Ensembles of Forecast Model Run Collections using pyFerret or Ferret

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Ensembles of FMRCs

A Forecast Model Run Collection

Each run, 12 months

Every month, another run
The collected time axes are a 2D field

<table>
<thead>
<tr>
<th>Model Run Time Axis</th>
<th>Forecast Initialization Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN 1</td>
<td>RUN 2</td>
</tr>
<tr>
<td>1</td>
<td>744.</td>
</tr>
<tr>
<td>2</td>
<td>1440.</td>
</tr>
<tr>
<td>3</td>
<td>2184.</td>
</tr>
<tr>
<td>4</td>
<td>2904.</td>
</tr>
<tr>
<td>5</td>
<td>3648.</td>
</tr>
<tr>
<td>6</td>
<td>4368.</td>
</tr>
<tr>
<td>7</td>
<td>5112.</td>
</tr>
<tr>
<td>8</td>
<td>5856.</td>
</tr>
<tr>
<td>9</td>
<td>6576.</td>
</tr>
<tr>
<td>10</td>
<td>7320.</td>
</tr>
<tr>
<td>11</td>
<td>8040.</td>
</tr>
<tr>
<td>12</td>
<td>8784.</td>
</tr>
</tbody>
</table>
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]

1\textsuperscript{st} 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”?
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

Lead time (months) for achieving “good” forecast error

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

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

What accounts for this? winds?

1st ensemble member

Global “good” forecast lead time (months)

# of months lead achieving 0.5 std dev
How robust is our forecast skill across ensemble members?

The ensemble standard deviation.