Estimation of the model climate (reforecasts)

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Model climate from reforecasts

Forecast and re-Climate cumulative distribution functions with ECI values at 12 LFP on 12 UTC
validation 24 hours from Sunday 8 December 2013 00 UTC to Monday 9 December 2013 00 UTC

cdf for 24h precipitable mm

cdf for 24h maximum wind gust (m/s)

cdf for 24h mean temperature (°C)

ECMWF EPS-Monthly Forecasting System
2-m air Temperature anomaly
Forecast start: 8 Dec 2013
Averaging time: 5-day
Modification time: 10-day

ECMWF

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Why do we need reforecasts?
Motivation 1:

17 km between the stations, ENS resolution 32 km..
Motivation 2:

SST anomaly (from the obs. climatology)

Forecasts from 28 Nov 0 UTC

+120h

+240h
Model bias day 10
Anomaly in respect to model climate (weekly mean)
Why do we need reforecasts?

- Local conditions that is not covered by the model grid (look at anomalies to the model climate)
- Account for systematic errors in the model
- Account for model drift (change in systematic error with lead time)
Aim of reforecasts: Sampling the climatology of the current model version
Configuration of reforecasts

Example: Thursday 12 December 2013:

12 December 1993:

12 December 1994:

12 December 2012:

20 years x 5 forecasts = 100 forecasts
Present model version
Ensemble configuration to 32 days
Initialised from ERA Interim
Example: 2-metre temperature values for 132-hour reforecasts

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Probability distribution function (PDF)
Cumulative distribution function (CDF)
What is the probability for temperature < -10?
Cumulative distribution function
Model climate and observed climate (Nikkaloukta)
Nearby stations (Nikkaloukta – black, Tarfala – green)
How to use the reforecast data set?

**M-Climate**: this stands for "Model Climate". It is a function of lead time, date ( +/- ~15 days), and model version. It is derived by rerunning a 5 member ensemble, over the last 20 years, once a week (500 realisations). M-Climate is always from the same model version as the displayed EPS data. On this page only the 24-48h lead M-Climate is displayed.
Sampling issues: Extreme forecasts

- Need to sample the tails of the distribution
- Focus on short to medium range
- Problems with correlated forecasts (members, steps)

2013
28 November
5 December
12 December
19 December
26 December

5 x 5 x 20 = 500 fields
99th percentile of climate (24-hour max. wind gusts)

Day 1

Thu 19 Dec 2013 00UTC

- 30-35 m/s

Day 7

Thu 26 Dec 2013 00UTC

- 21-25 m/s
Reforecasts valid 26 December 1999 (Max. wind gusts and MSLP)

From 26 December 1999 +12h

From 19 December 1999 +180h
Forecast outside the model climate:

- CDF for 24h precipitation (mm)
- CDF for 24h maximum wind gust (m/s)
- CDF for 24h mean 2m temperature (°C)

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Long forecast (monthly, seasonal)

Normally weak signals
Sampling issues: Monthly forecasts

- Need to sample the mean
- Model drift
- Sensitive to subtle difference between real time forecast and reforecast configuration

12 December = 5 x 20 = 100 fields
Sampling issues: How to extend the number of fields

Use more time steps = correlation on the large scale, model drift

Use more start dates = seasonal cycle issues
Configuration of reforecasts for seasonal forecasts

Example: 1 November

1 November 1981: 1 November 1982: 1 November 2010:

30 years x 15 forecasts = 450 forecasts
Run once for System 4, Initialised from ERA Interim

Bias correction and estimate of skill
Configuration of reforecasts (from next model upgrade)

Example: Thursday 12 December 2013:

12 December 1993: 12 December 1994: 12 December 2012:

20 years x 11 forecasts = 220 forecasts
Present model version
Ensemble configuration to 32 days
Initialised from ERA Interim

Twice a week + 5 weeks window for EFI = 1980 forecasts
Monthly forecast anomalies – new configuration

20 years x 11 forecasts x 3 dates = 660 forecasts
Summary

- The model climate can be different from the observed climate
- We need the model climate to determine whether the forecast is anomalous
- Once (twice) a week, forecasts for the 20 last years are rerun to build up the model climate
- Used for several forecast products
Model climate from reforecasts

ECMWF EPS-Monthly Forecasting System
2-meter Temperature anomaly
Forecast start date: 11 Dec 2013
Days: 1-14
Anomalies: 3.6°C or more
45°N Climate Centre

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