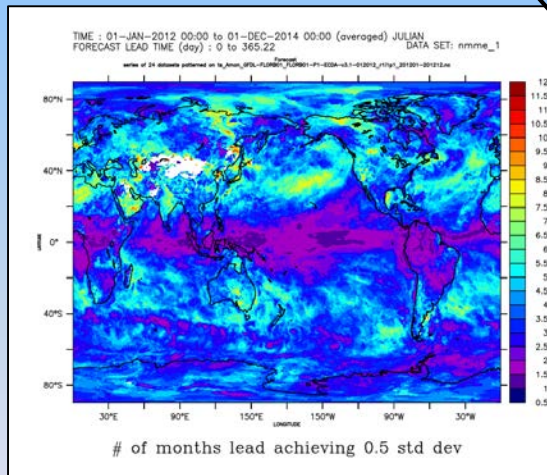"F=@loc:.5" finds the location where the curve crosses .5

1st ensemble member, only

Lead time (months) for achieving "good" forecast error

If we time-average this we have a point measure of ensemble forecast skill

yes? FILL ts_skill[M=@ave,L=@ave]

Global "good" forecast lead time (months)

What accounts for this? winds?

TIME : 01-JAN-2012 00:00 to 01-DEC-2014 00:00 (T ave) JULIAN
E (realization) : 1 to 12 (T ave)
FORECAST LEAD TIME (day) : 0 to 365.22

DATA SET: nmme

Ensemble series of 12 datasets patterned on nmme_1

# of months lead achieving 0.5 std dev

1st ensemble member
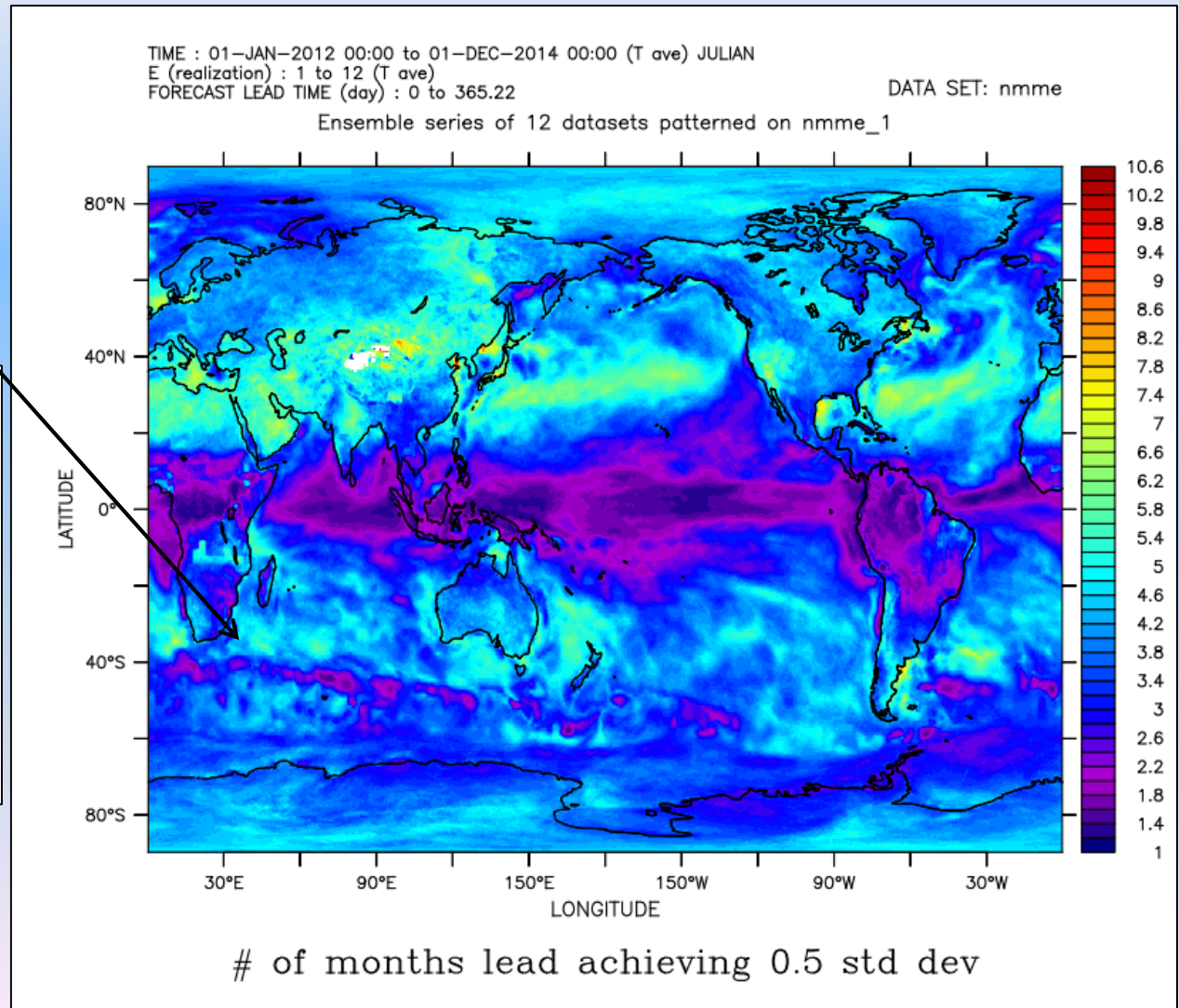
yes? FILL ts_skill[L=@ave,M=@std]

How robust is our forecast skill across ensemble members?

The ensemble standard deviation.

TIME : 01-JAN-2012 00:00 to 01-DEC-2014 00:00 (averaged) JULIAN
E (realization) : 1 to 12 (standard deviation)
FORECAST LEAD TIME (day) : 0 to 365.22   DATA SET: nmme

Ensemble series of 12 datasets patterned on nmme_1

# of months lead achieving 0.5 std dev