Climate Forecasting Unit

SPECS
Seasonal-to-decadal climate Prediction for the improvement of European Climate Services

METEO FRANCE

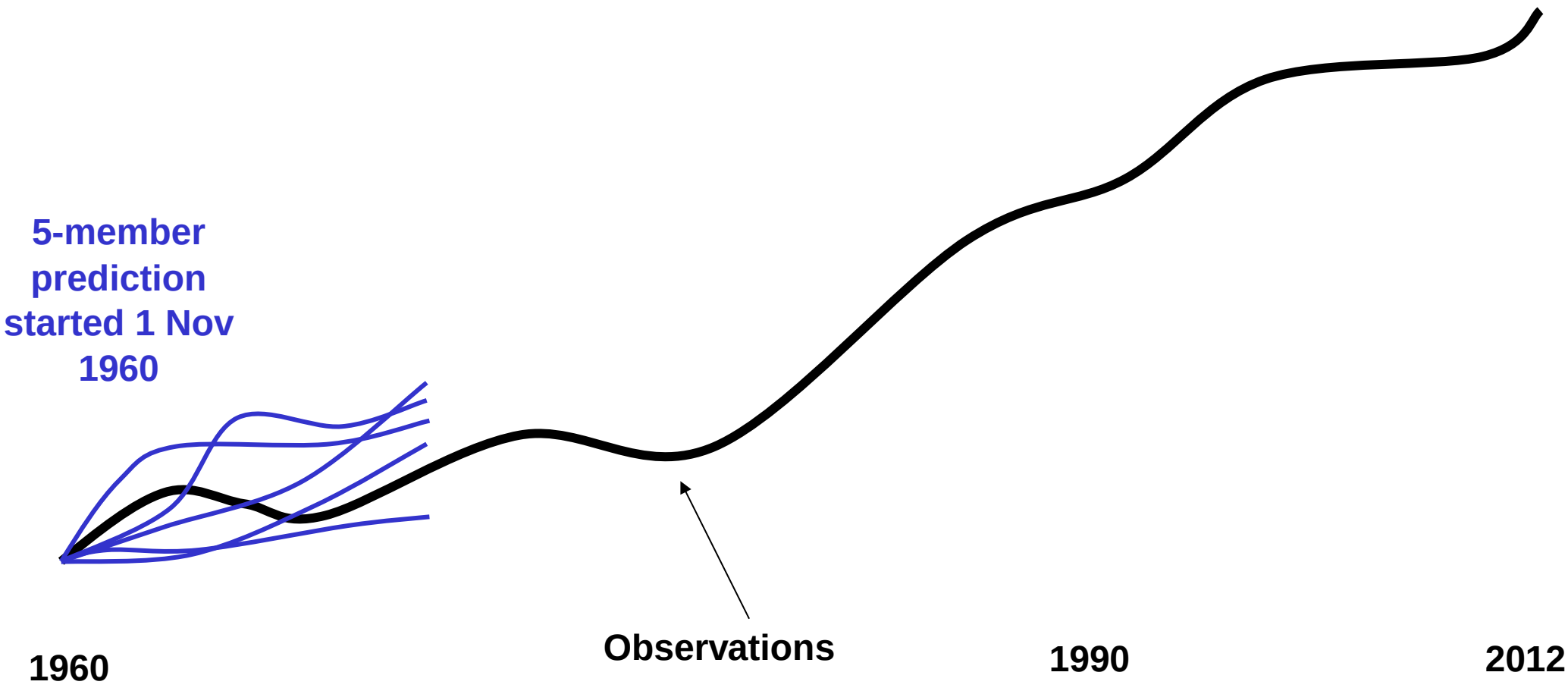
Attribution of the 2001-2010 global temperature plateau

Virginie Guemas, Francisco J. Doblas-Reyes, Isabel Andreu-Burillo and Muhammad Asif

International Workshop on Seasonal to Decadal Prediction, Toulouse, 13 May 2013

Methodology

Experimental setup



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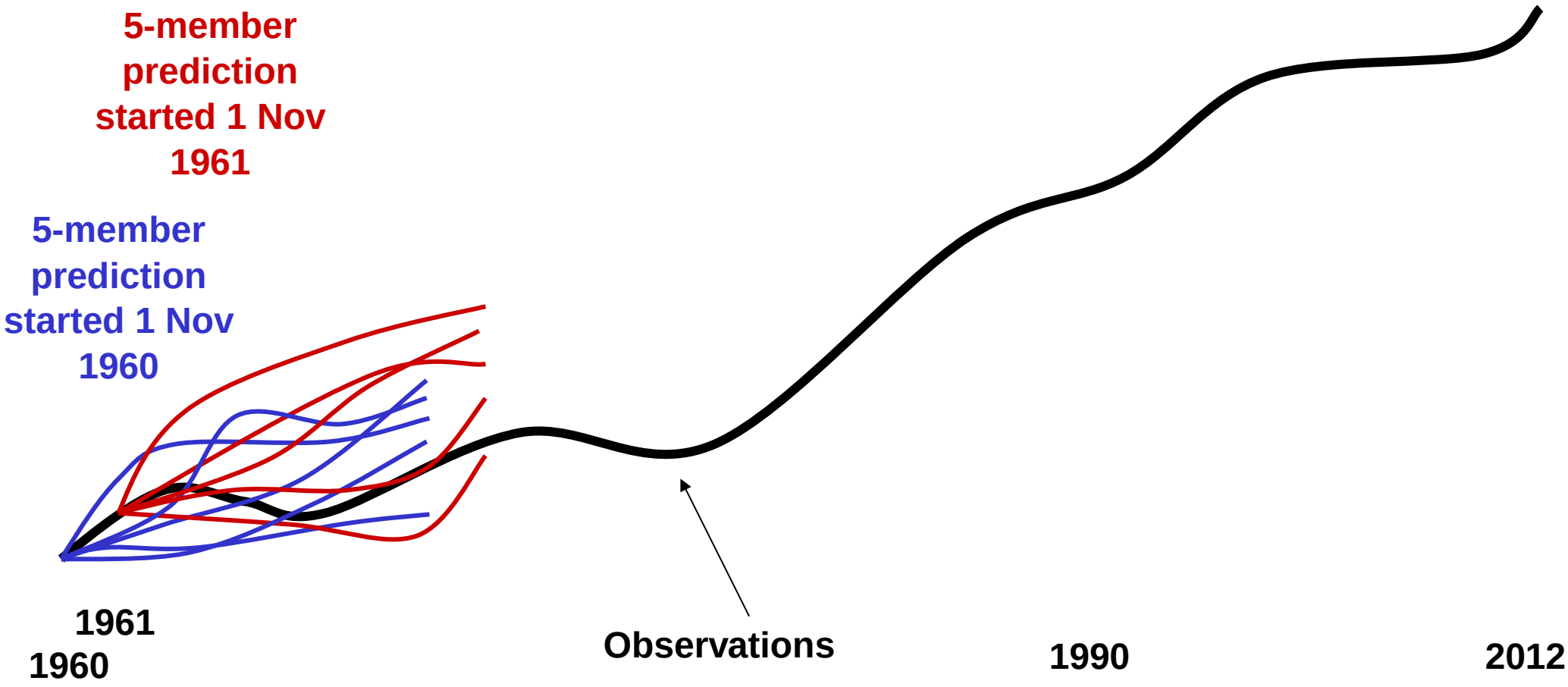

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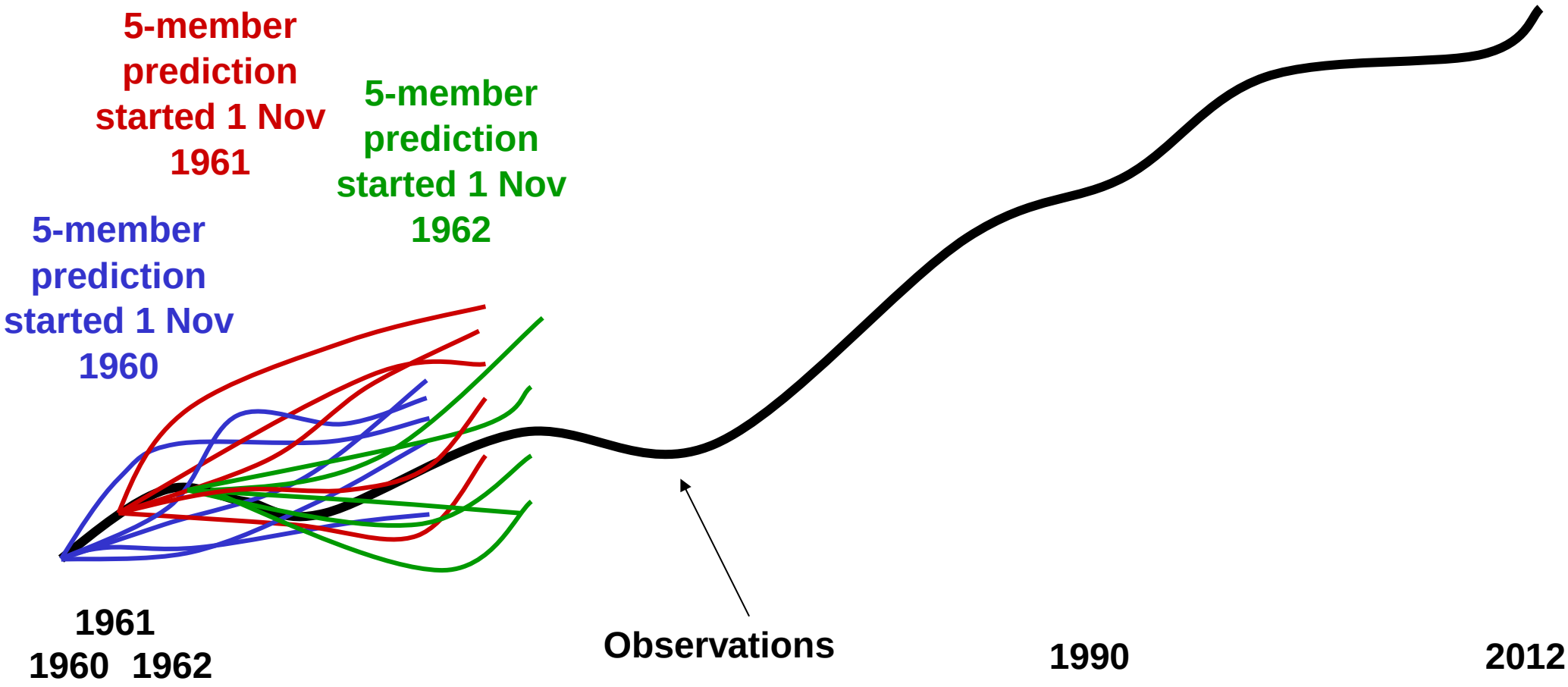

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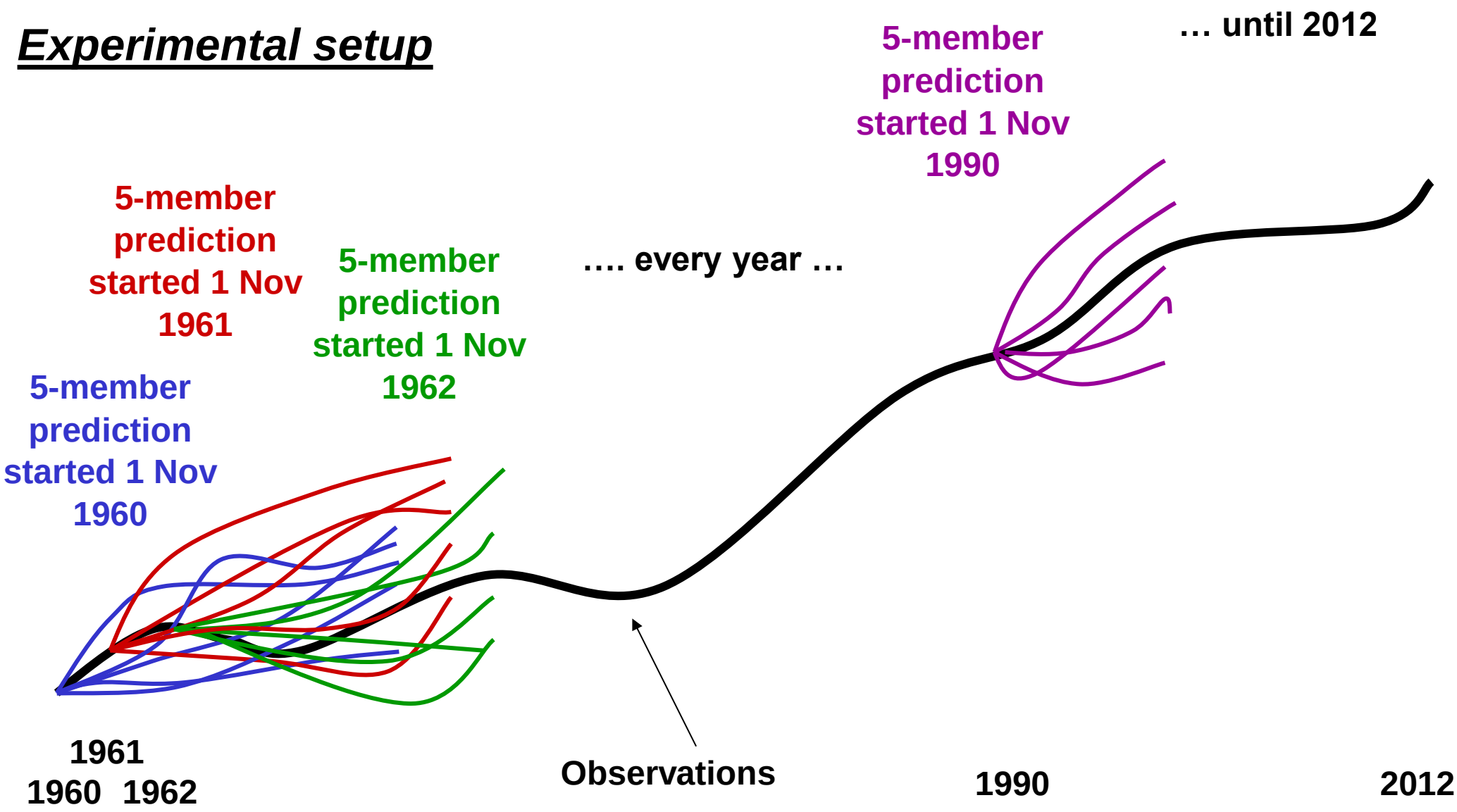

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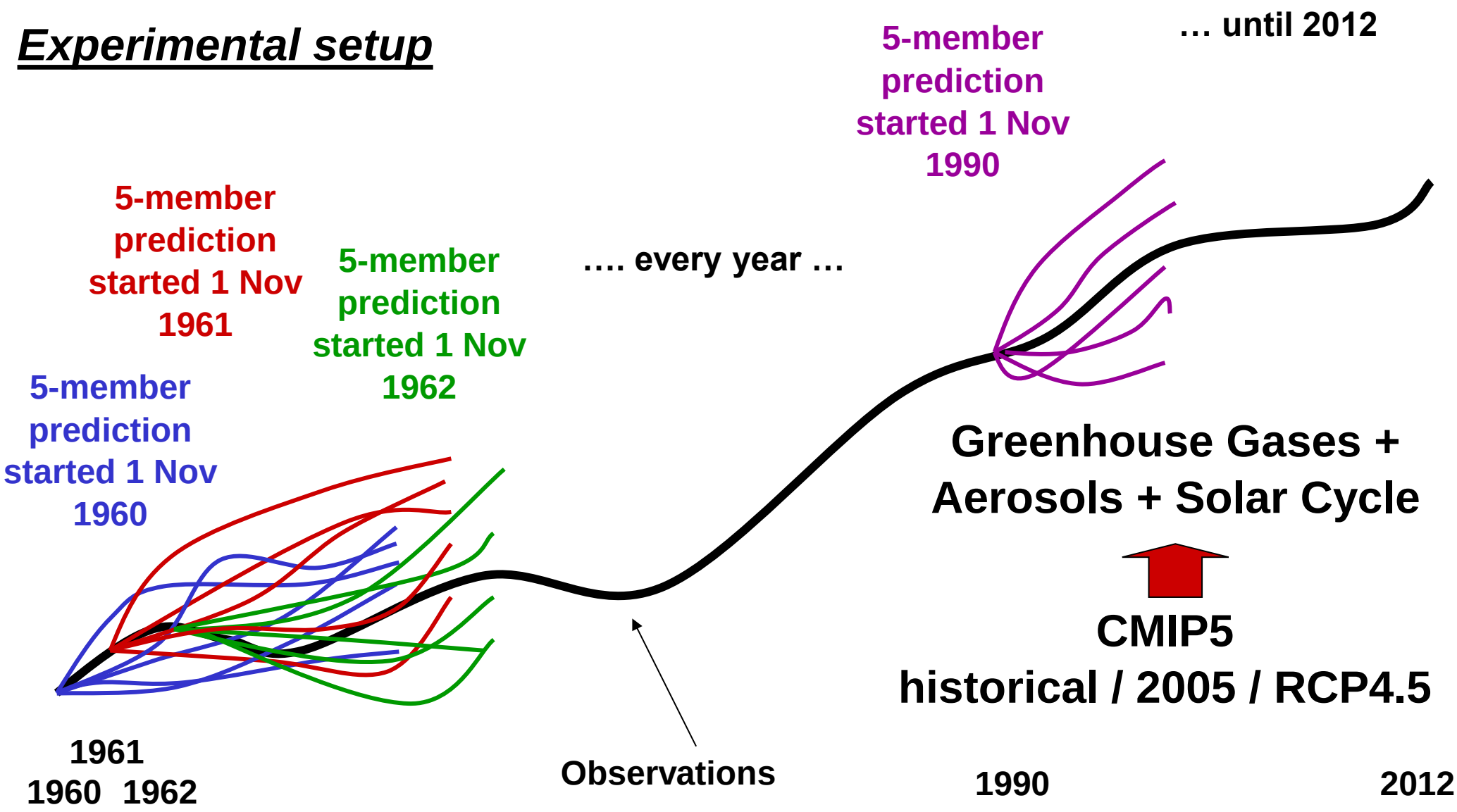
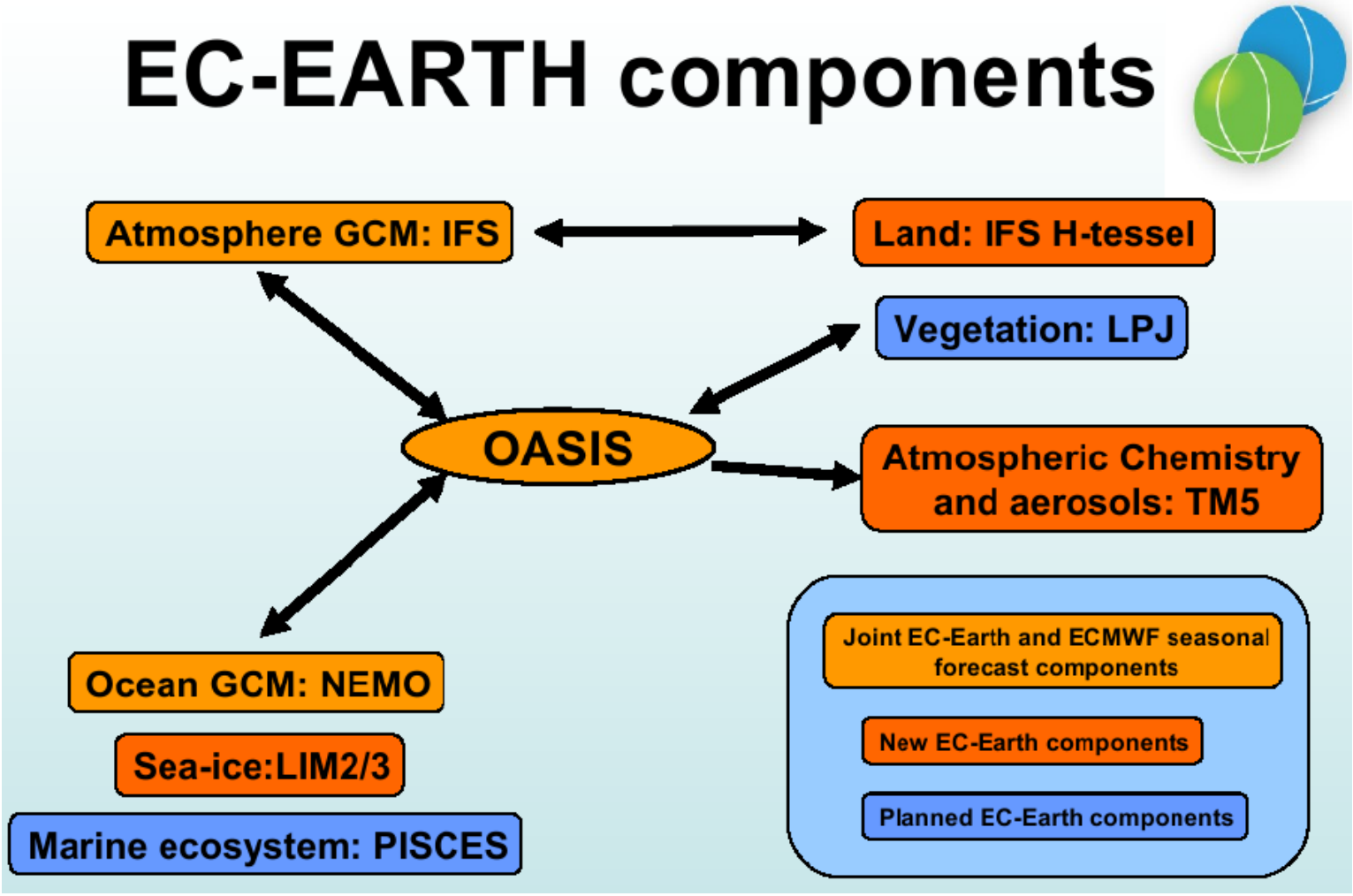


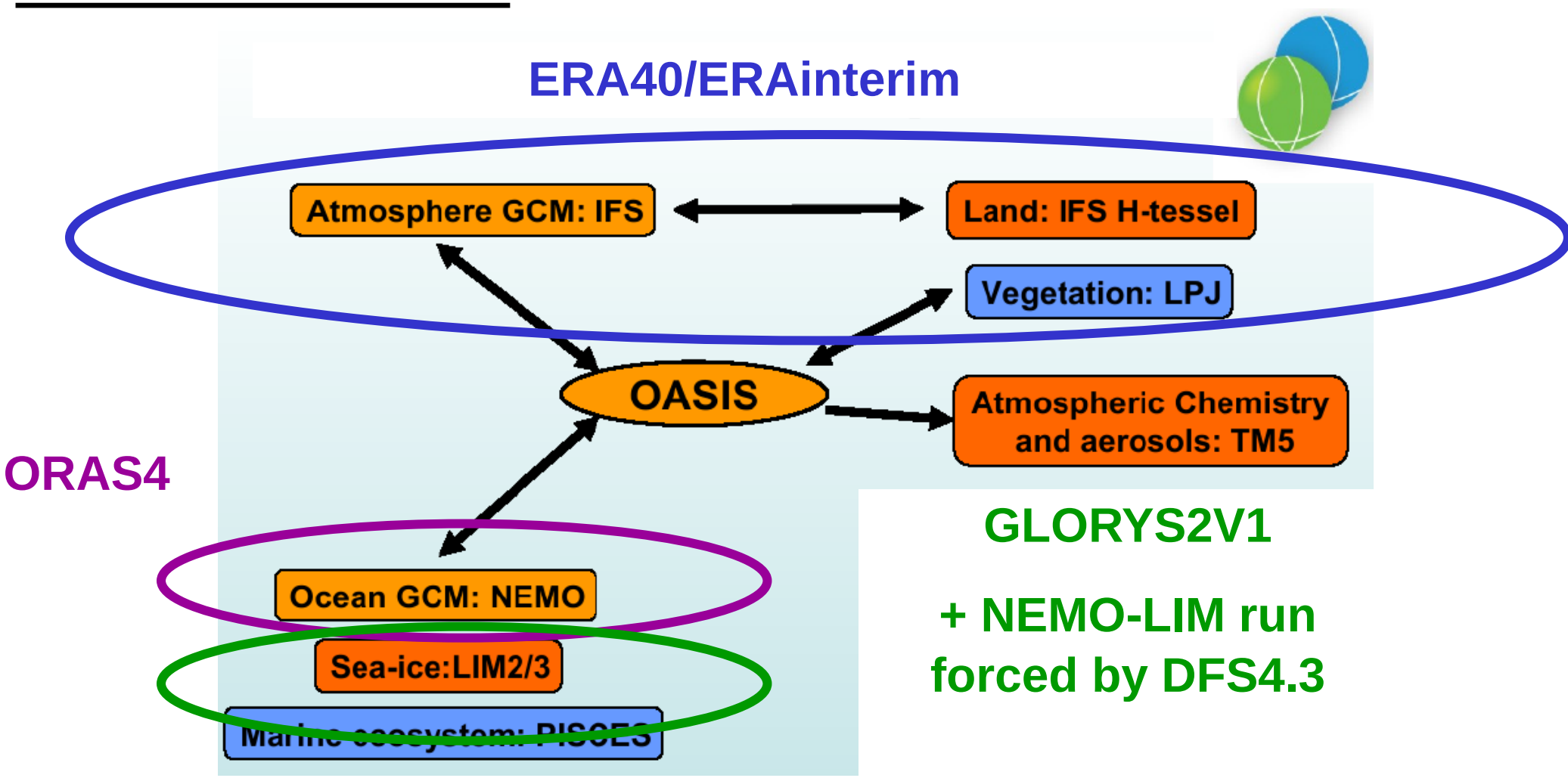
Methodology

Model



Methodology

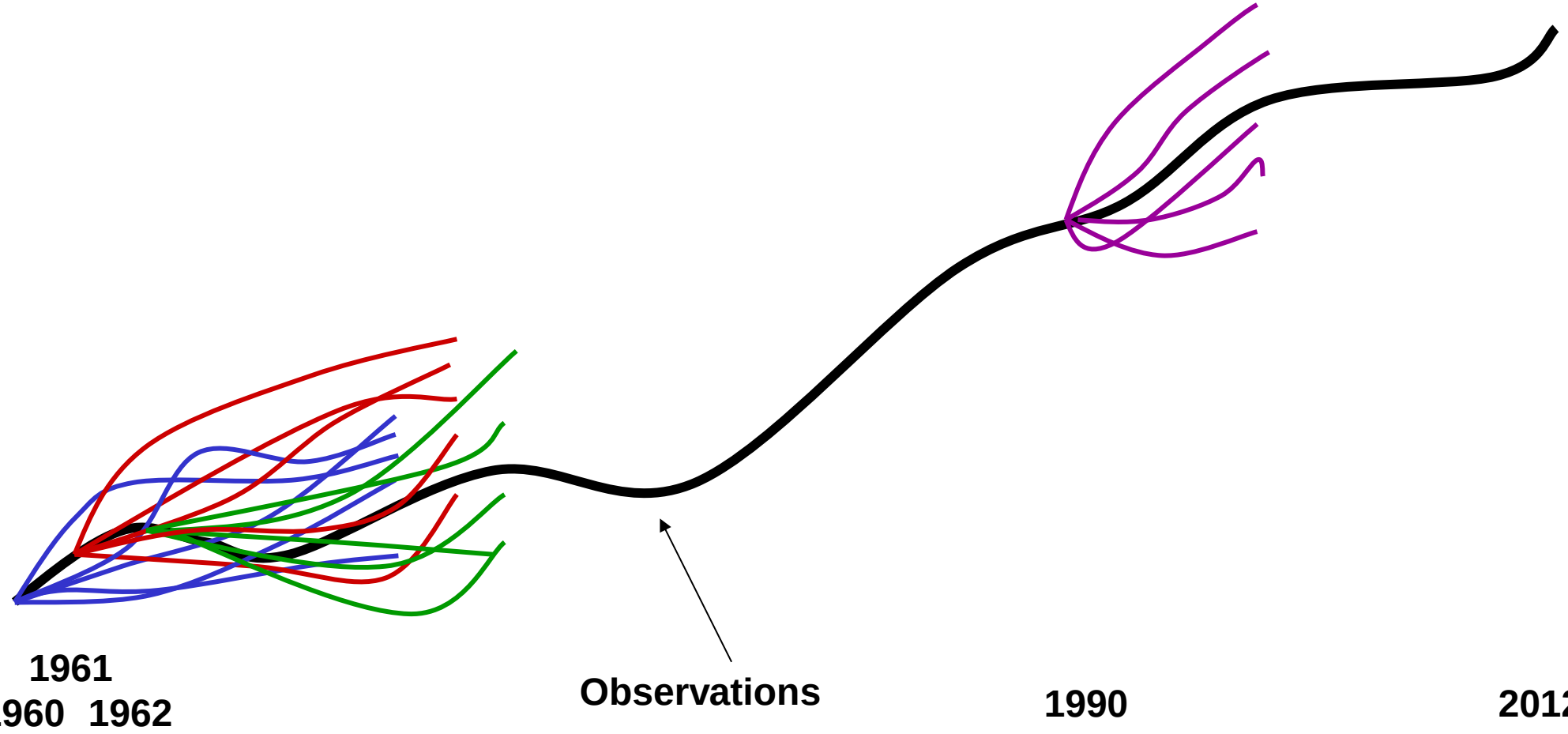
Full field Initialisation



Methodology

Analyses:

Example : Focus on 3rd forecast year



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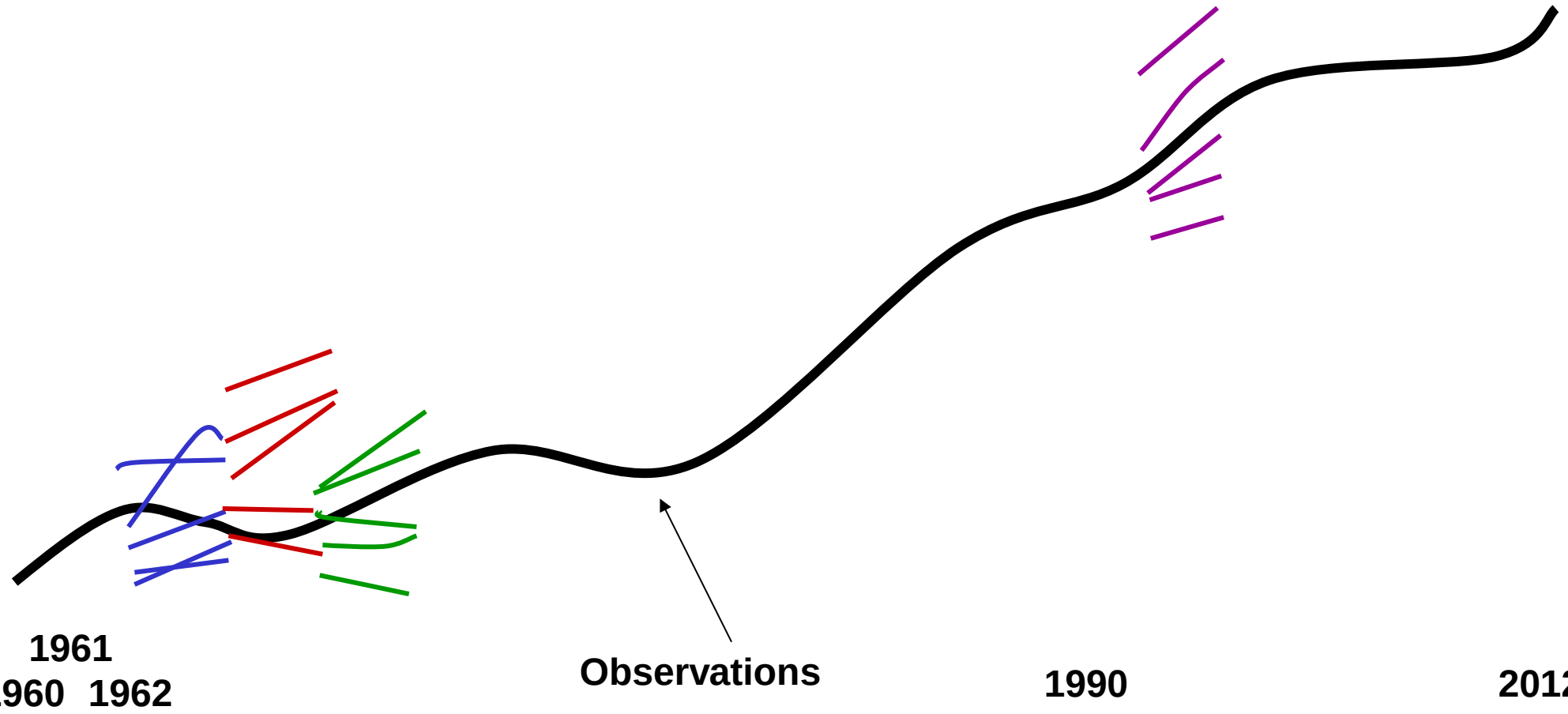

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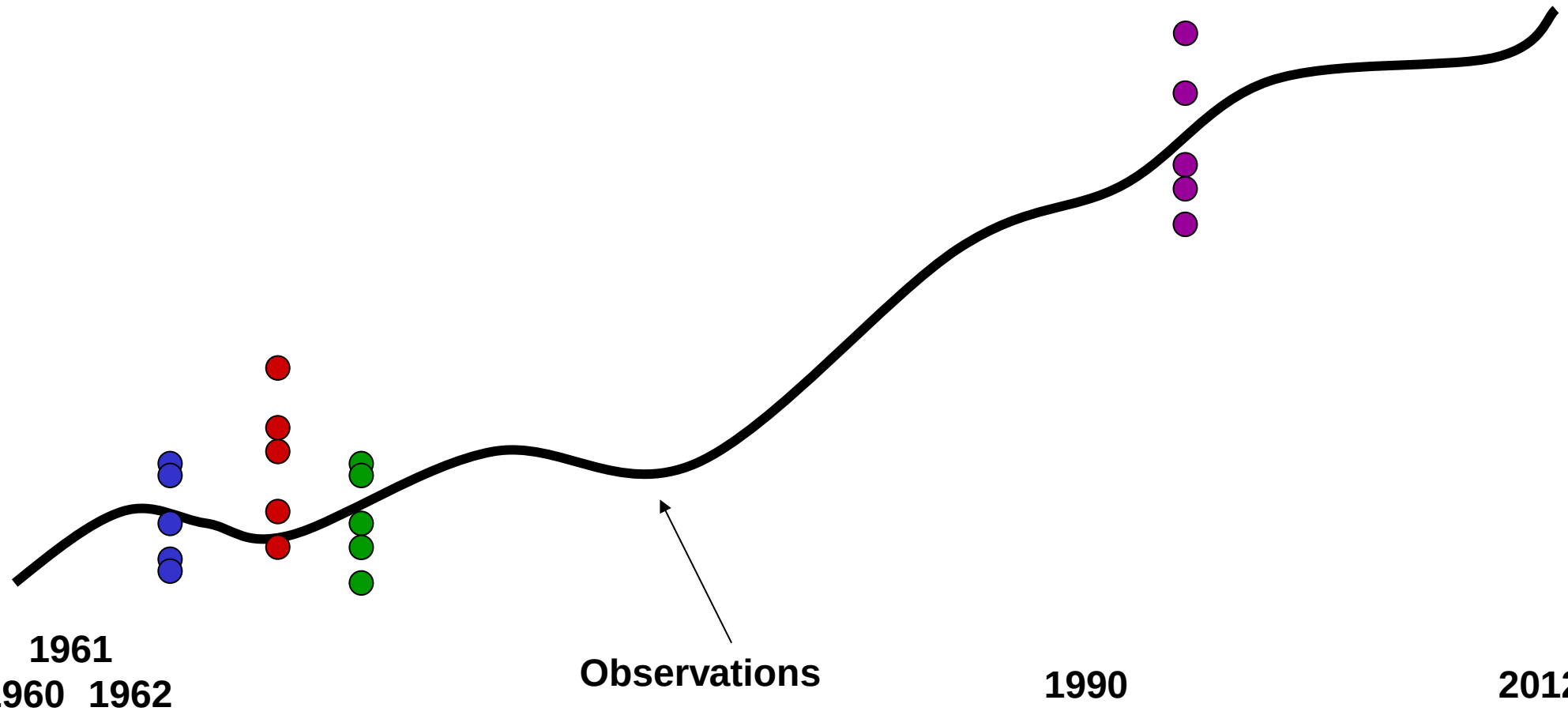

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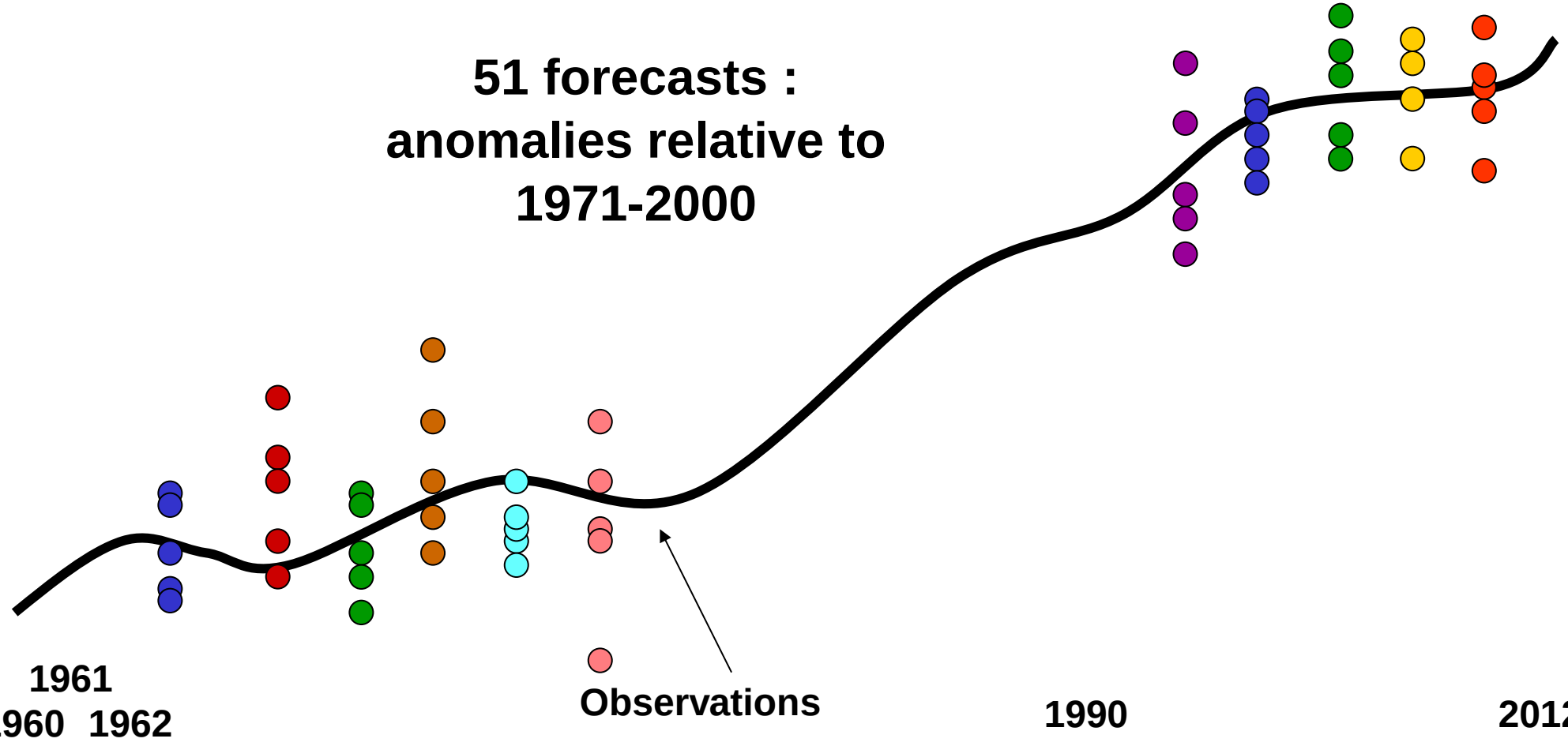
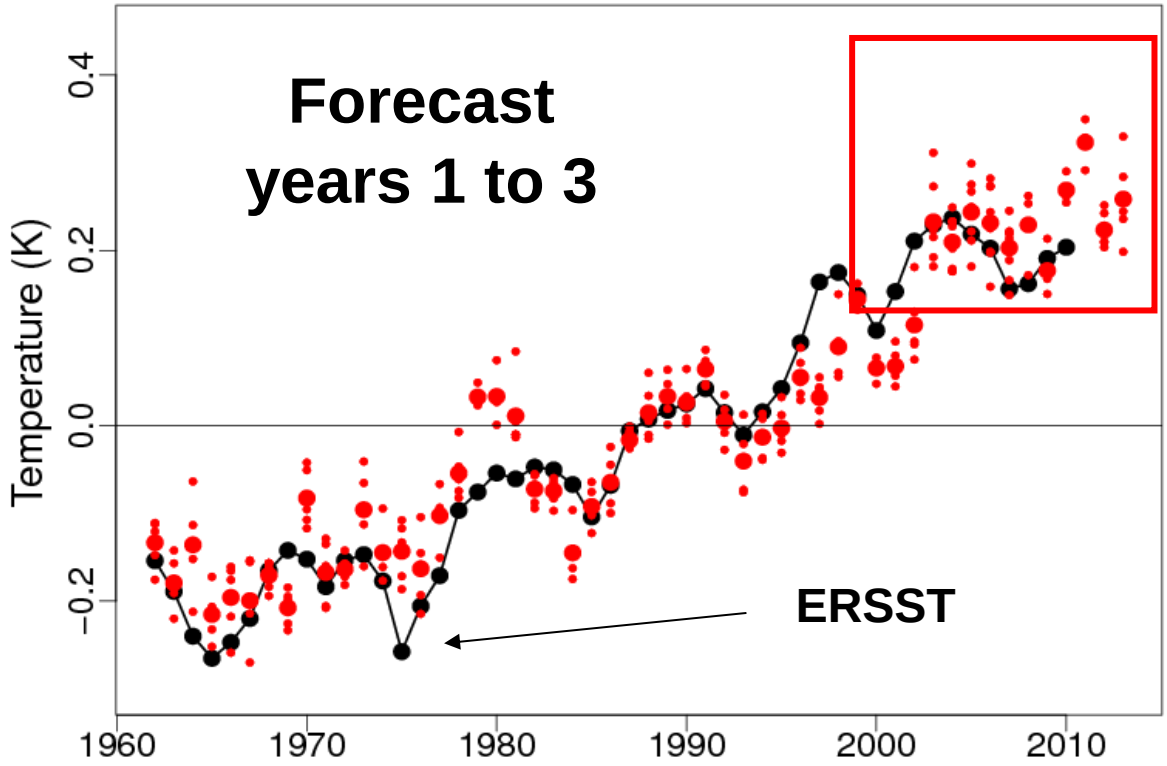


Successful climate prediction of the 2000-2010 global temperature plateau

Global mean Sea Surface Temperature (60°S-60°N)

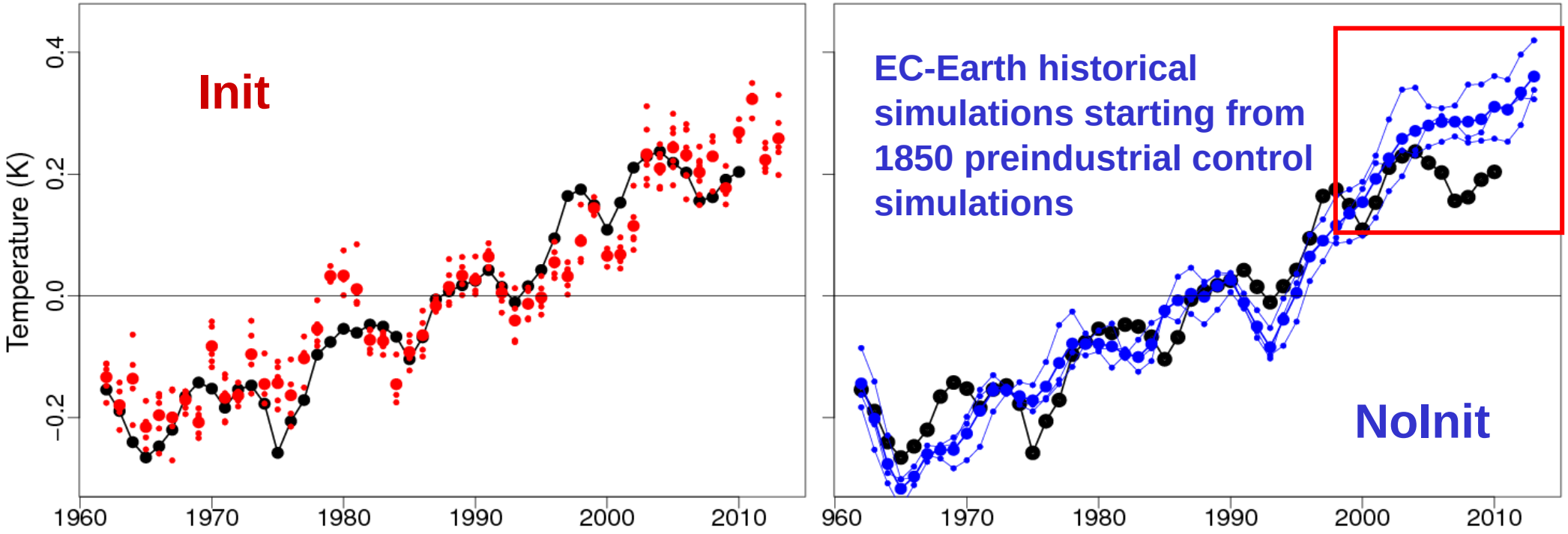


The climate predictions capture the warming slowdown

Climate Forecasting Unit

Successful climate prediction of the 2000-2010 global temperature plateau

Global mean Sea Surface Temperature (60°S-60°N)

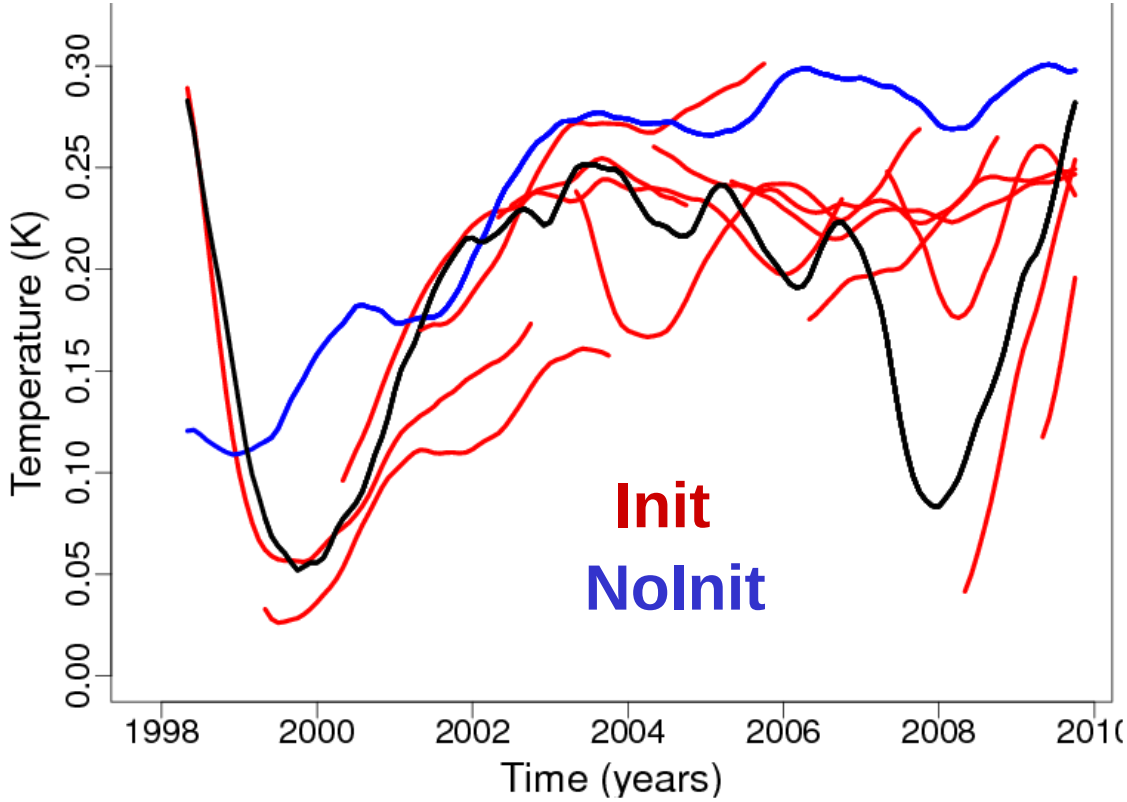


Initializing from observations is crucial to capture the plateau

Successful climate prediction of the 2000-2010 global temperature plateau

Global mean Sea Surface Temperature (60°S-60°N)

Smoothing with 1-year running mean



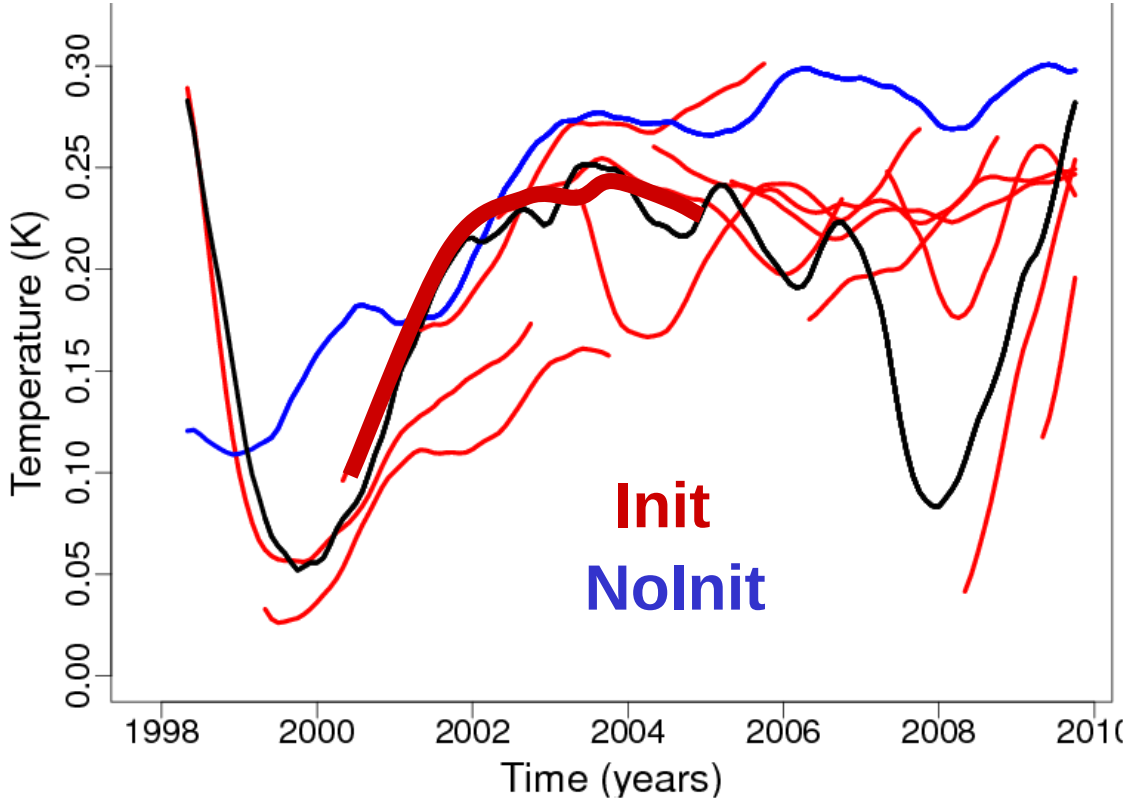
ERSST

Initializing allows to the SST evolution along the predictions

Successful climate prediction of the 2000-2010 global temperature plateau

Global mean Sea Surface Temperature (60°S-60°N)

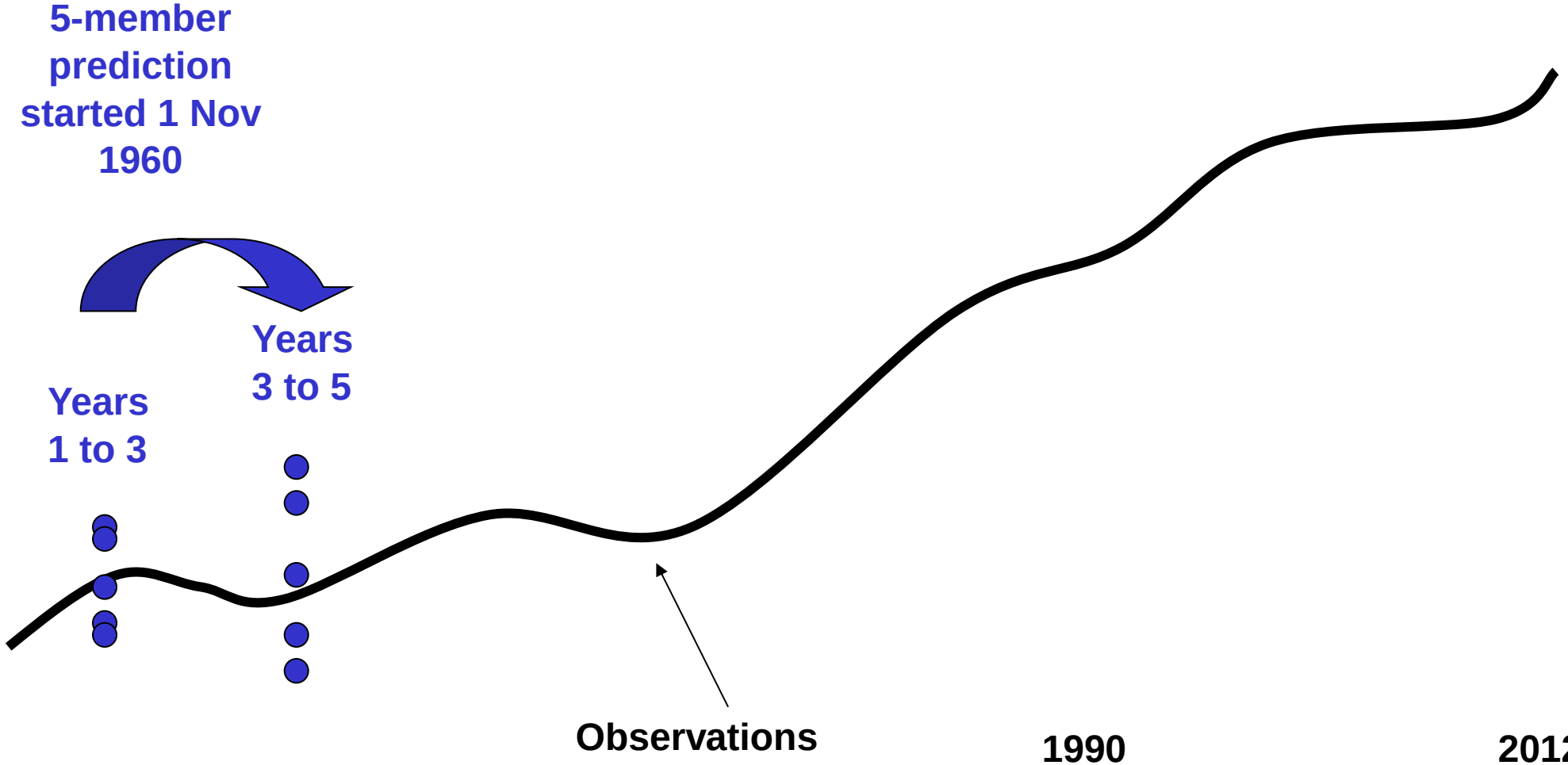
Smoothing with 1-year running mean



Initializing allows to the SST evolution along the predictions

Methodology

Analyses: **3-year mean changes along the forecast**



Methodology

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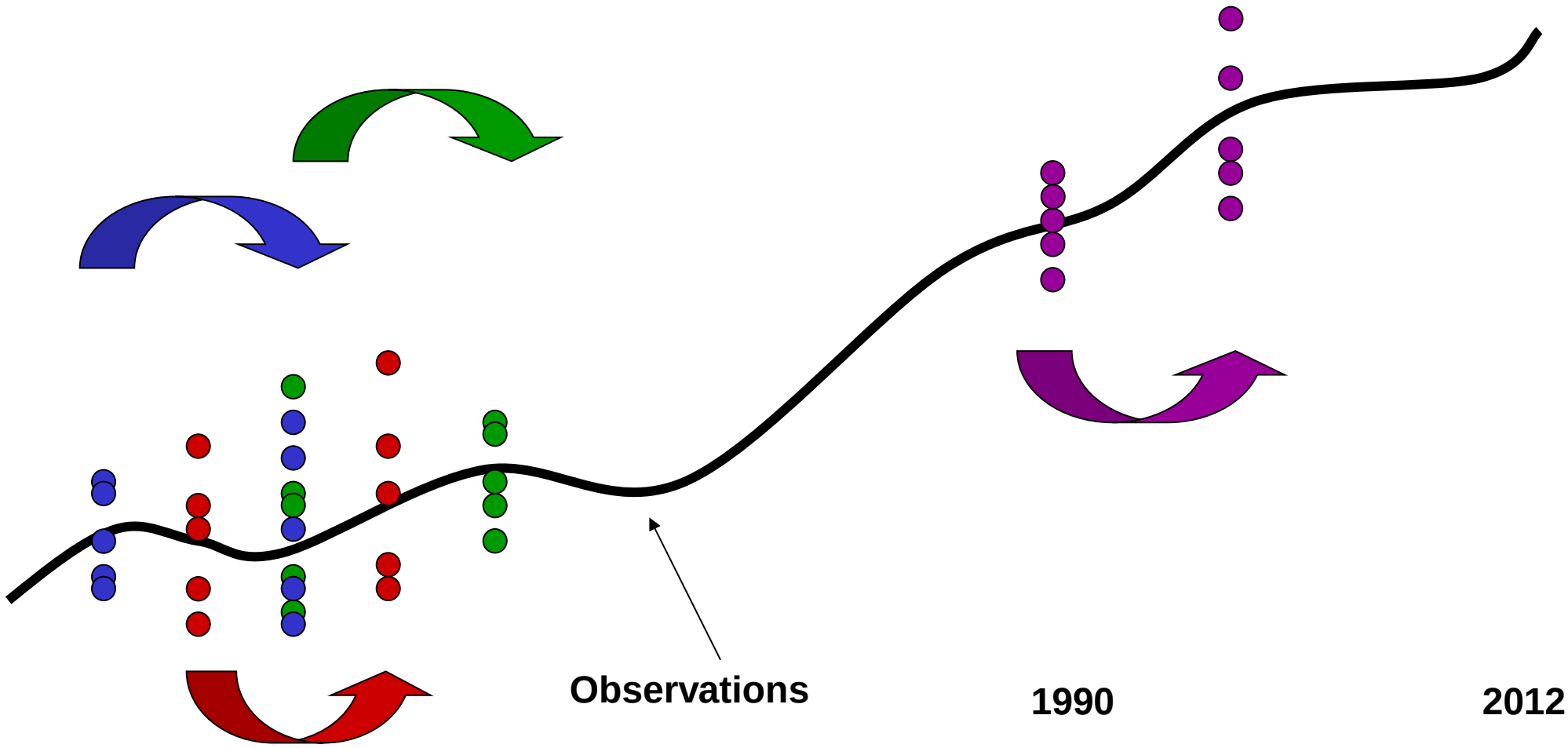
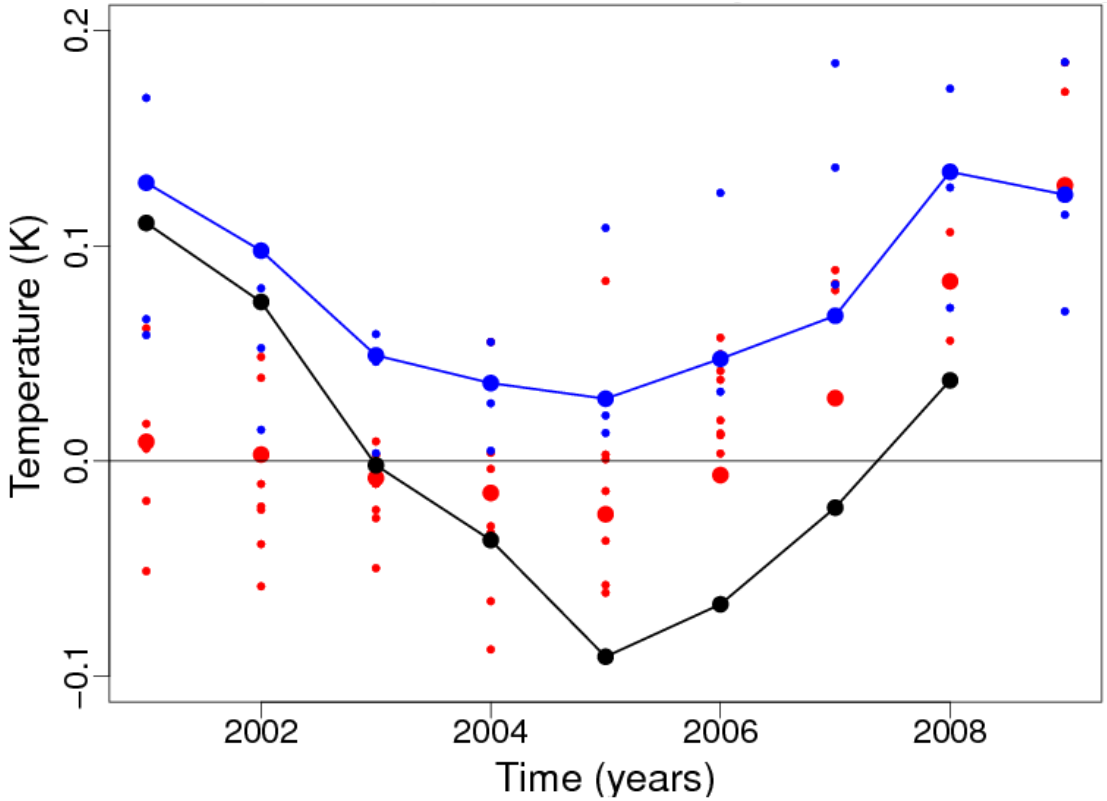


Successful climate prediction of the 2000-2010 global temperature plateau

3-year mean change in global SST (60°S-60°N)



Init

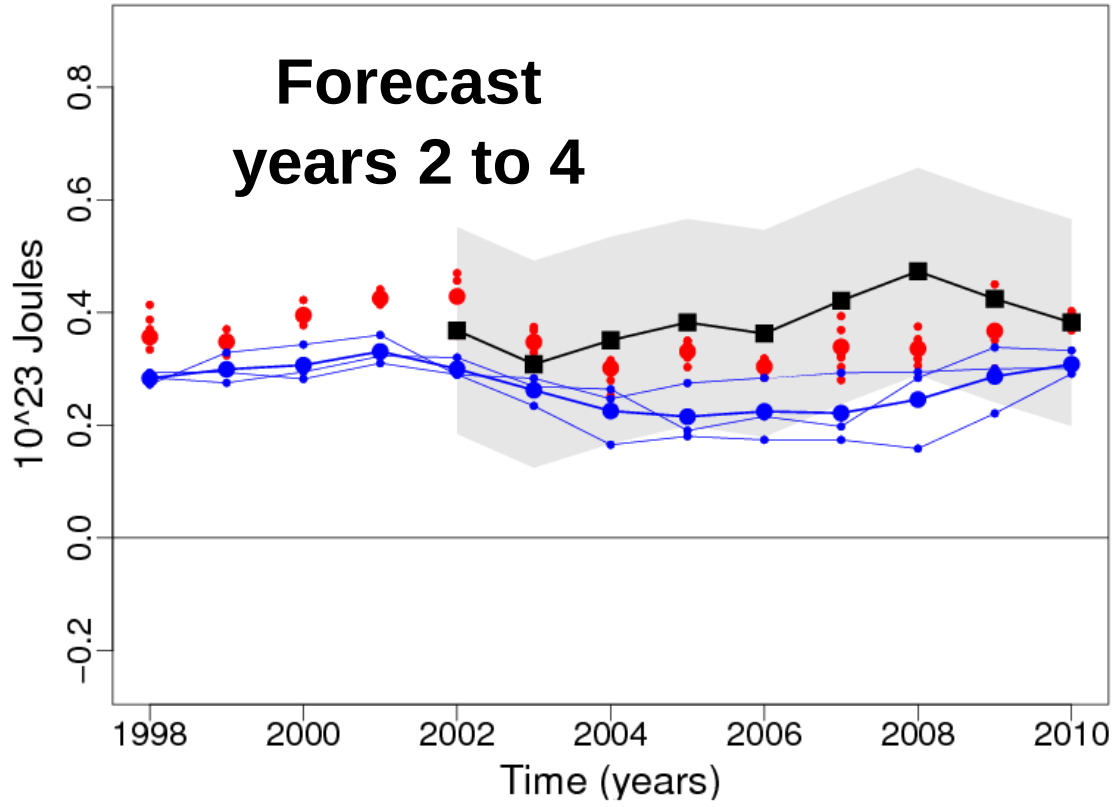
ERSST

NoInit

Initialization improves the SST trend along the forecast

Analysis of these predictions to attribute the 2000-2010 global temperature plateau

Global Top-of Atmosphere Excess Energy



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CERES

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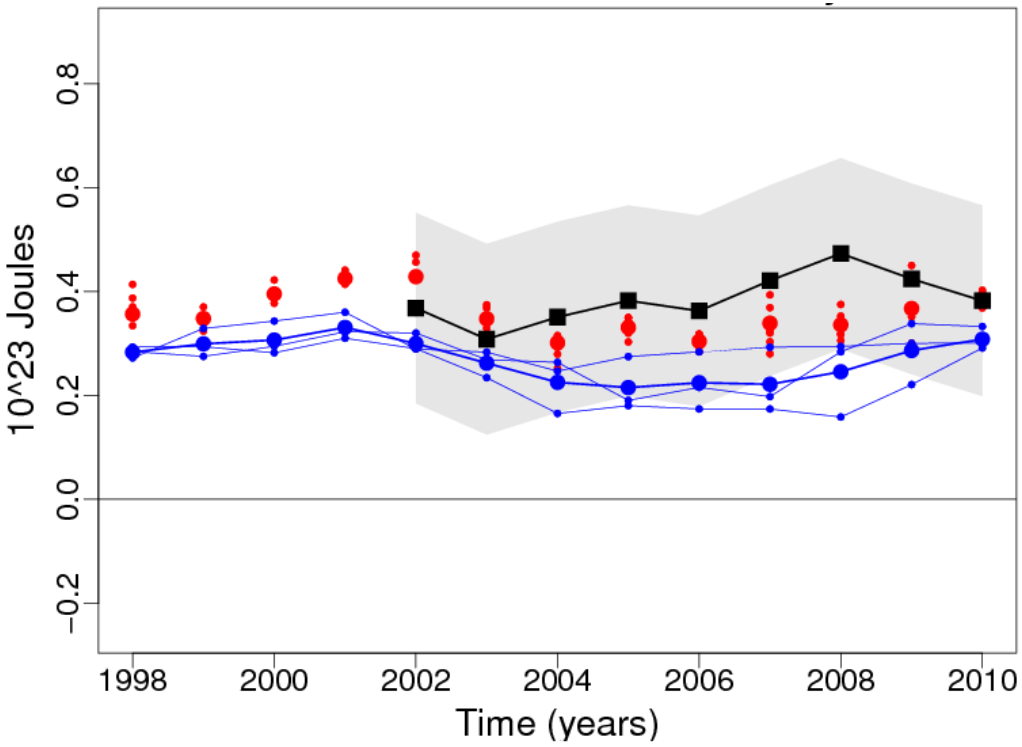
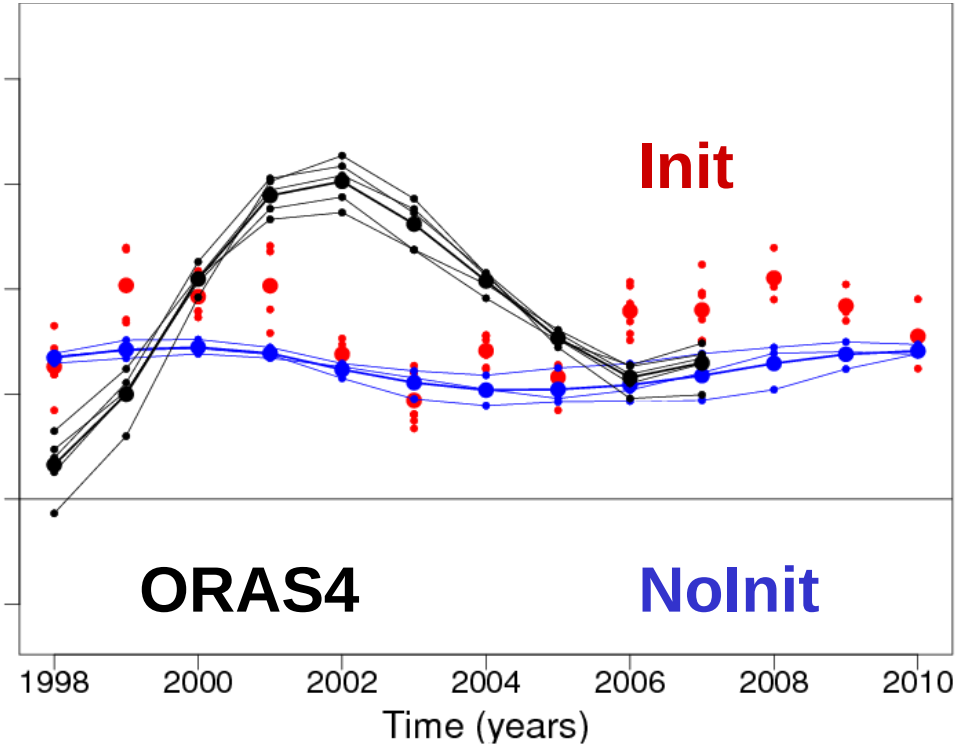
TOA input energy around 0.4 x 10^{23} Joules captured

Analysis of these predictions to attribute the 2000-2010 global temperature plateau

Global TOA Excess Energy



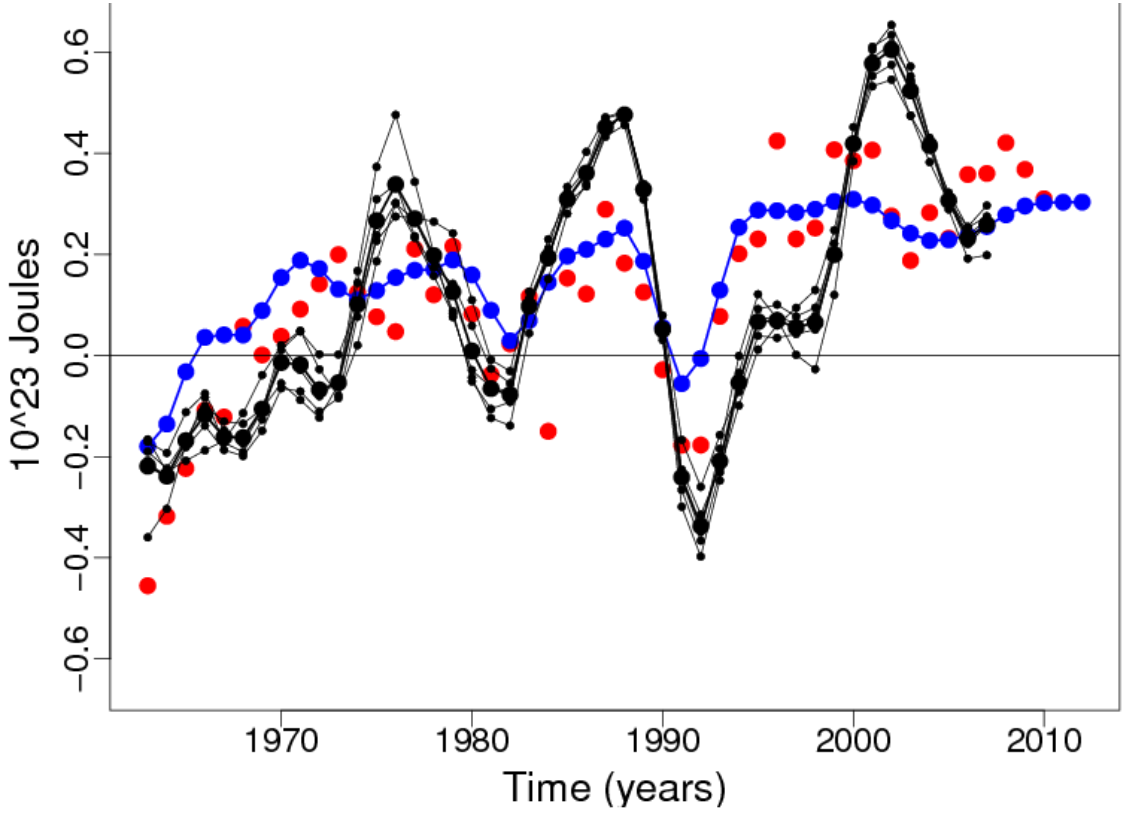
Global Ocean Heat Uptake



Increased Ocean Heat Uptake compensates for TOA inflow

Analysis of these predictions to attribute the 2000-2010 global temperature plateau

Global Ocean Heat Uptake



Init

ORAS4

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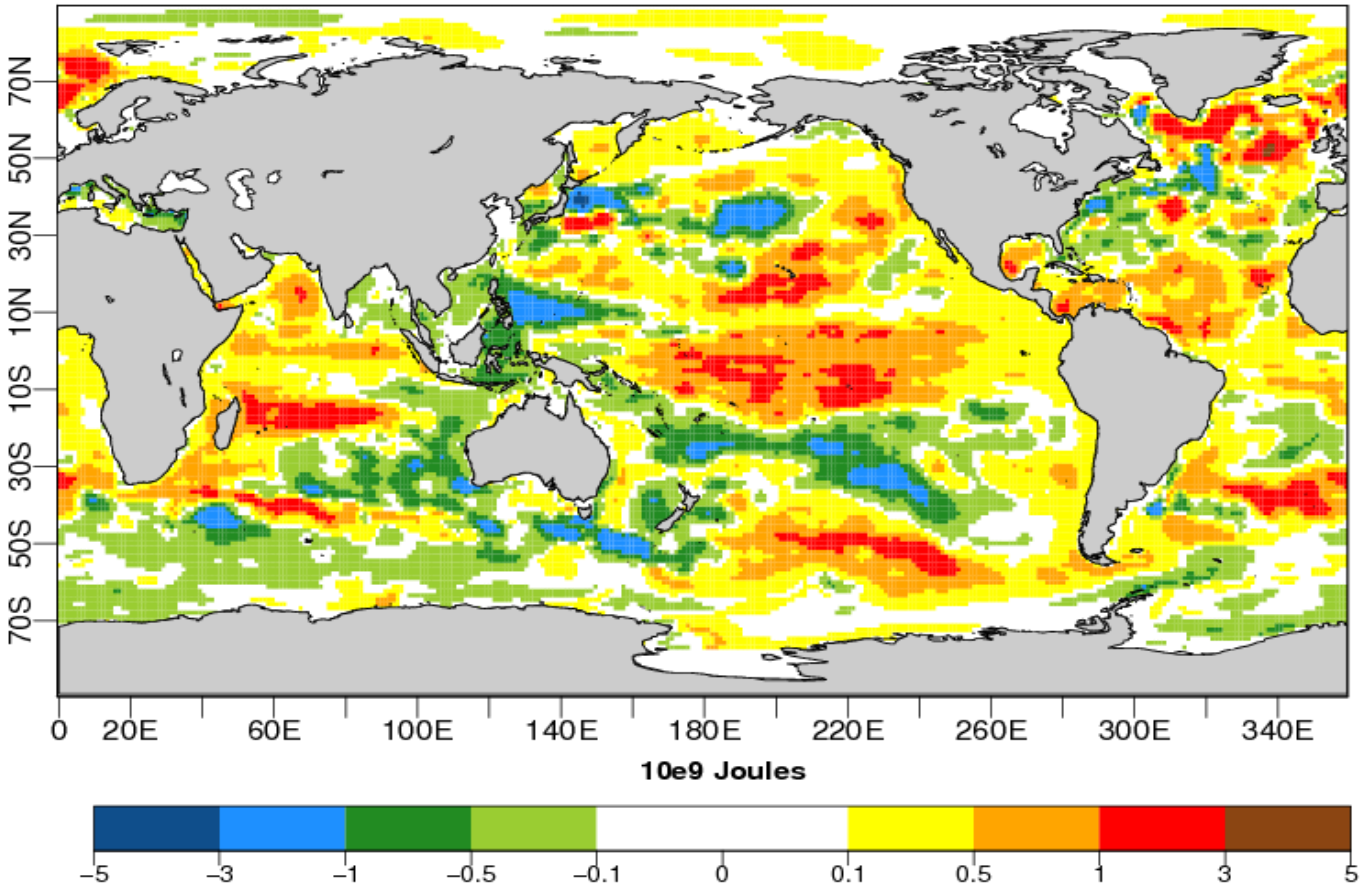
Largest ever recorded peak in ocean heat uptake

Analysis of these predictions to attribute the 2000-2010 global temperature plateau

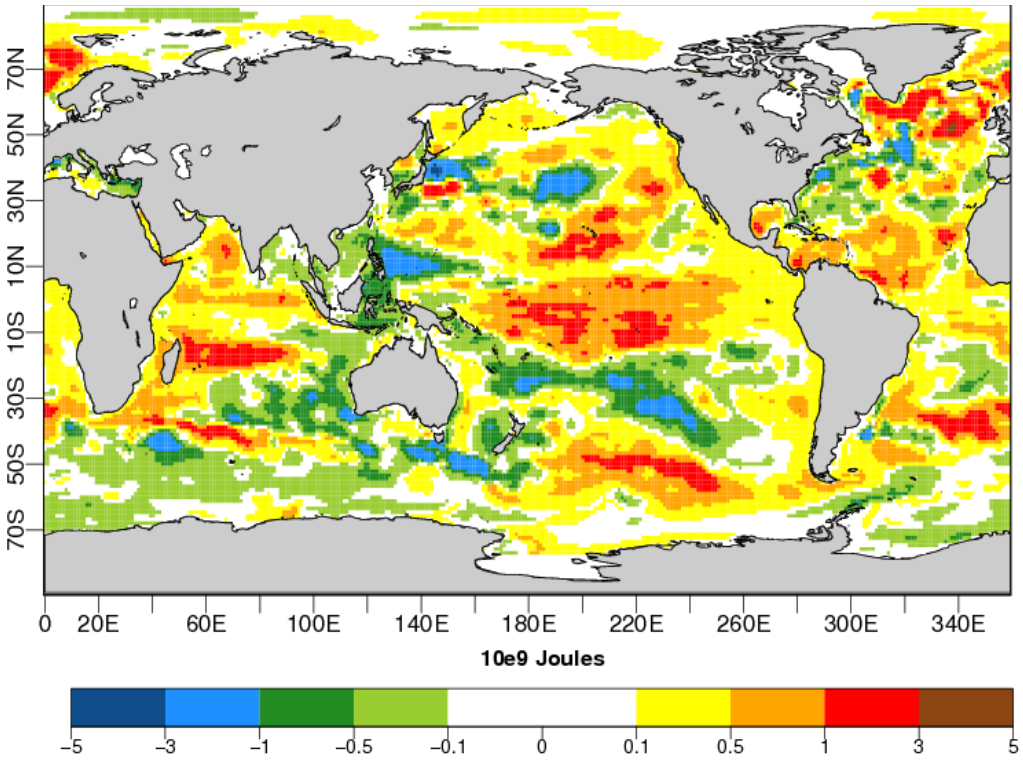
ORAS4 Ocean heat uptake (0-800m excluding the mixed layer) at the onset of the plateau



The plateau seems due to increased ocean heat absorption

Analysis of these predictions to attribute the 2000-2010 global temperature plateau

ORAS4



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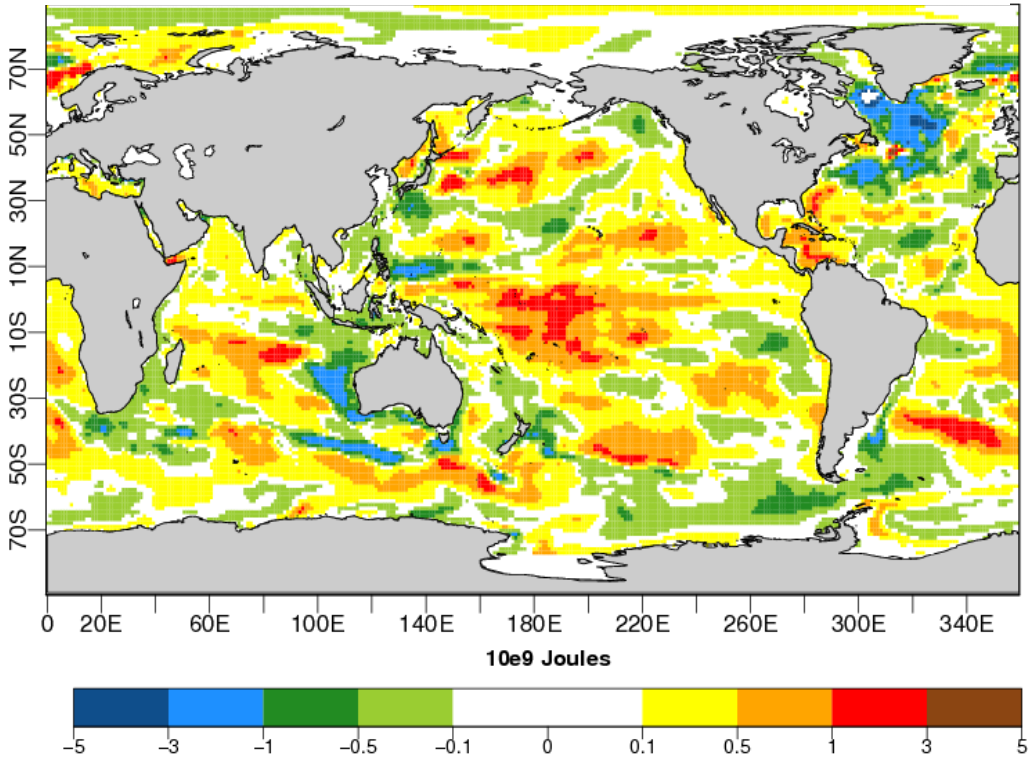
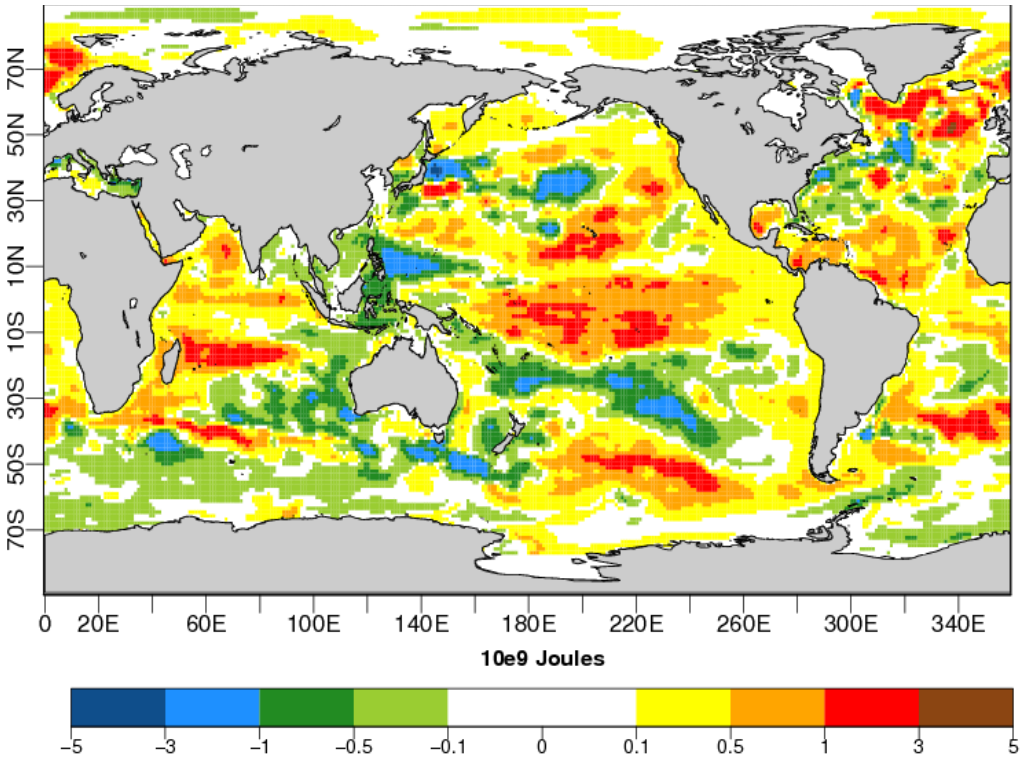


Increased ocean heat uptake in the Pacific captured by Init

Analysis of these predictions to attribute the 2000-2010 global temperature plateau

ORAS4



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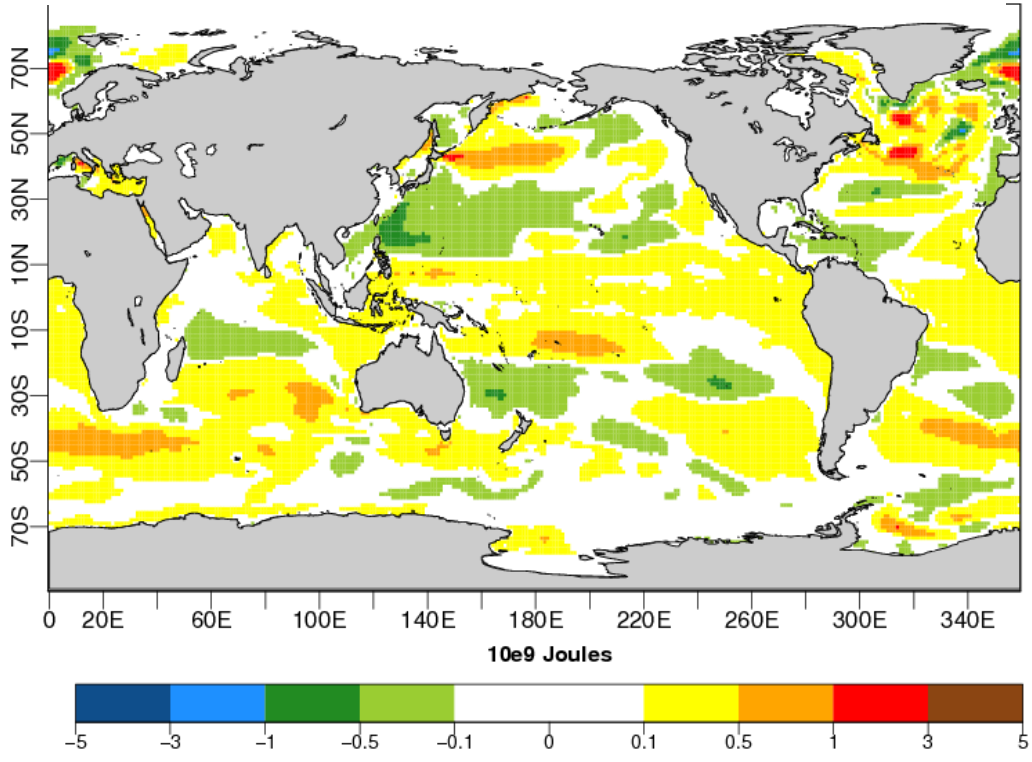

Weak signals after ensemble-mean operator on NoInit

Conclusions

- **Ec-Earth climate predictions capture the temperature plateau until 5 years ahead. The realism of the SST trend along the forecast is improved with initialization**
- **The Earth's heat budget shows that the TOA excess energy has been mainly absorbed in the ocean below the mixed layer at the onset of the plateau**

Thank you very much for your attention

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