

On Spread and Skill

HIRLAM ASM 2013

Reykjavík, Iceland

16 April 2013

Usual Definition

MSE of the Ensemble Mean Forecast

=

Ensemble Variance = VARE

Alternative Definition

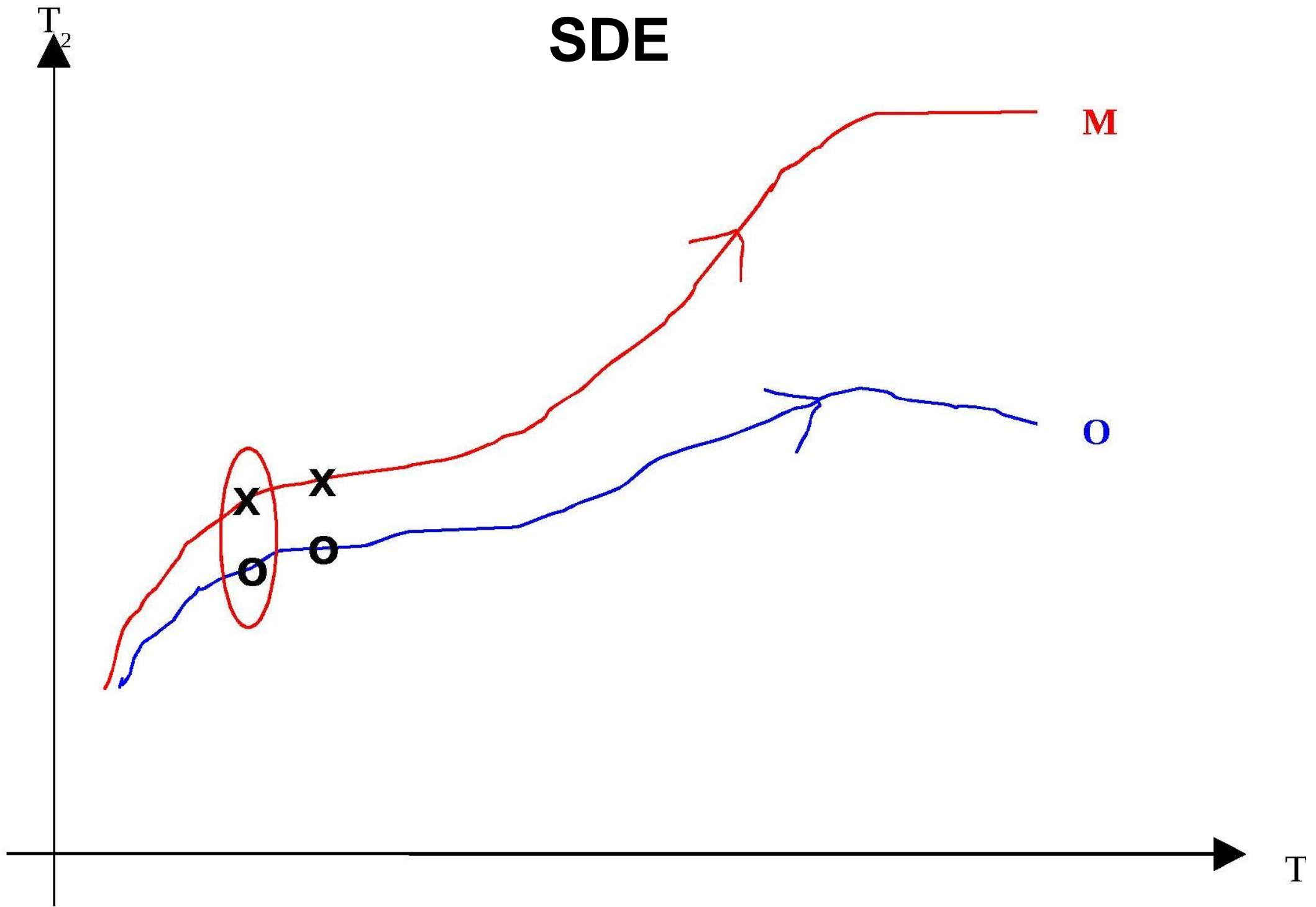
~~MSE of the Ensemble Mean Forecast~~
SDE of Perturbed Forecasts

Alternative Definition

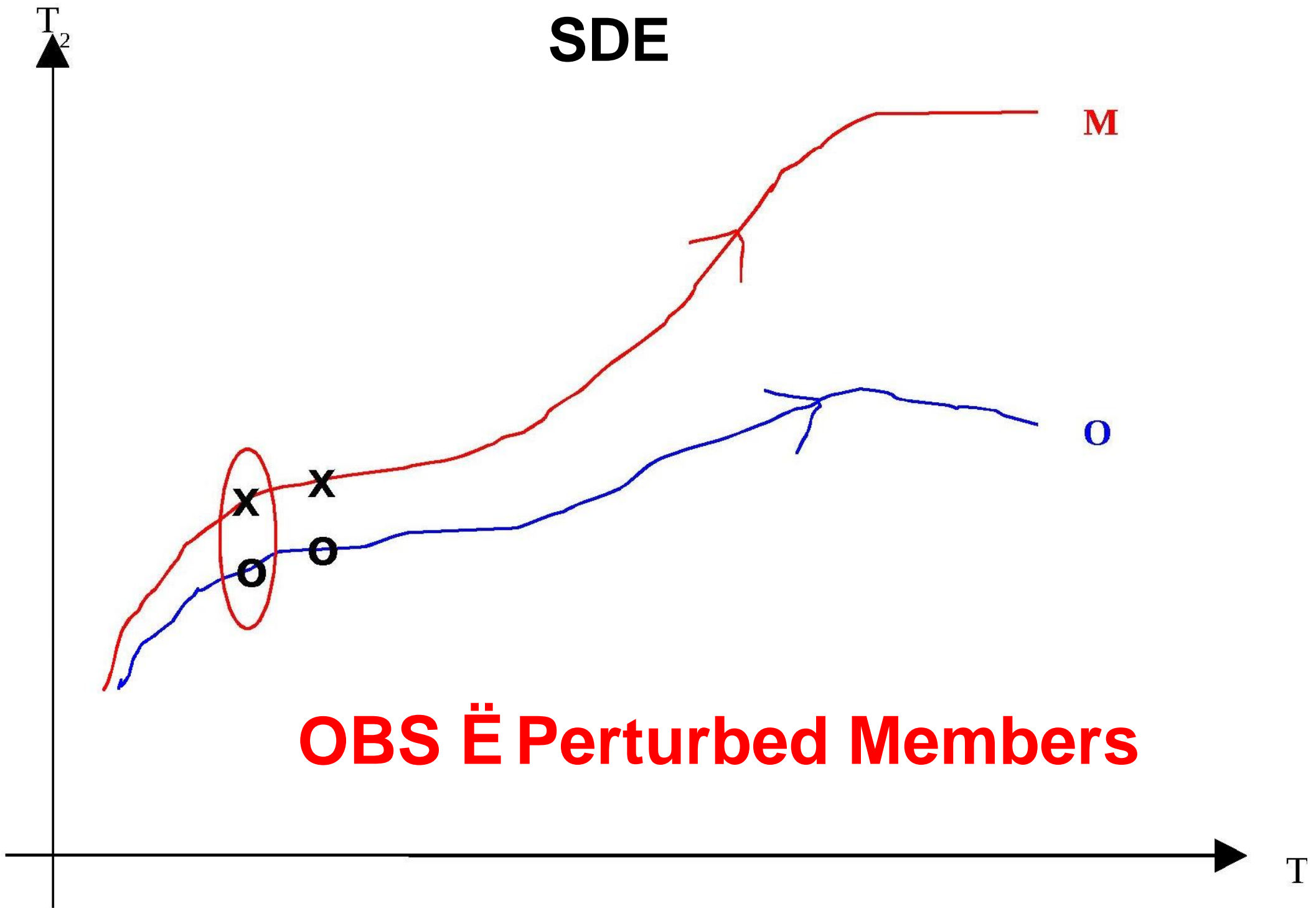
~~MSE of the Ensemble Mean Forecast~~
SDE of Perturbed Forecasts

$$\text{RMSE}^2 = B^2 + \sigma_e^2$$

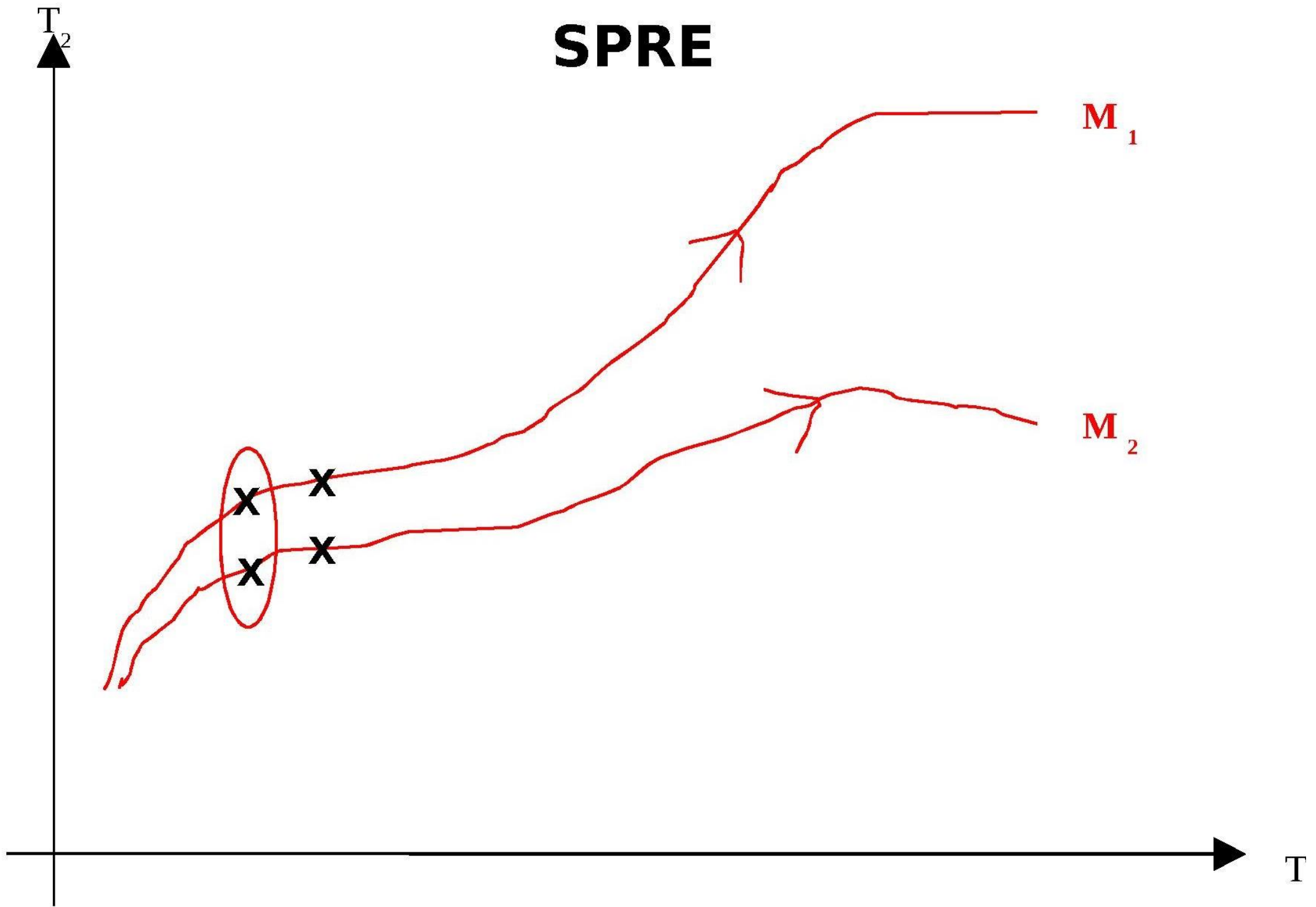
SDE



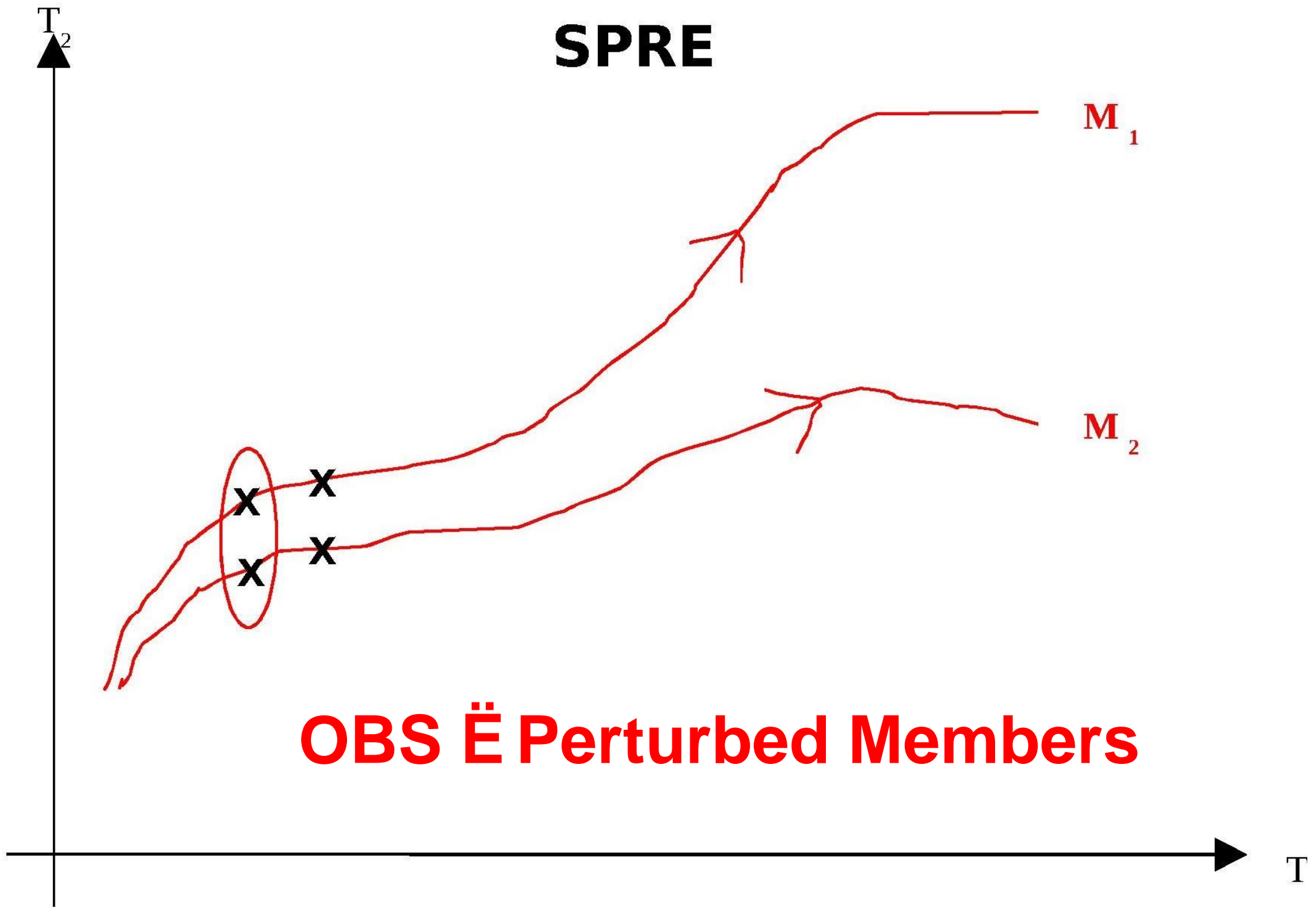
SDE



SPRE



SPRE



Alternative Definition

~~MSE of the Ensemble Mean Forecast~~
~~SDE of Perturbed Forecasts~~

=

~~Ensemble Variance = VARE~~
Spread of Perturbed MBR = SPRE

$$\text{SPRE} = 2 \cdot [\text{VARE} - \text{COVE}]$$

$$\text{VARE} = \frac{1}{K} \sum_{k=1}^K [e(k)]^2$$

$$\text{SPRE} = \frac{2}{K \cdot (K - 1)} \sum_{k=1}^{K-1} \sum_{\kappa=k+1}^K [e(k) - e(\kappa)]^2$$

$$\text{COVE} = \frac{2}{K \cdot (K - 1)} \left[\sum_{k=1}^{K-1} \sum_{\kappa=k+1}^K e(k)e(\kappa) \right]$$

$$\text{VARE} = \frac{1}{K} \sum_{k=1}^K [e(k)]^2$$

$$\text{SPRE} = \frac{2}{K \cdot (K - 1)} \sum_{k=1}^{K-1} \sum_{\kappa=k+1}^K [e(k) - e(\kappa)]^2$$

$$\text{COVE} = \frac{2}{K \cdot (K - 1)} \left[\sum_{k=1}^{K-1} \sum_{\kappa=k+1}^K e(k)e(\kappa) \right]$$

OBS Æ Perturbed Members

New set of major Hindcast Experiments

EXP_2.x , x=0, 1, 2, Å

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- **1 JUL Æ 31 AUG 2010**

New set of major Hindcast Experiments

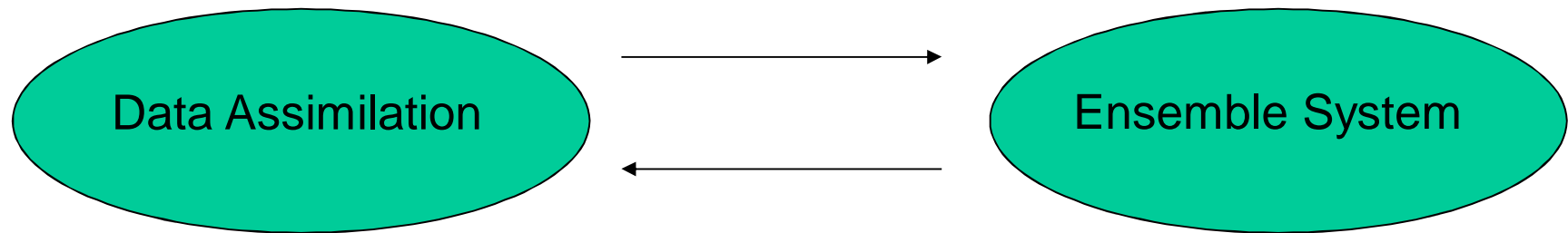
EXP_2.x , x=0, 1, 2, Å

- **1 JUL Æ 31 AUG 2010**
- **8 DEC 2010 Æ 8 FEB 2011**

ACKNOWLEDGEMENT

Kai Sattler

Marriage

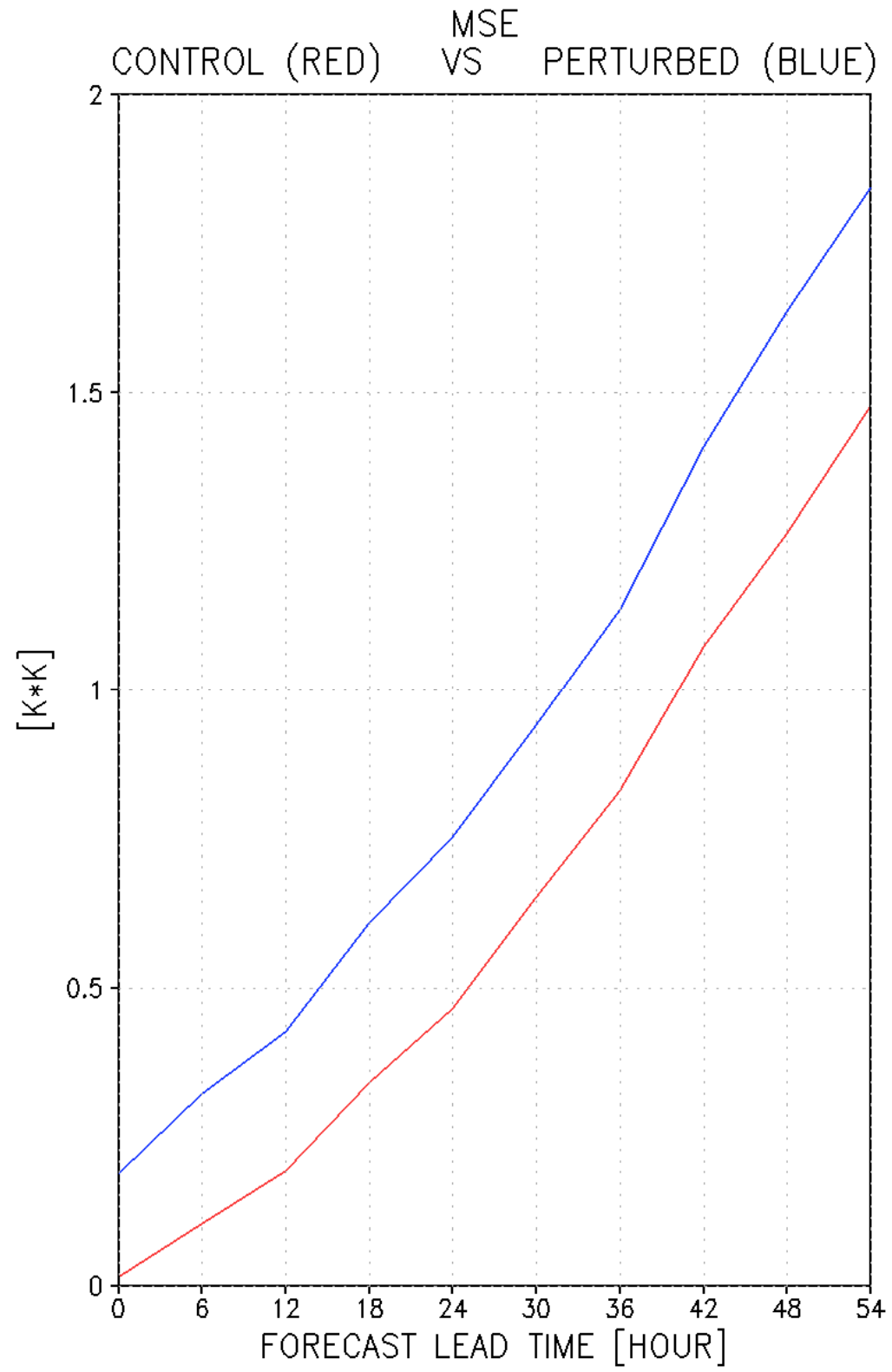


ETKF HYBRID

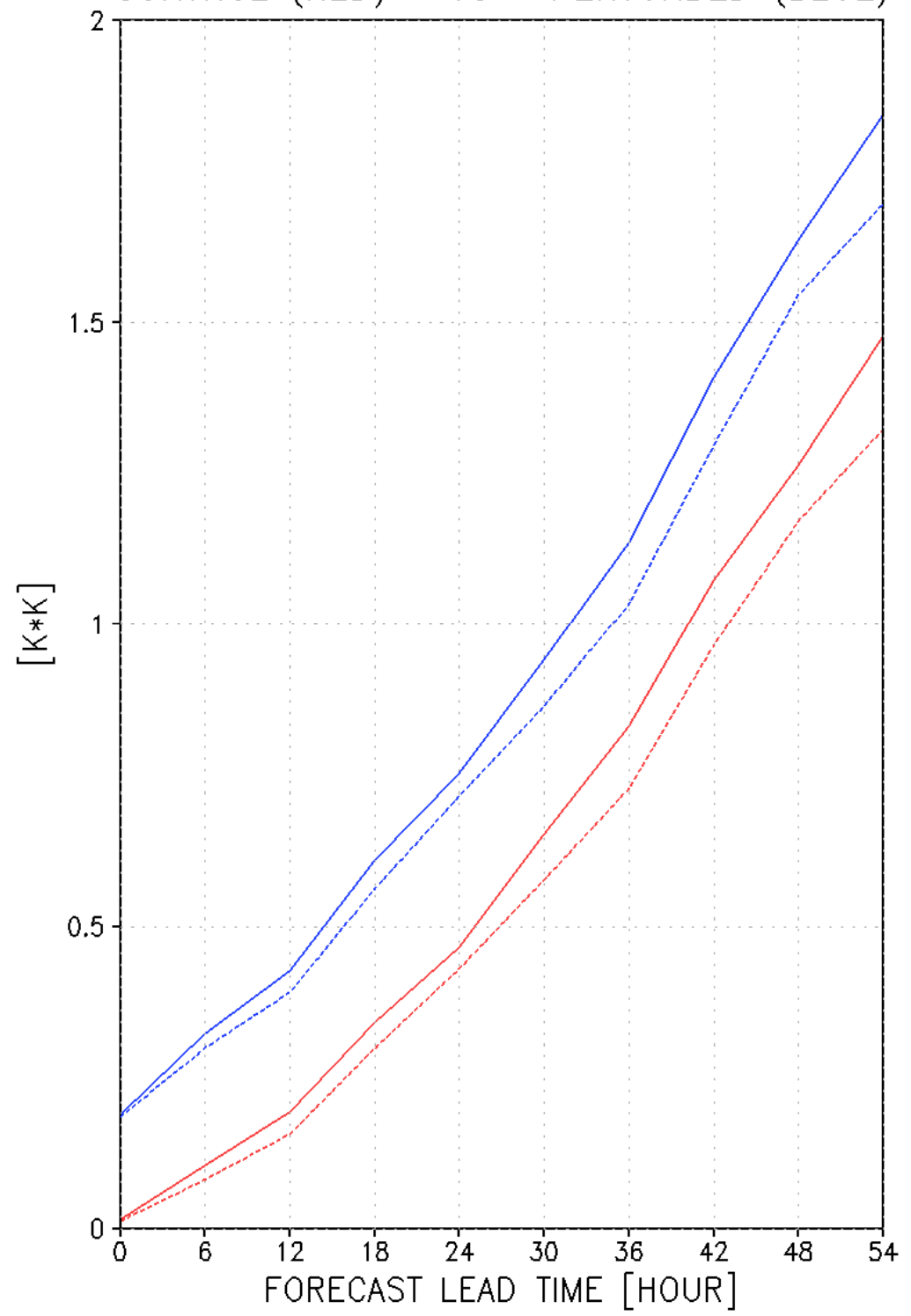
New set of major Hindcast Experiments

EXP_2.2

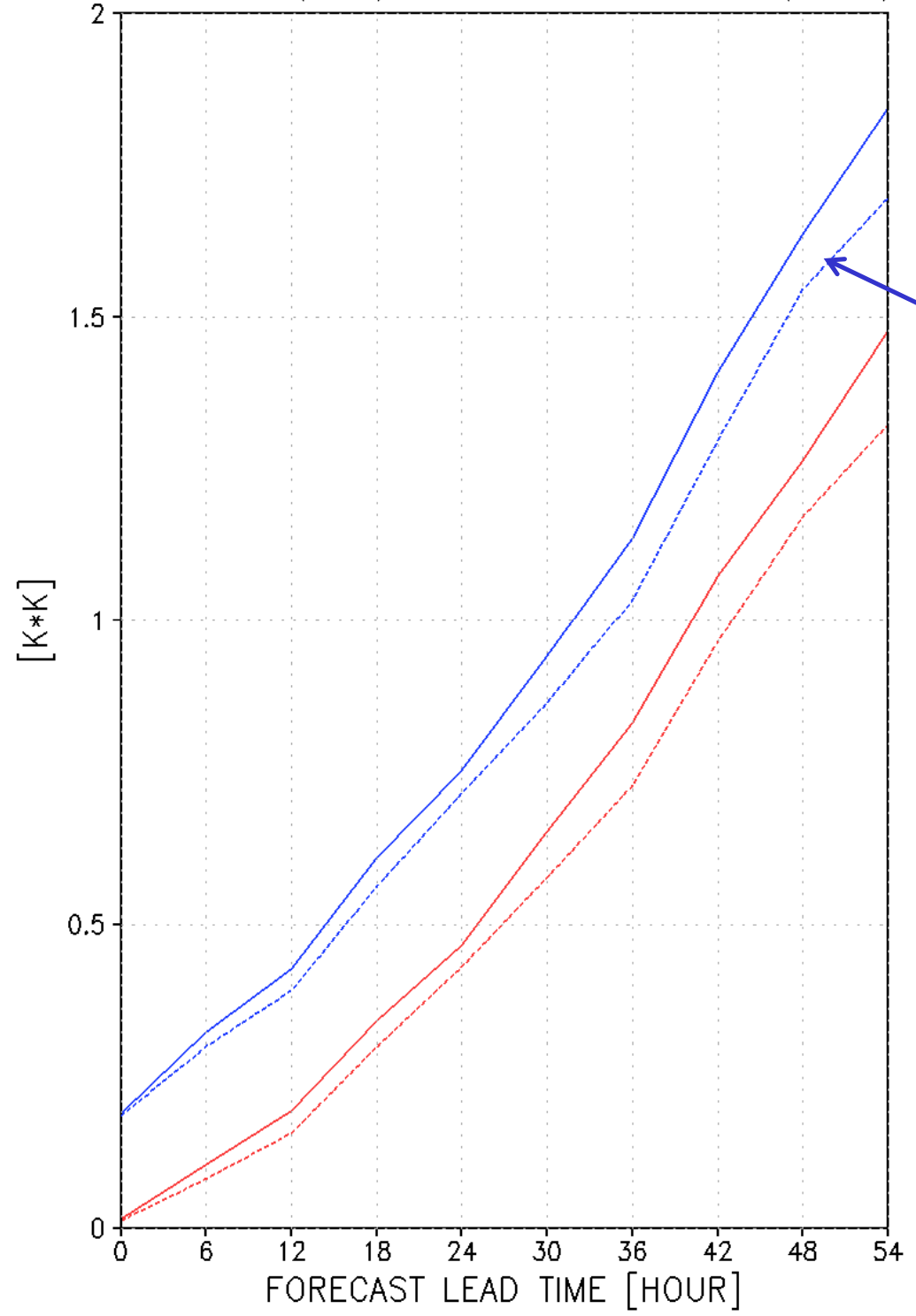
- **11 JUL Ë 31 AUG 2010**



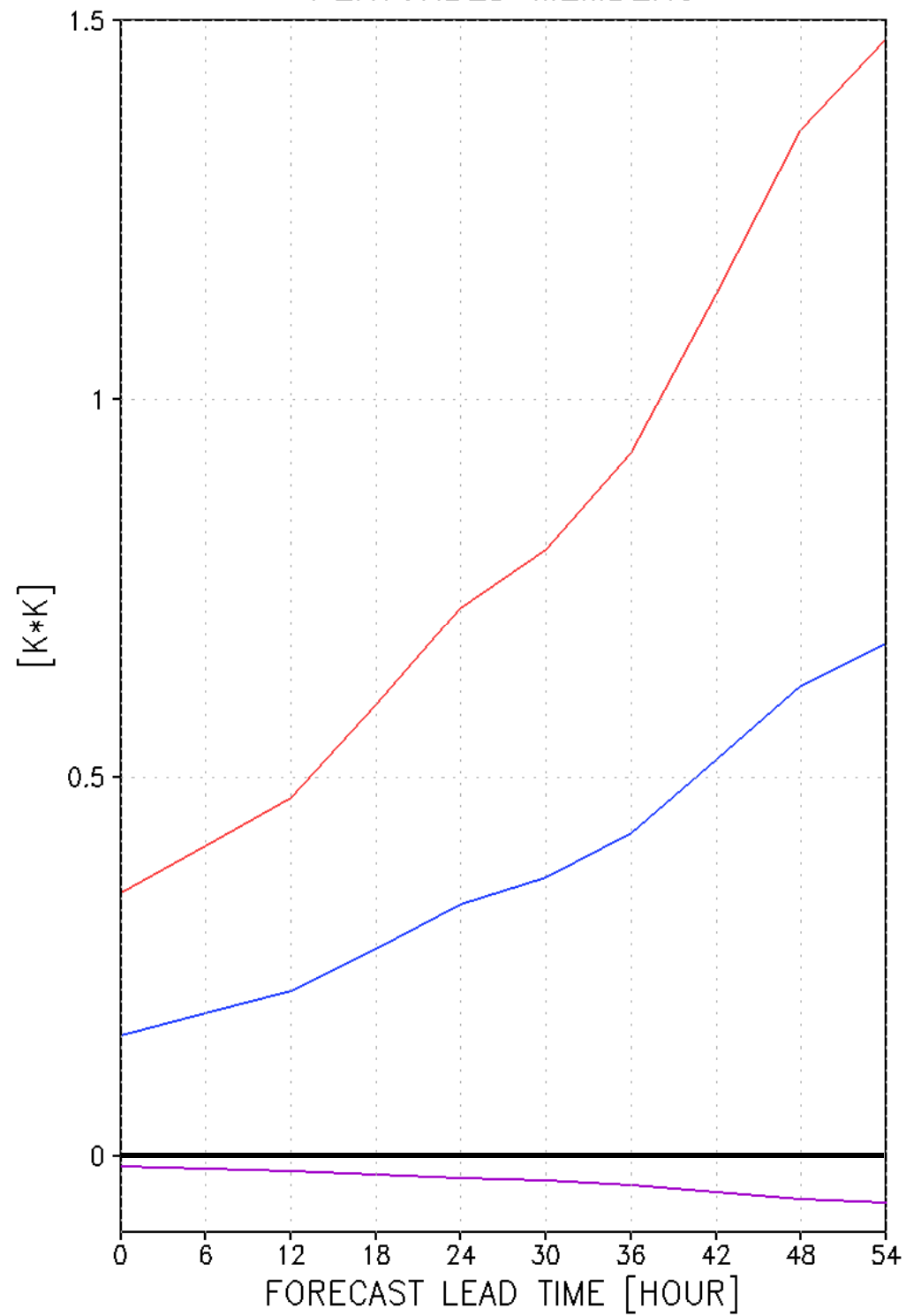
MSE and SDE
CONTROL (RED) VS PERTURBED (BLUE)



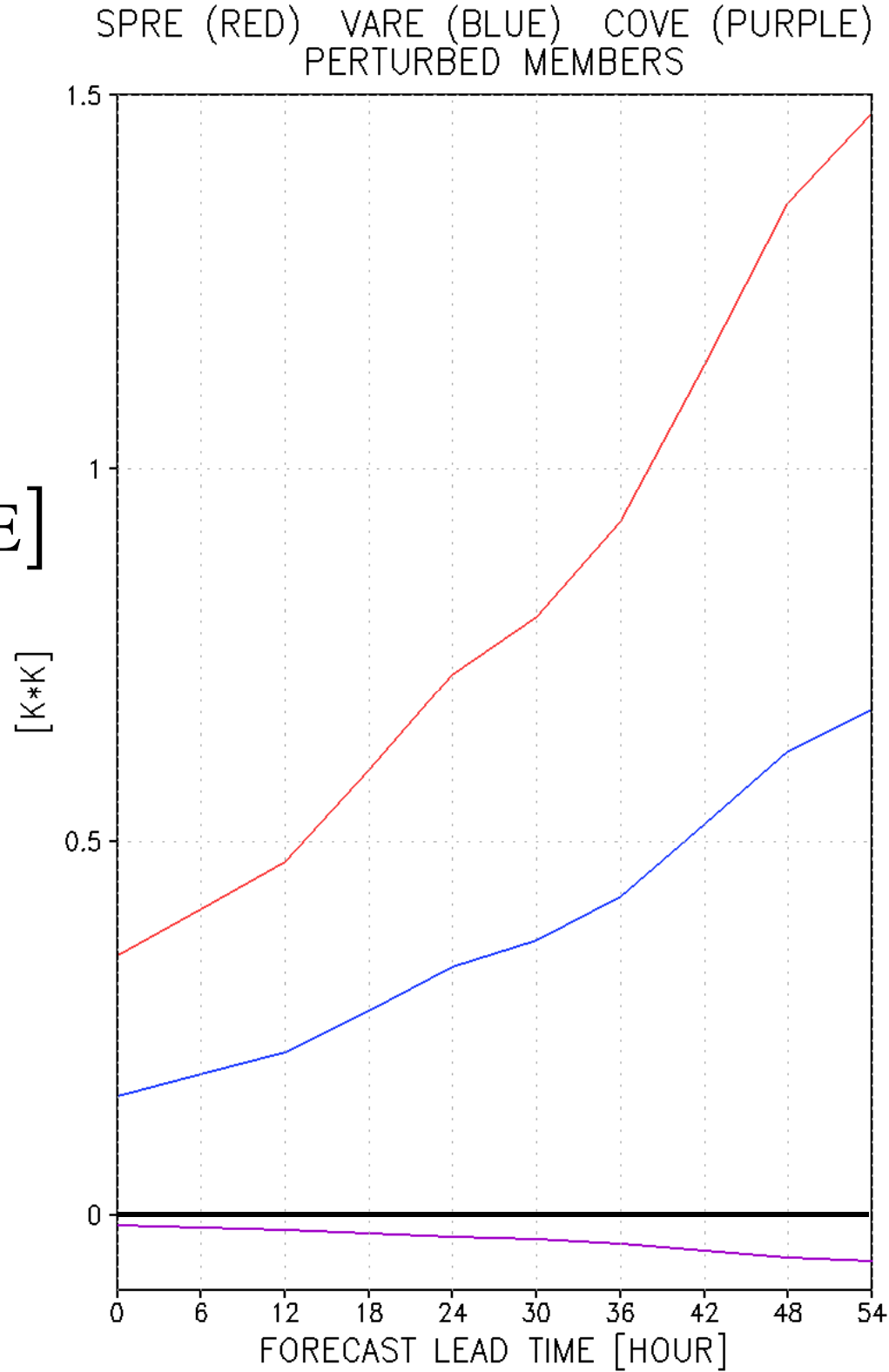
MSE and SDE
CONTROL (RED) VS PERTURBED (BLUE)



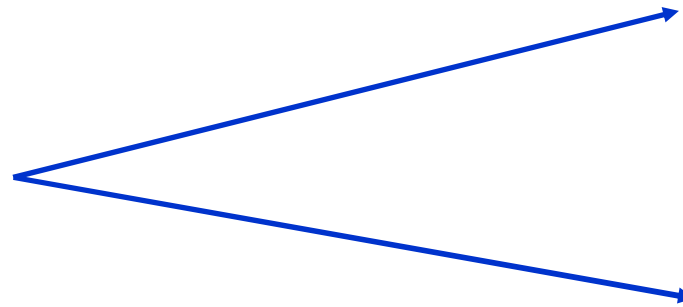
SPRE (RED) VARE (BLUE) COVE (PURPLE)
PERTURBED MEMBERS



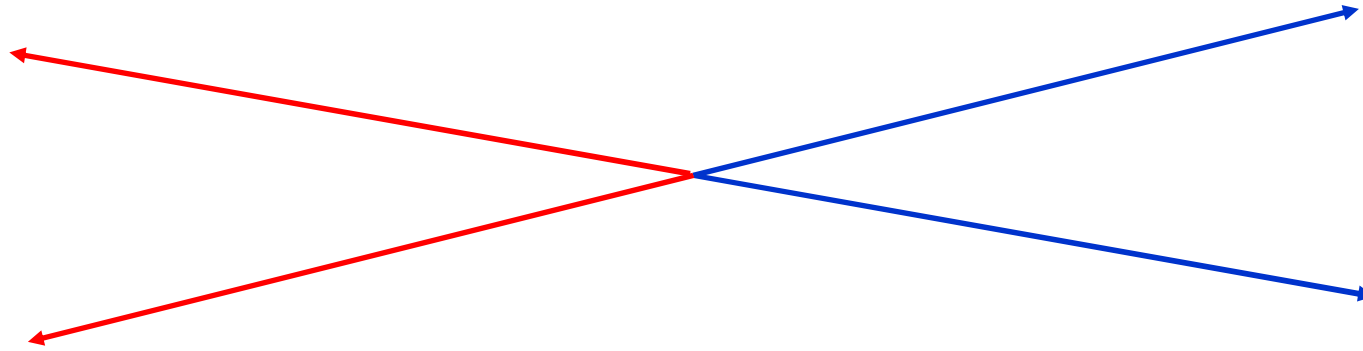
$$\text{SPRE} = 2 \cdot [\text{VARE} - \text{COVE}]$$



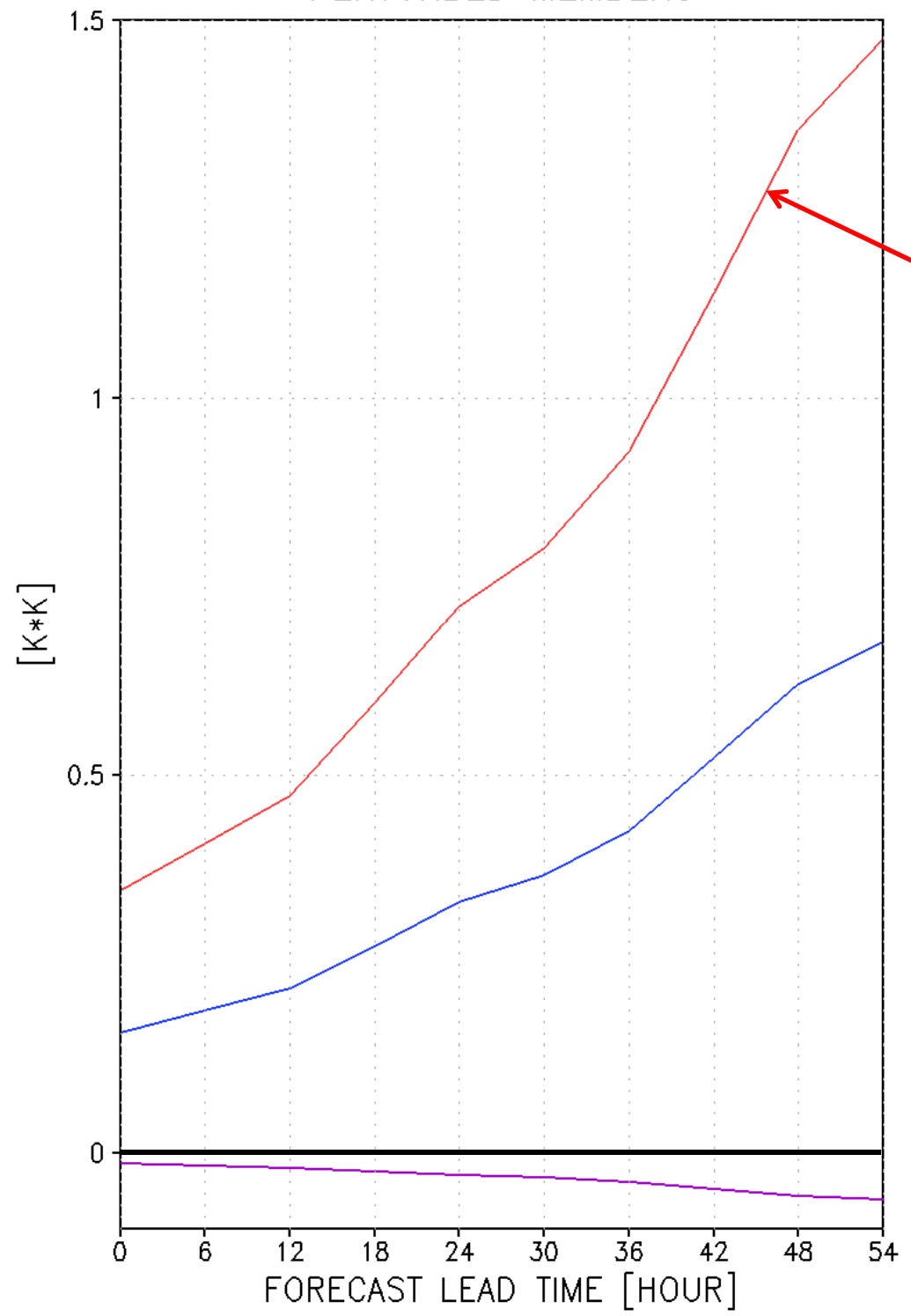
Positive-Negative Pairing



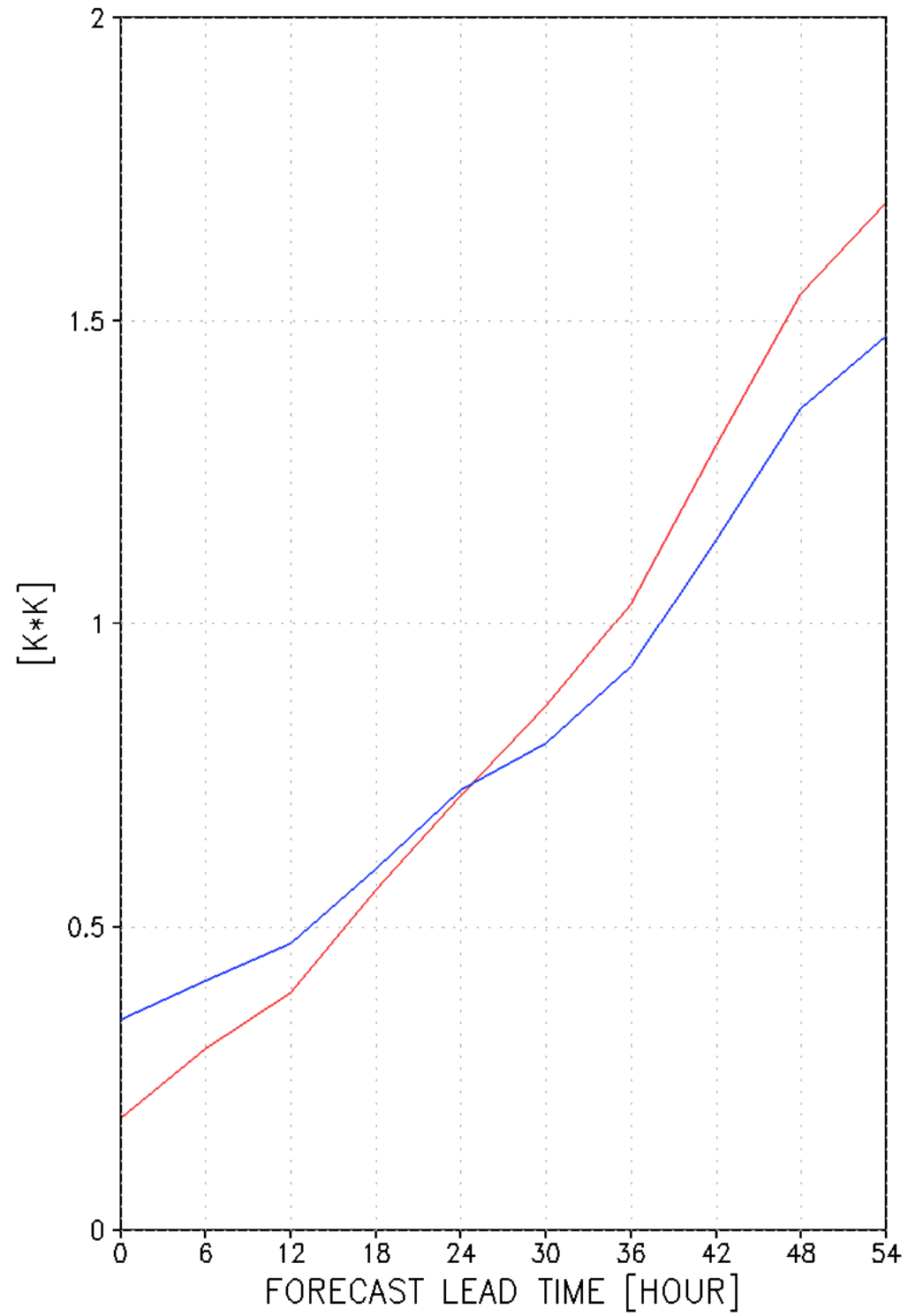
Positive-Negative Pairing



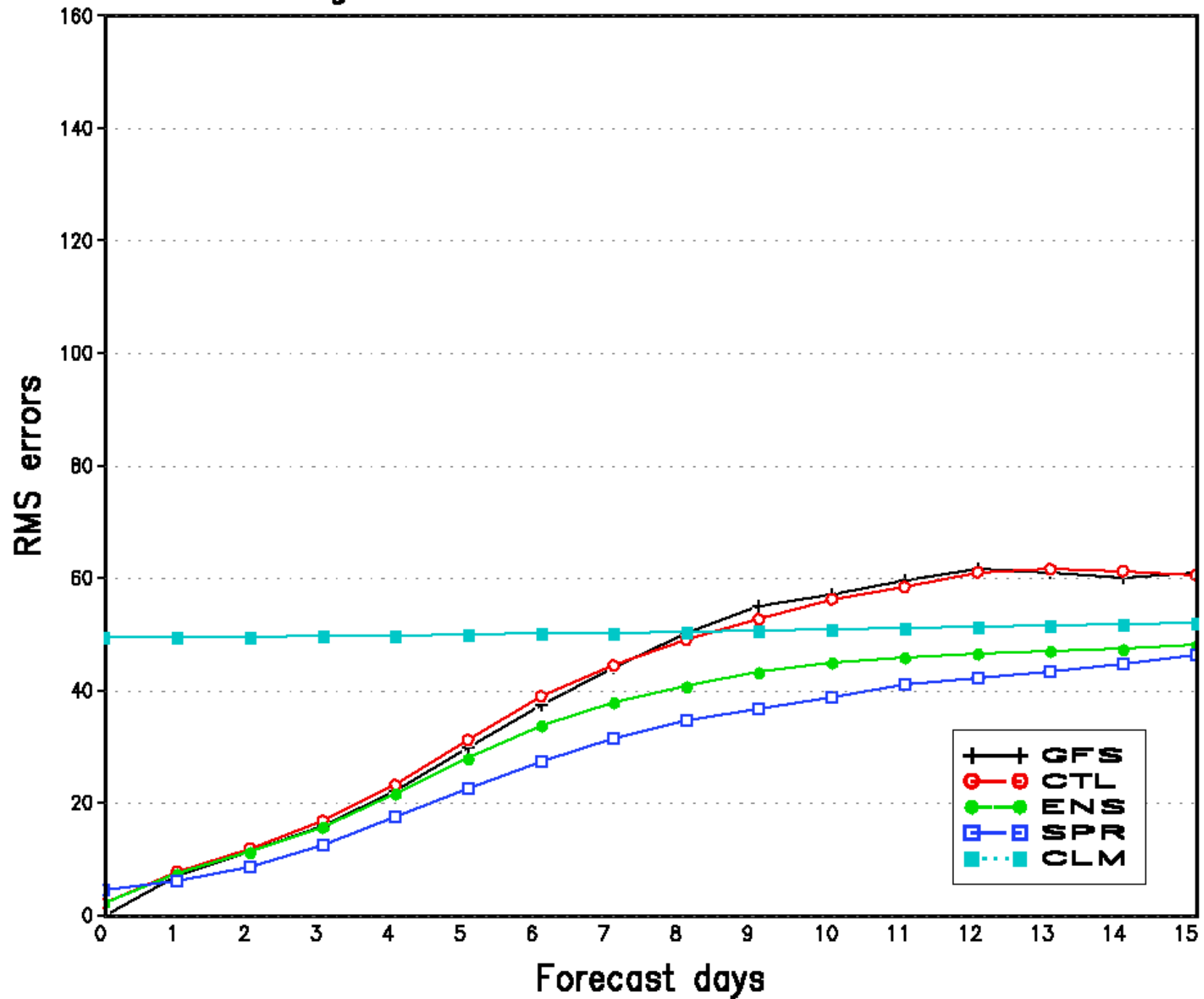
SPRE (RED) VARE (BLUE) COVE (PURPLE)
PERTURBED MEMBERS



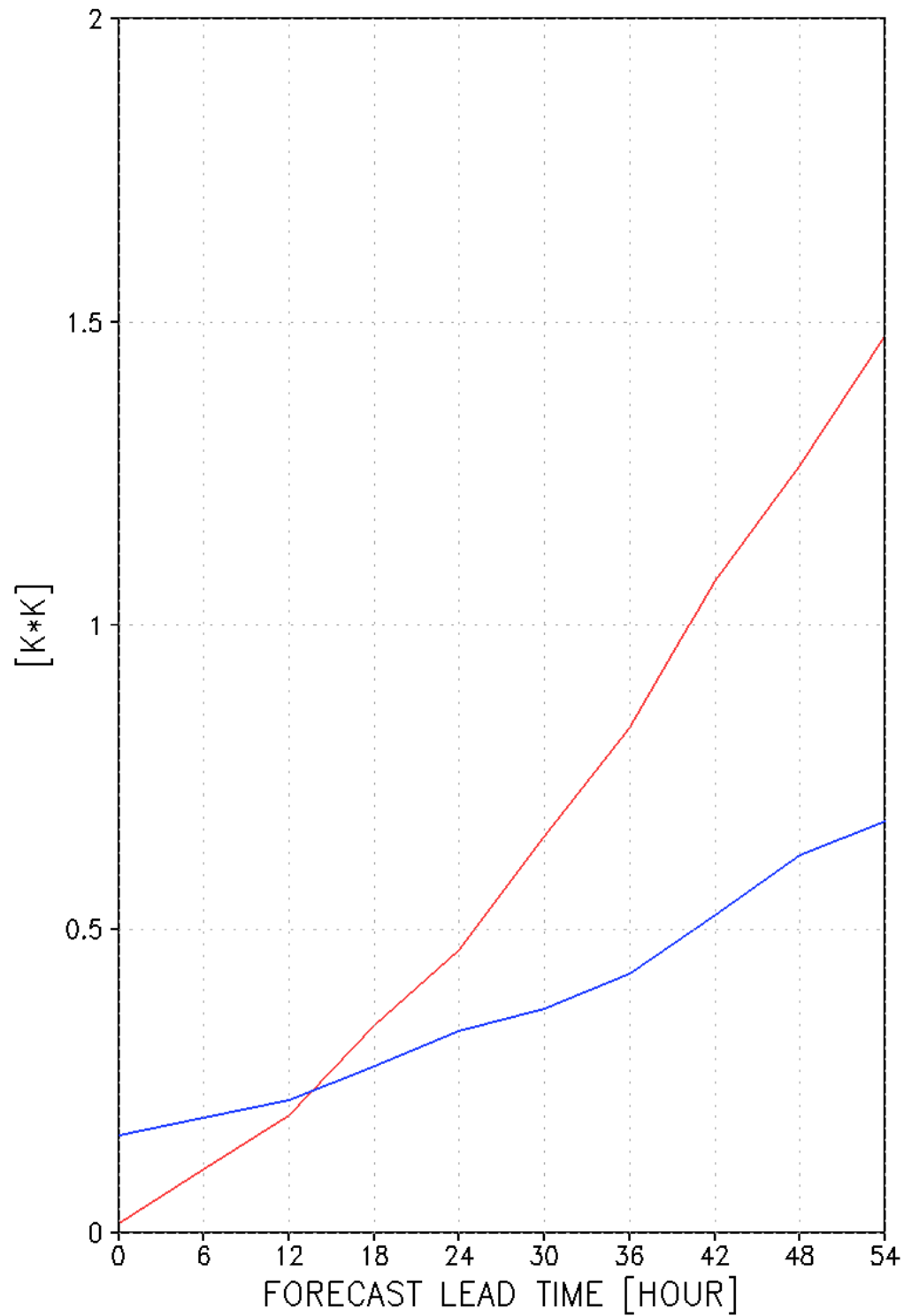
SDE (RED) and SPRE (BLUE)
PERTURBED MEMBERS



NH 500 mb Height Average For 00Z28JUL2012 – 00Z11SEP2012



MSE (RED) and VARE (BLUE)
CONTROL and PERTURBED



SDE (RED) and SPRE (BLUE)
PERTURBED MEMBERS

