The Consistency of Ensemble Forecasts

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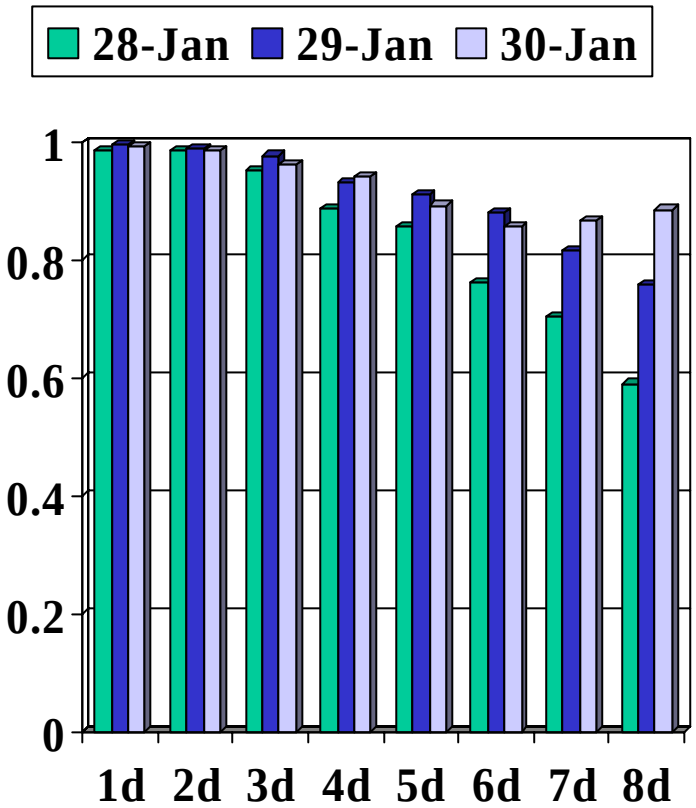
Concept of Consistency

- Expect to have the same/similar solution from different initial conditions.
- Consistency is different from accuracy.
- The main measuring tool of forecast model.
- User consideration (requirement), user likes consistency forecasts.
- The similar properties: deterministic or ensemble forecasts.
- Comparing different cycles (00z,06z,12z,18z).
- Comparing different lead times of the same cycle.

Measurement of Deterministic Forecast

- F(t) against F(t-1) (for same validation time)
- Pattern Anomaly Correlation (PAC)
  - To compare the PAC from verified analysis
  - High correlation is better
- Root Mean Square (RMS) Error
  - Low RMS error is better

Example for deterministic forecast

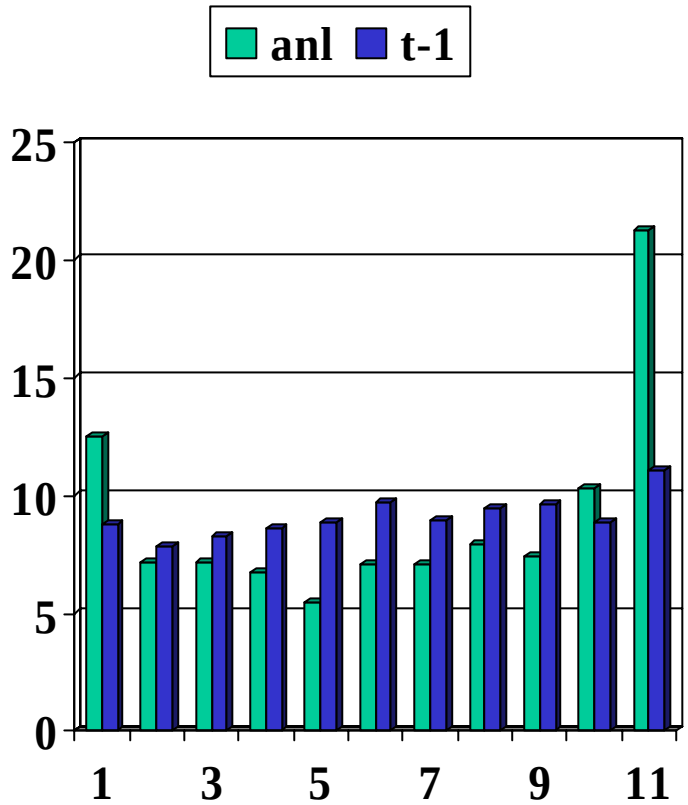


- NH 500hPa geopotential height
- PAC scores
- 1d means 24 hrs forecast .vs analysis
- 2d means 48 hrs forecast against 24 hrs forecast valid at the same time, and so on

The Measurement for Ensemble Forecasts

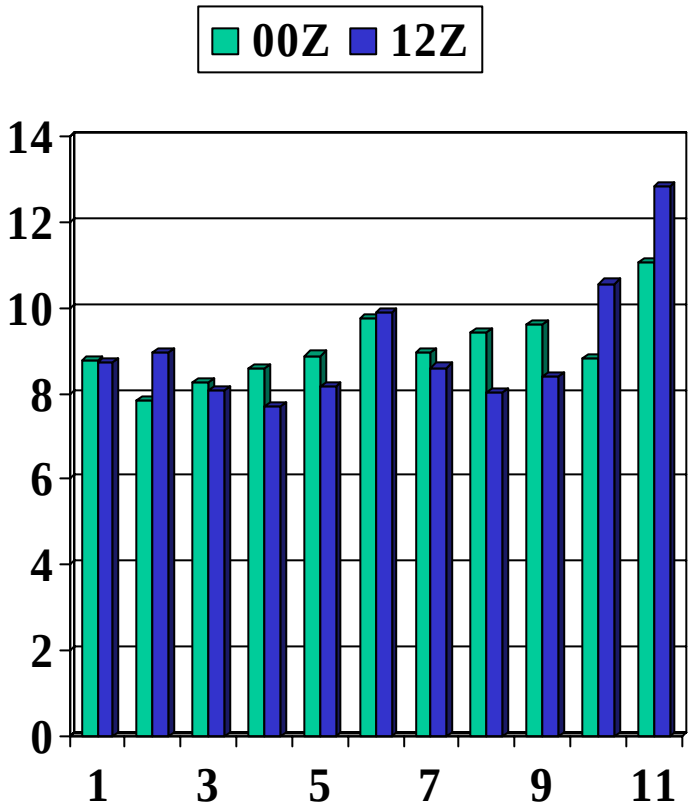
- F(t) against each F(t-1)i (ith member as verified analysis)
- To consider ensemble distribution instead of ensemble mean
- Talagrand diagram is one of the distribution measure
- Outlier is constructed from Talagrand diagram

Example of Talagrand

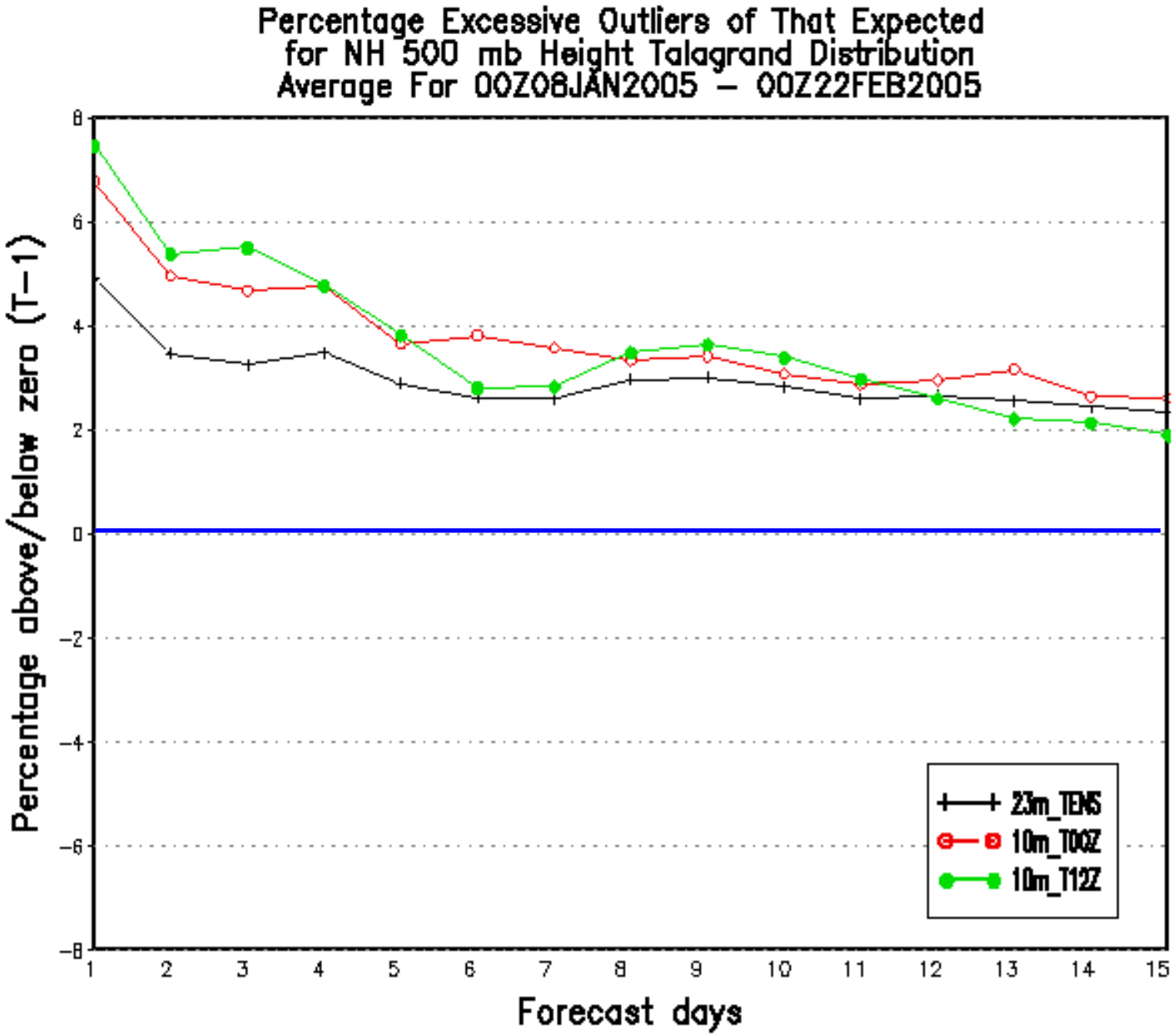


- For 10 ensemble members only
- Anl: forecasts .vs analysis
- T-1: sum of the forecasts(t) .vs each forecast(t-1), short lead time forecast as verified analysis

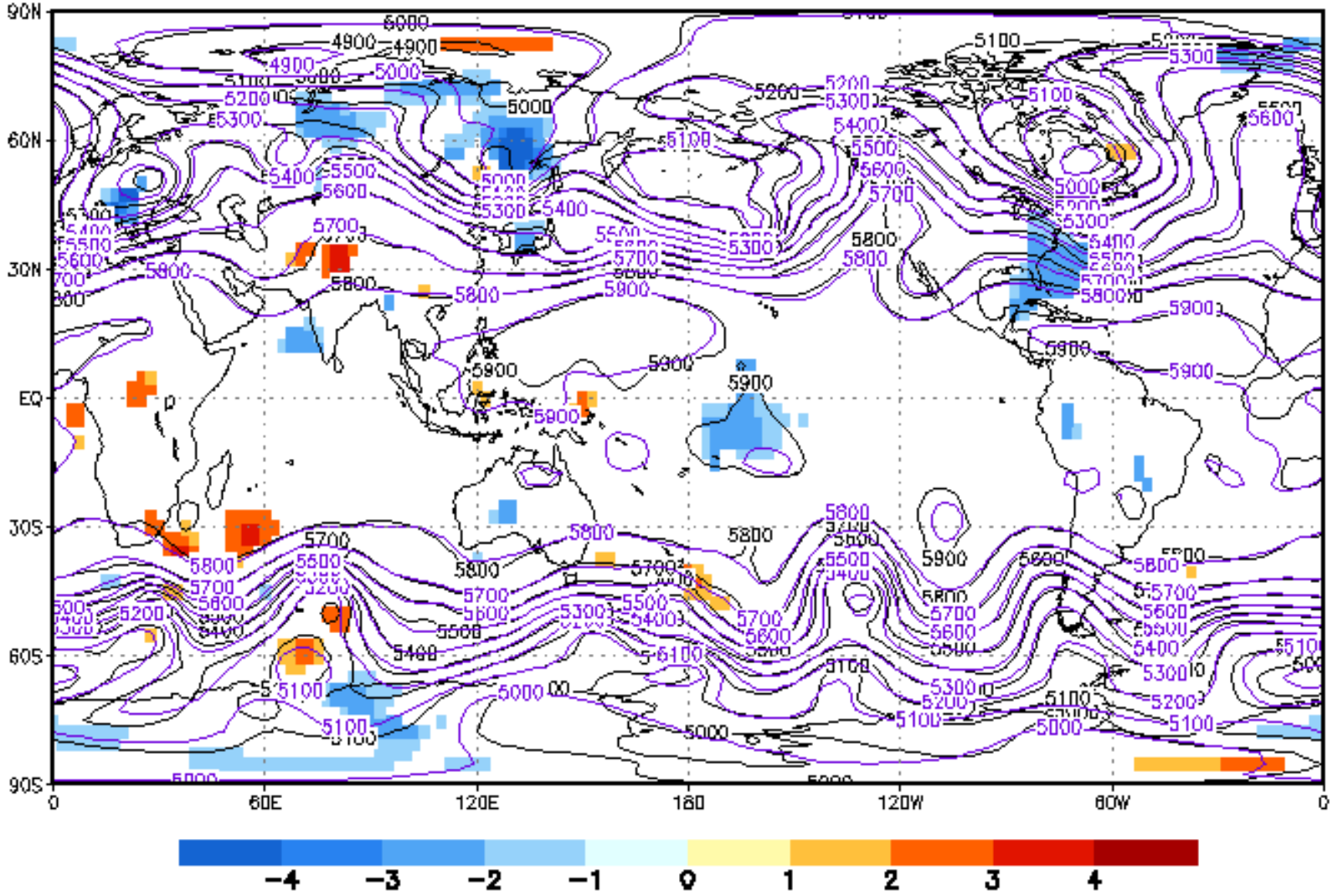
Example of Talagrand – diff. cycle



- For 10 ensemble members only
- 5-day .vs 4-day
- 00Z is for valid time at T00Z cycle
- 12Z is for valid time at T12Z cycle
- Considering outliers


Percentage Excessive Outliers of That Expected
for NH 500 mb Height Talagrand Distribution
Average For 00Z08JAN2005 – 00Z22FEB2005
Percentage above/below zero (T–1)
8
6
4
2
0
–2
–4
–6
–8
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Forecast days
23m_TENS
10m_T00Z
10m_T12Z

Normalized distance (shaded) of analysis from ens mean (purple contours)
where 4 consecutive ensemble sets miss verifying 500 hPa height (blk contours)
ini: 2005030600 vrfy: 2005030700 lead times: 24–36–48–60 hrs



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Discussion

- What kind production we need to produce?
- What kind measure we need to create?