Testing agro-climatic indices for yield predictions in long term experiments

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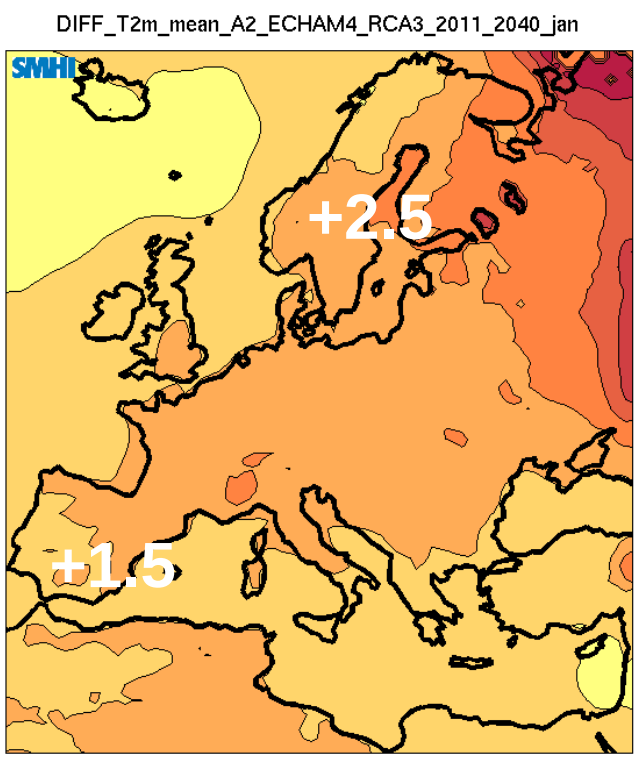
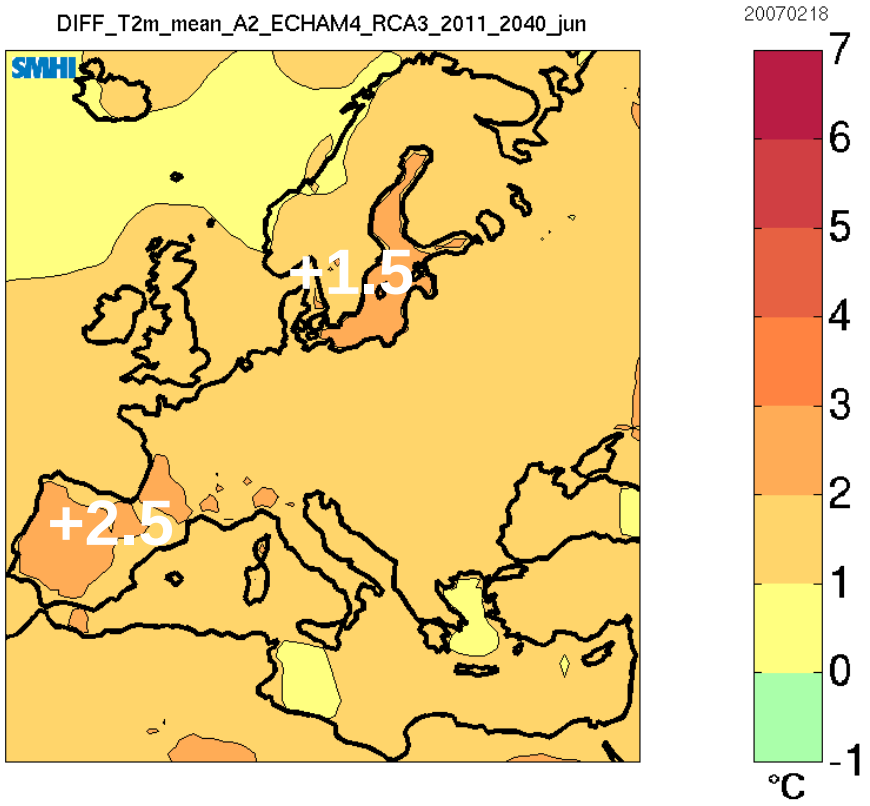
(2008-October)

Climate change scenario for ~2025$_{A2}$

January

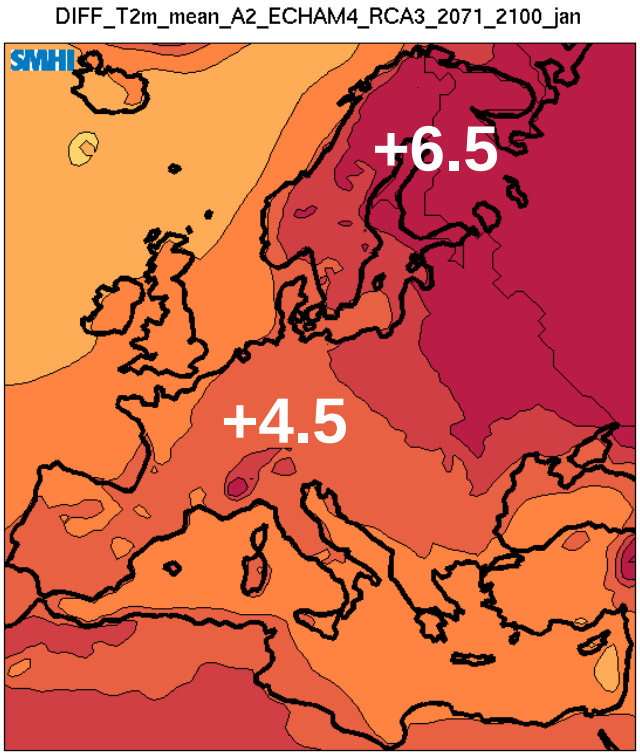


June

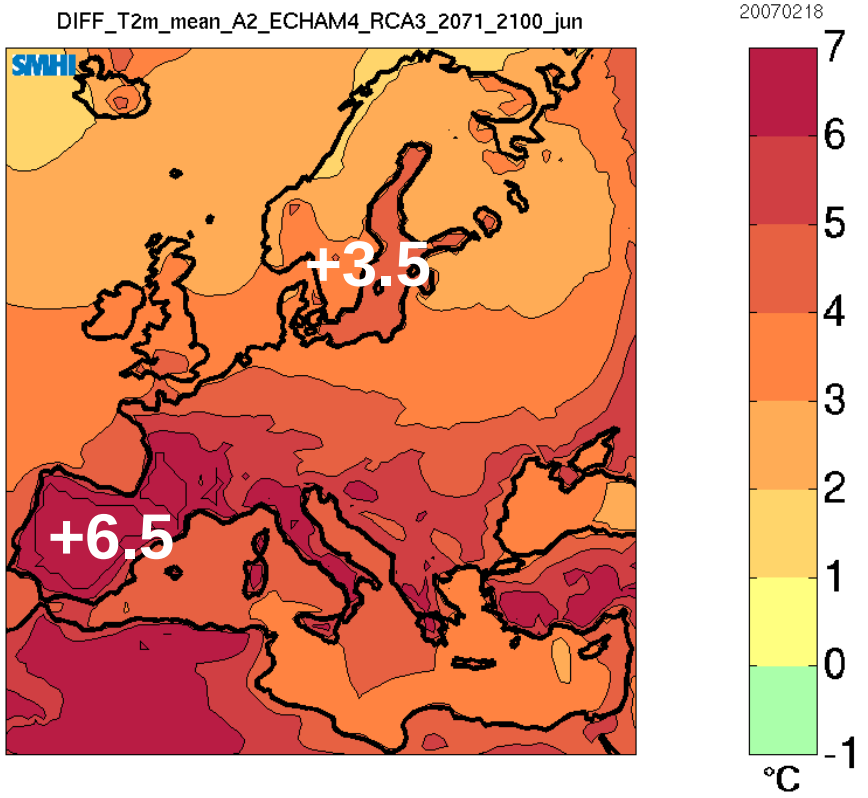


Climate change scenario for ~2085 A2

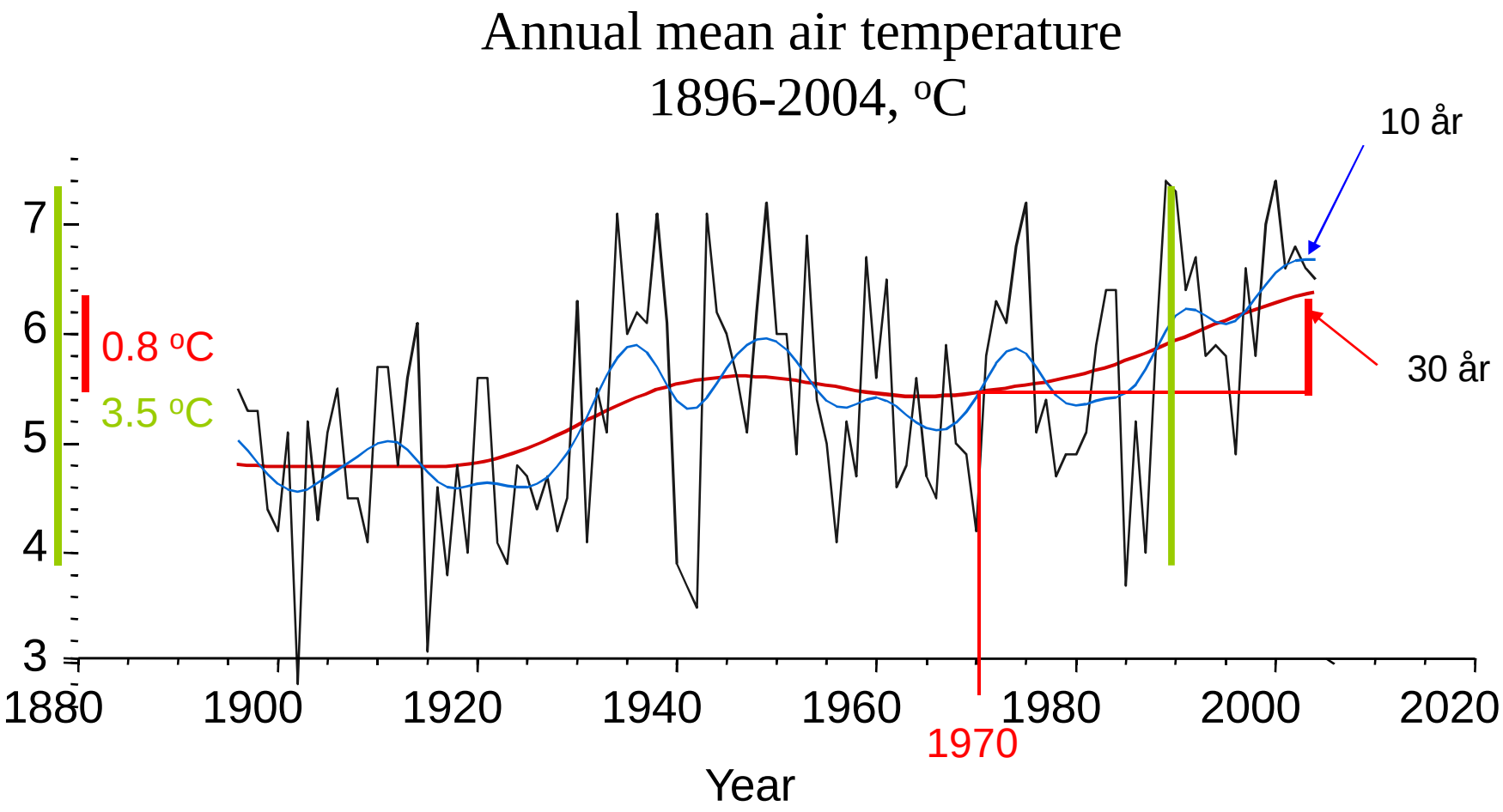
January



June

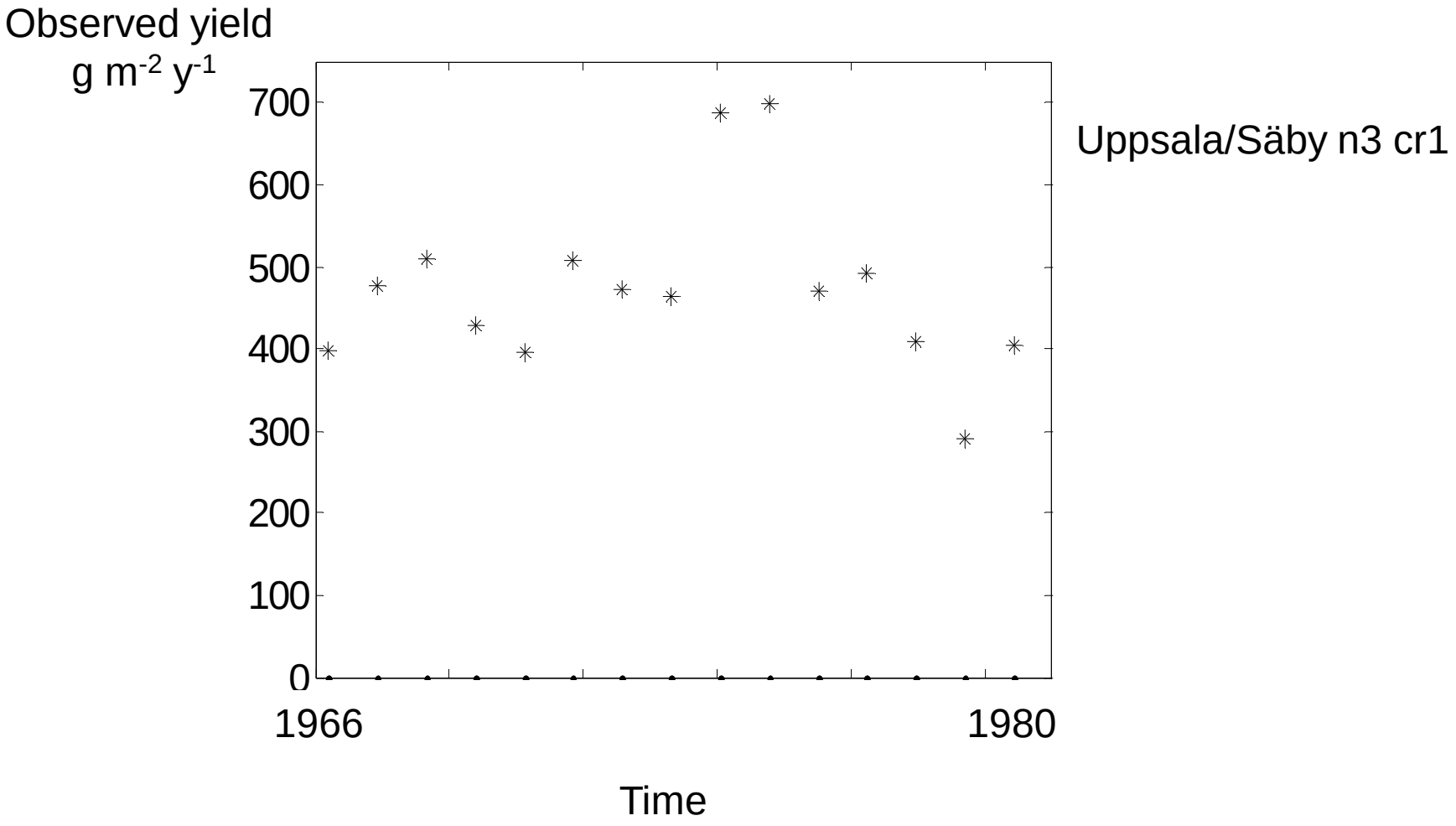


Ultuna - Uppsala

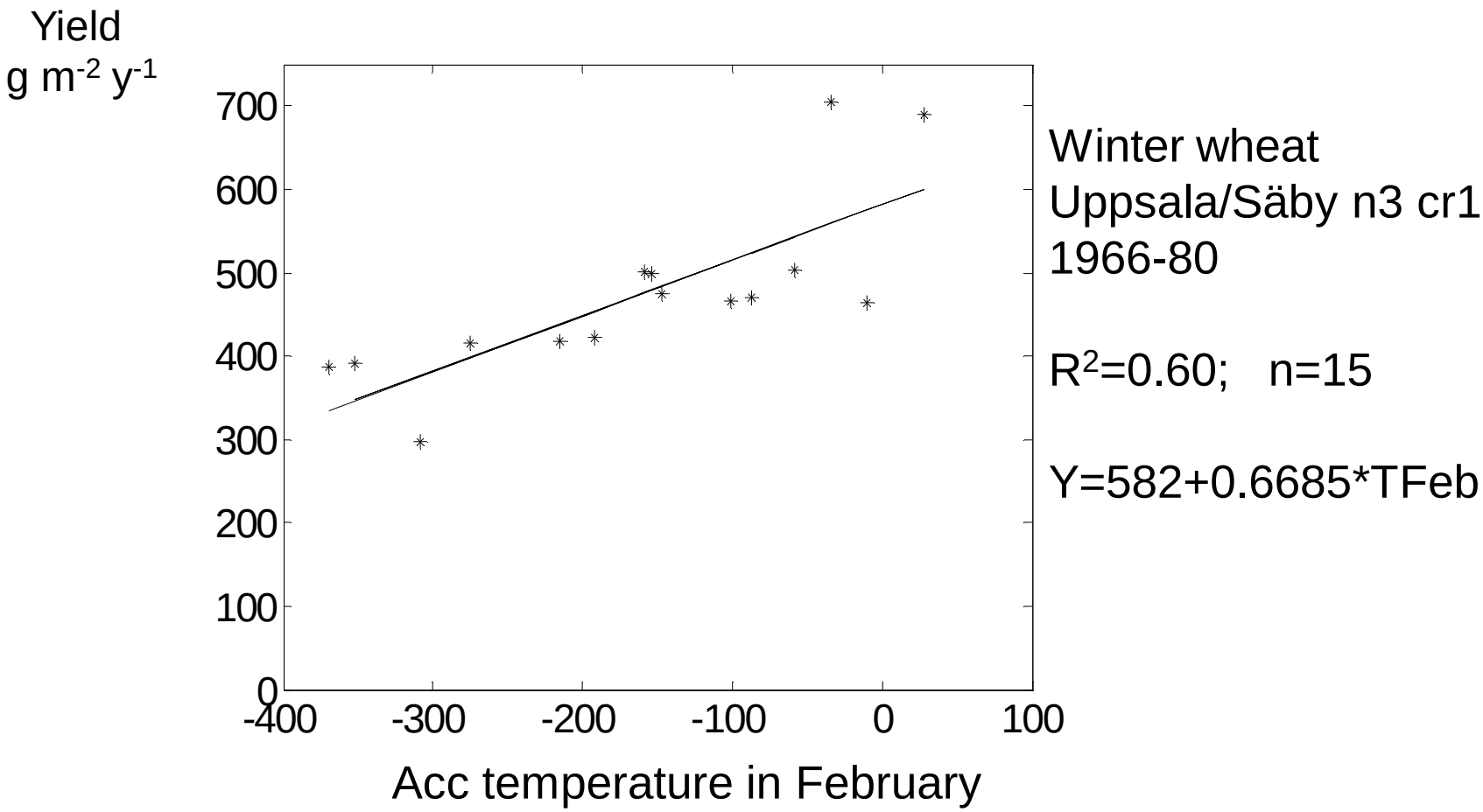


Per Nyman, SLU

Winter wheat yield varies between years



Yield and temperature are correlated

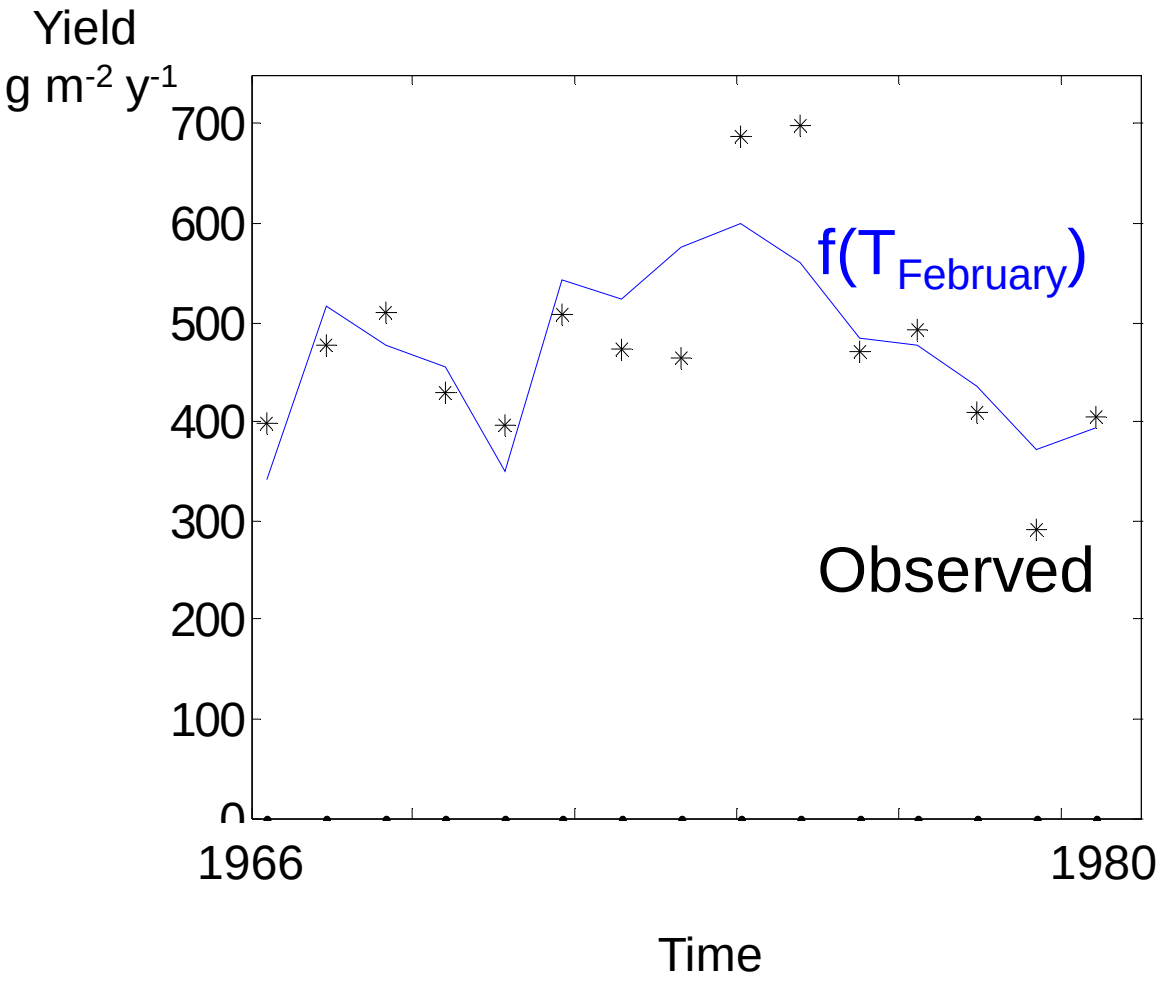


Winter wheat
Uppsala/Säby n3 cr1
1966-80

R^2=0.60; n=15

Y=582+0.6685*TFeb

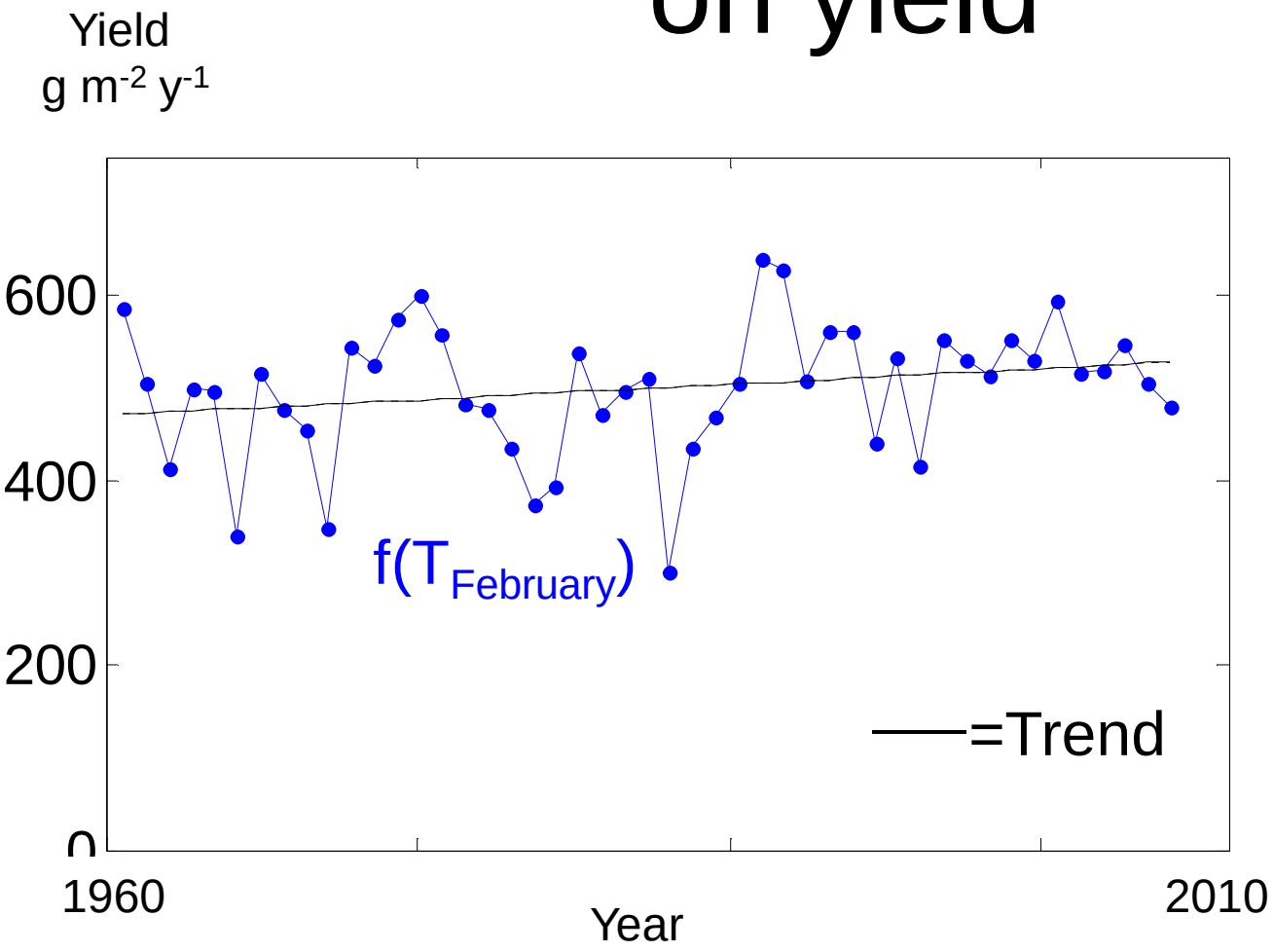
Yield = f(temperature)



Winter wheat
Uppsala/Säby n3 cr1

f(Tfebruary)=
582+0.6685*(TFeb)

The temperature effect on yield



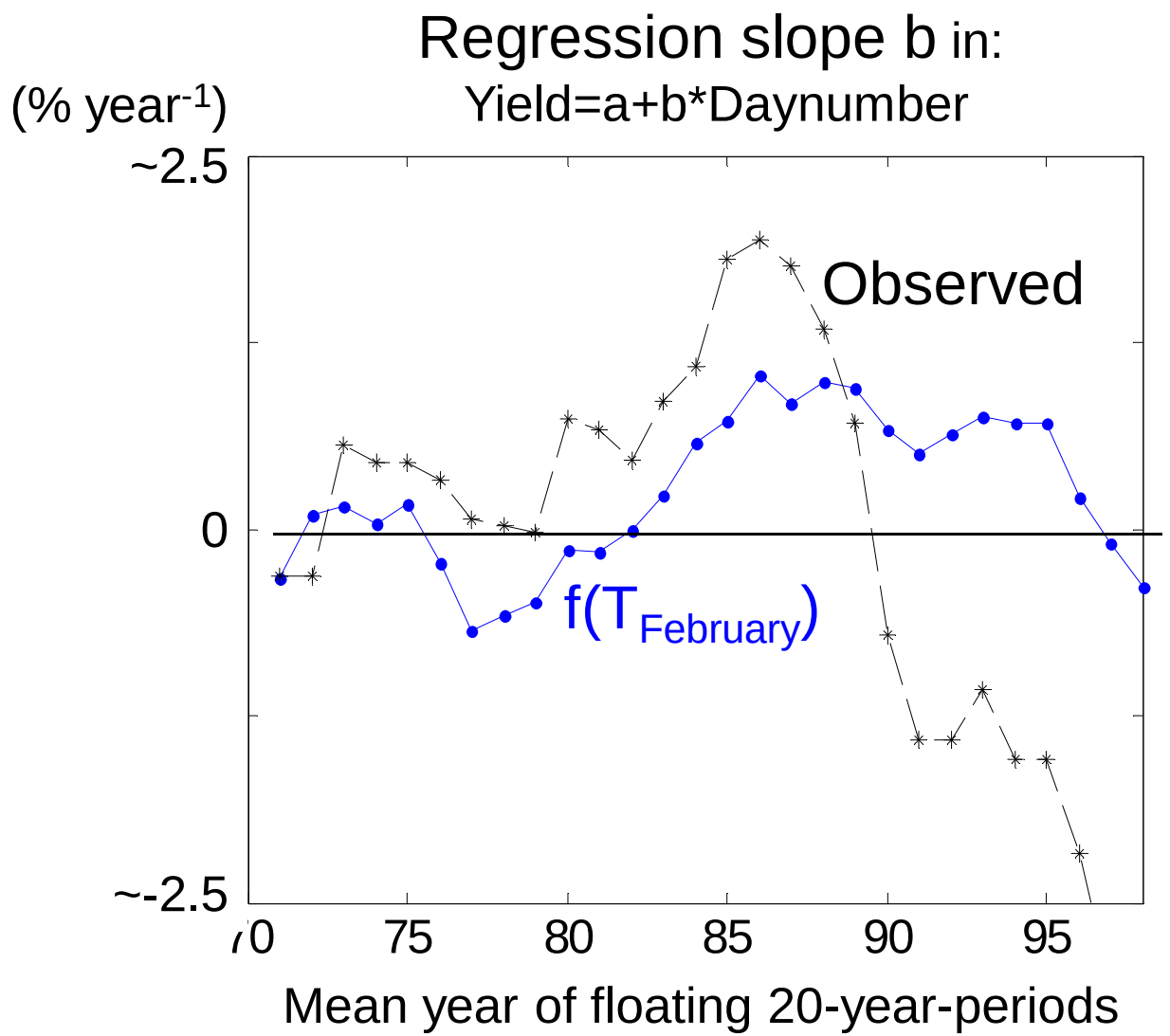
Winter wheat
Uppsala/Säby n3 cr1

f(Tfebruary=)
582+0.6685*(TFeb)

Trend function=
470+0.0034*DN
(~0.25% year^{-1})

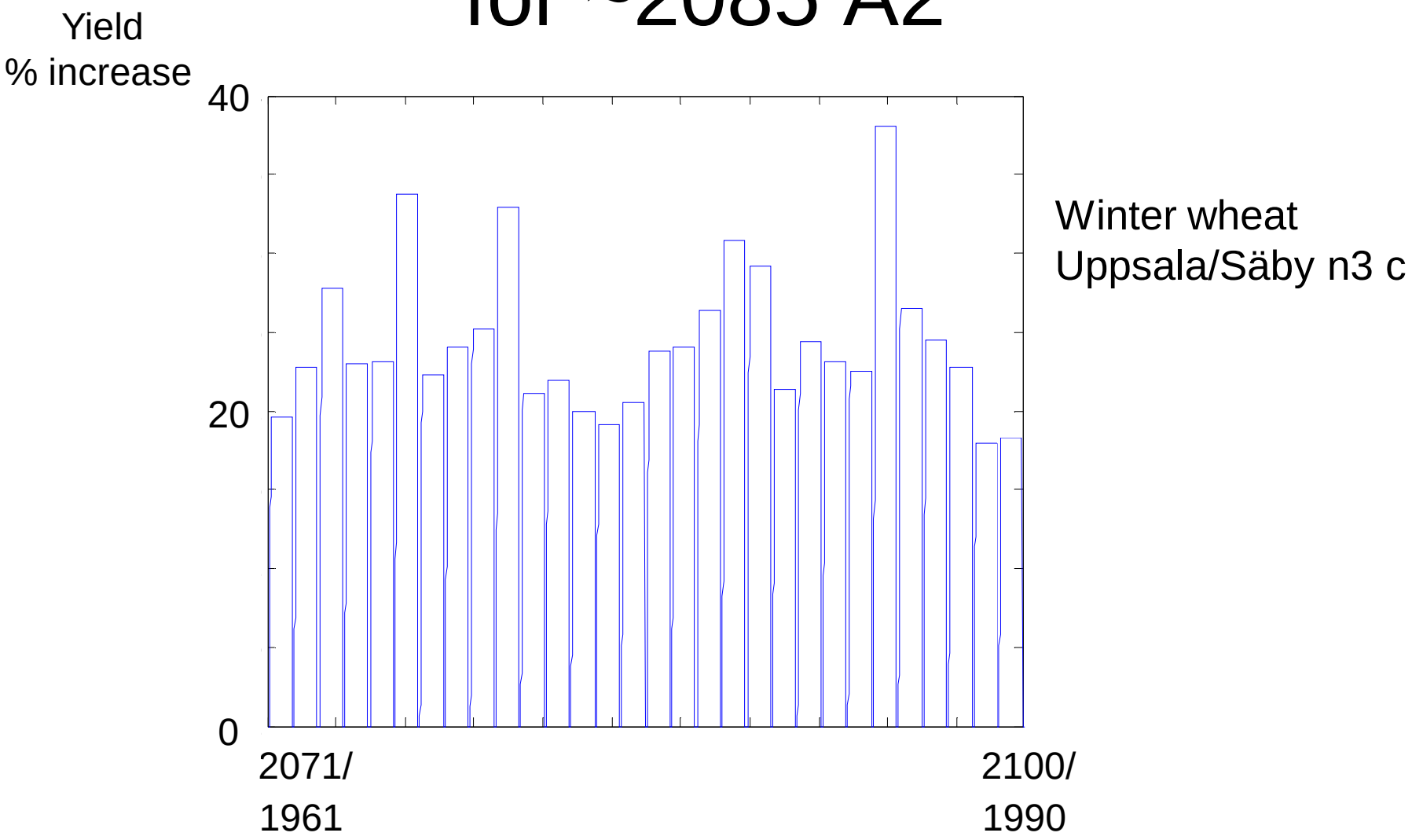
Trends in yield

due to temperature, and observed

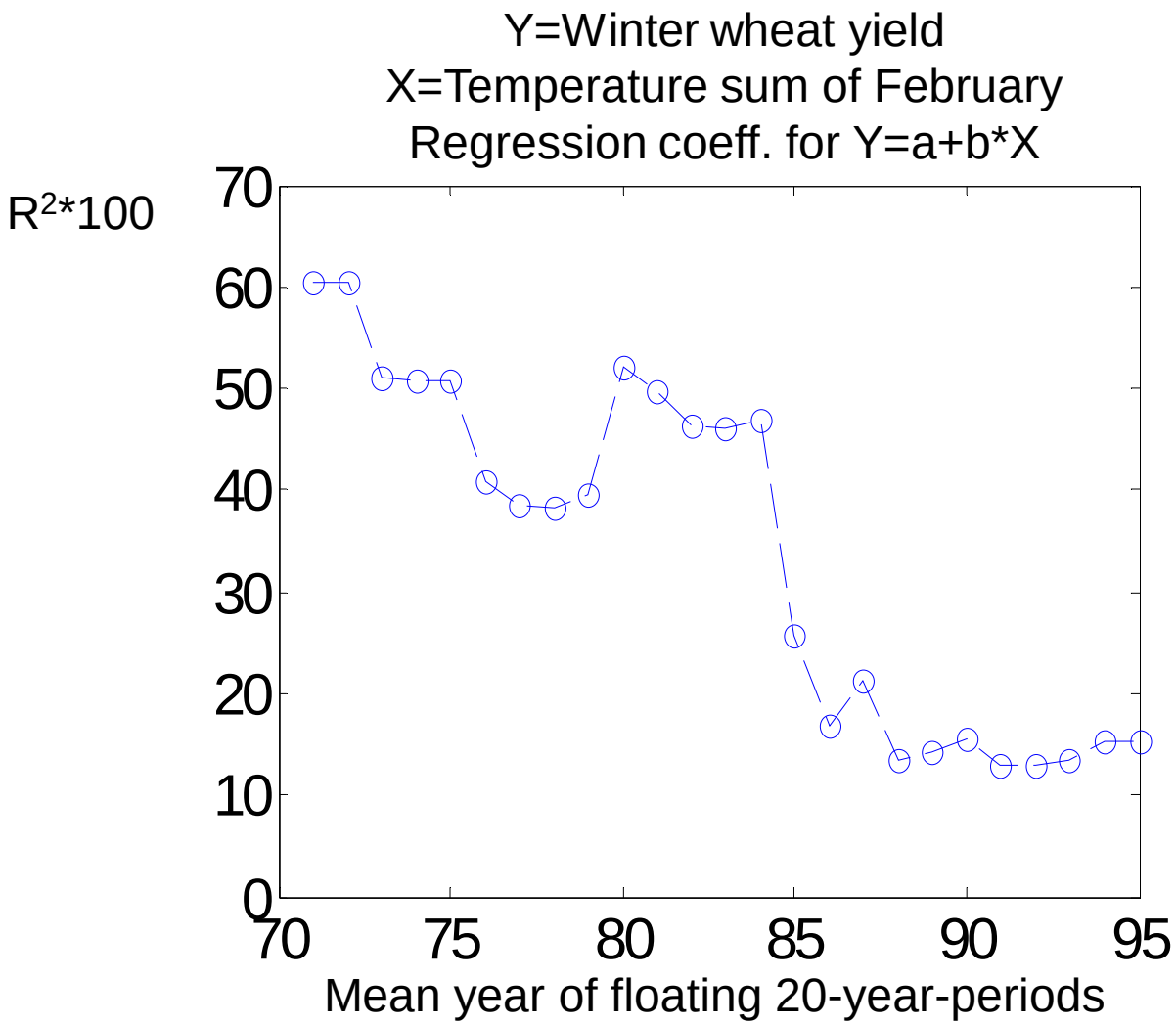


Winter wheat
Uppsala/Säby n3 cr1

Climate change assessment for ~2085 A2

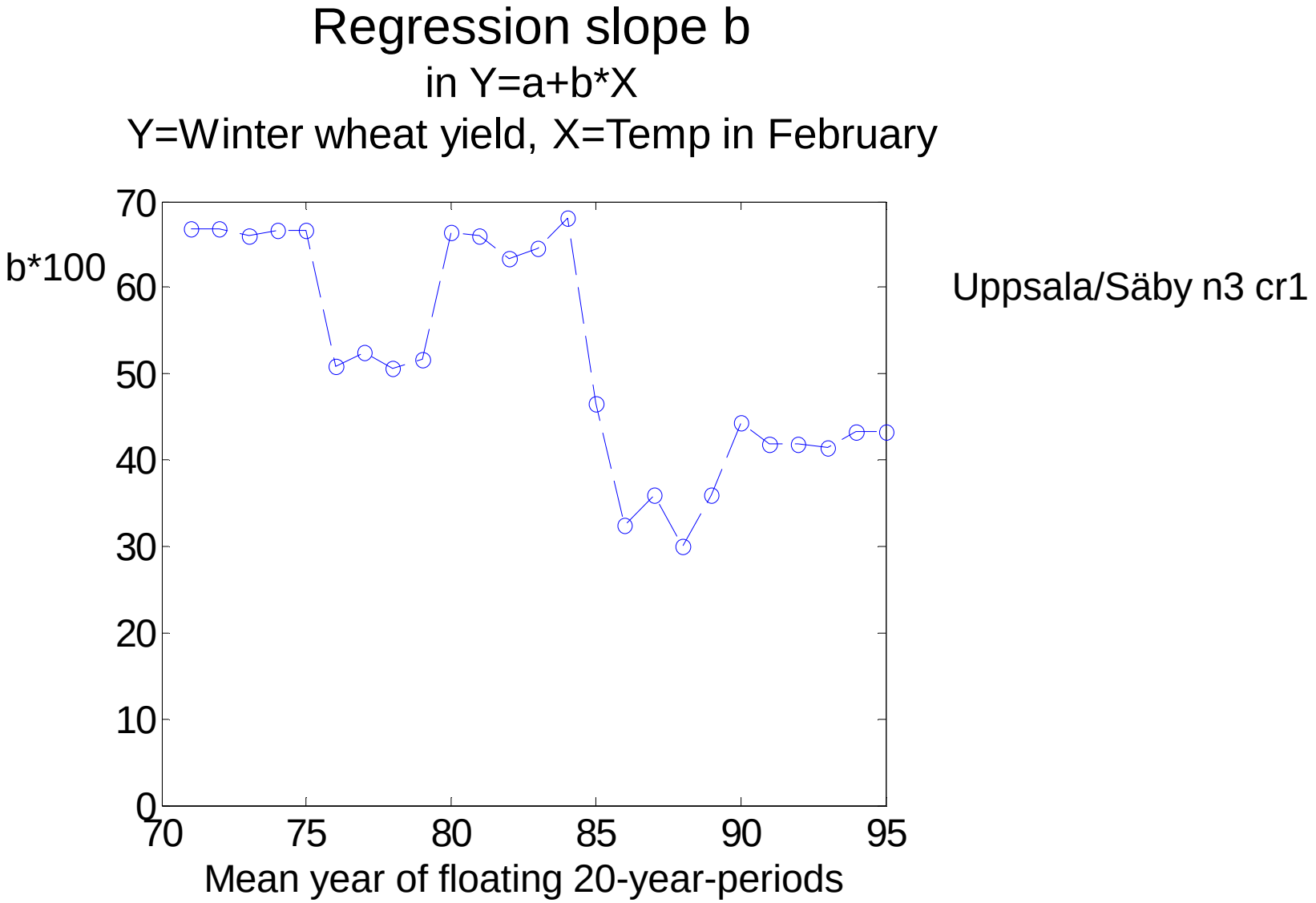


But,
is yield and temperature well correlated also after 1980?

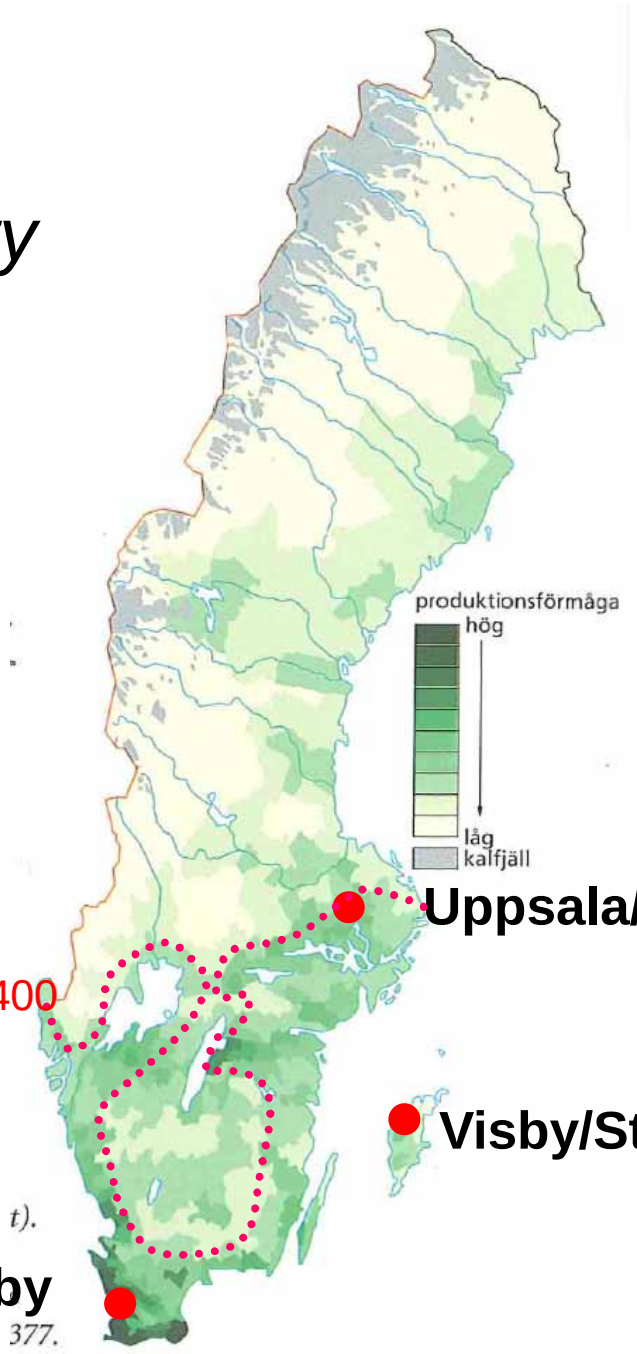


Winter wheat
Uppsala/Säby n3 cr1

Yield relation to temperature



Climate
/Crop productivity



temp summa (T > 5) 1400

Uppsala/Säby

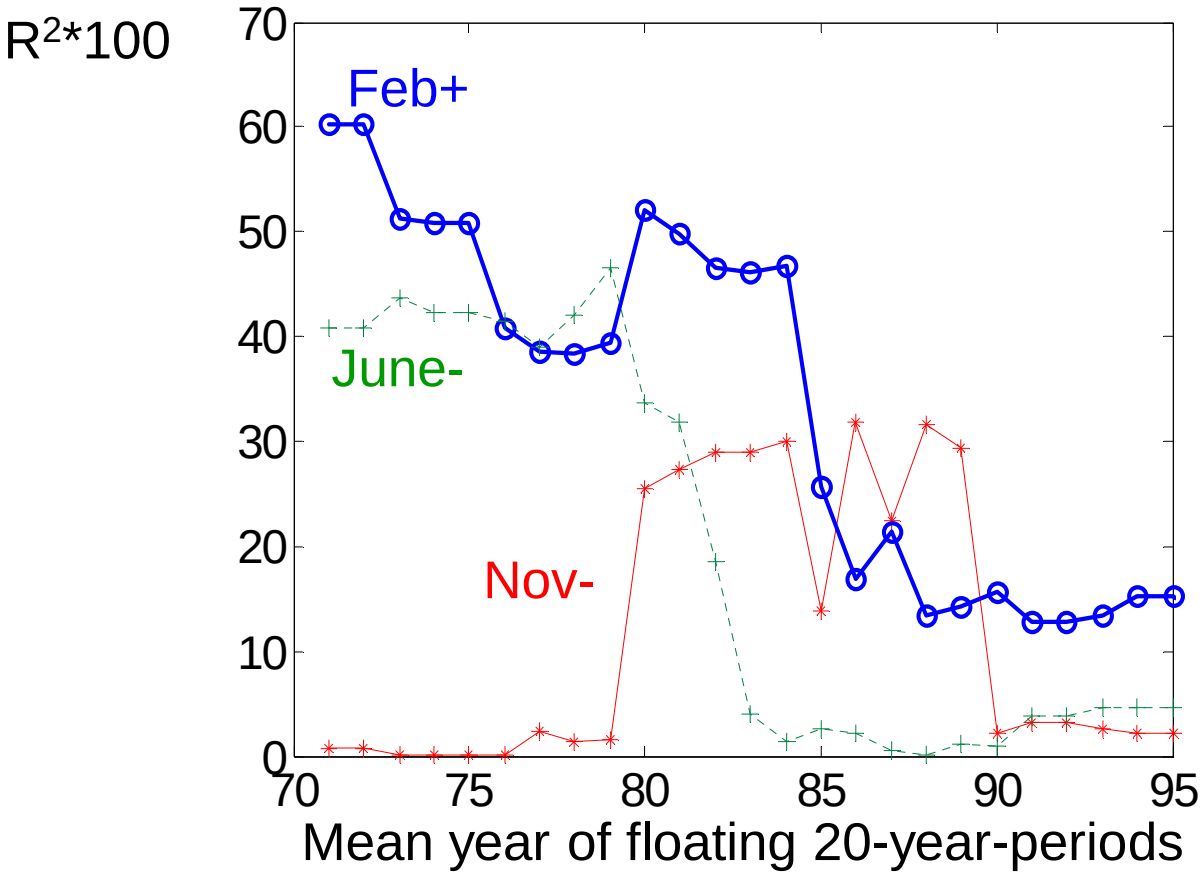
Visby/Stenstugu

Lund/Borgeby

Fogelfors m fl., 2001

Yield correlation to temperature shifts over time, Uppsala

Coefficient of determination
in Y=a+b*X
Y= yield, X=Temperature of single month



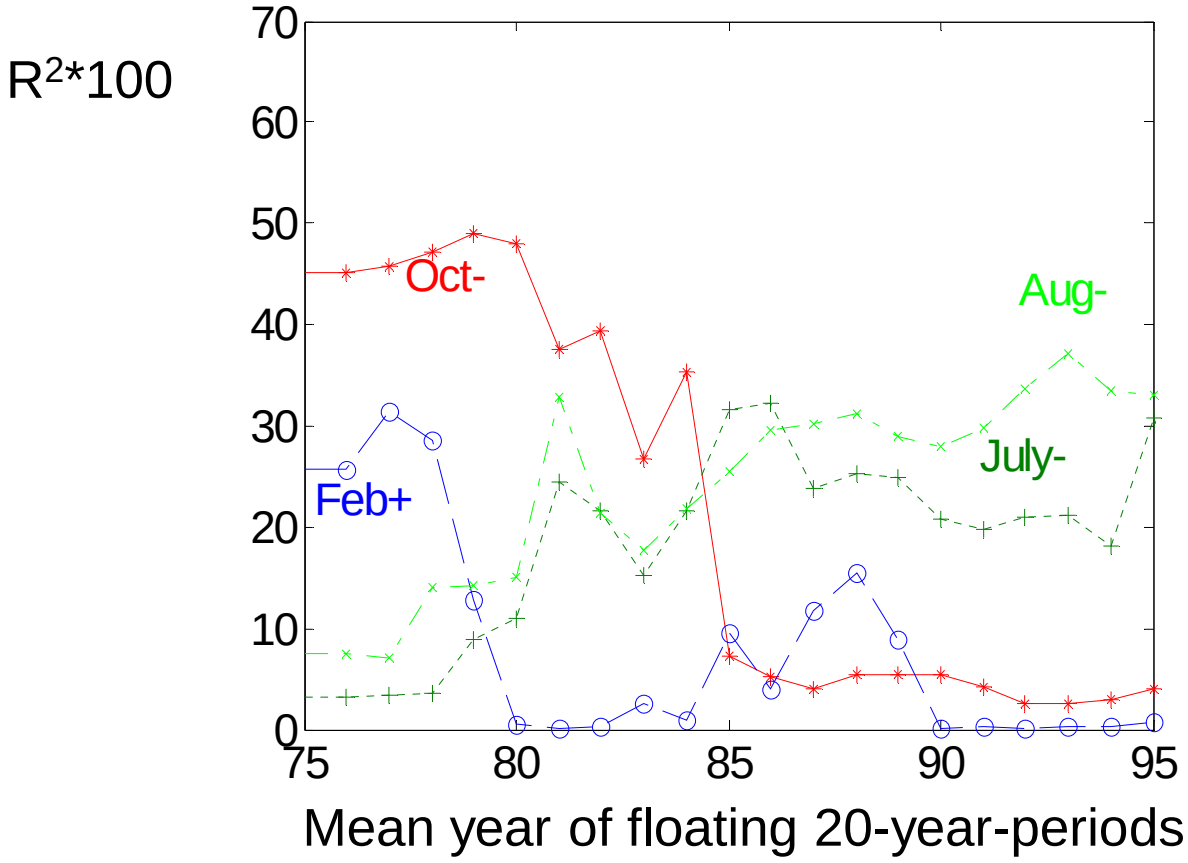
Winter wheat
Säby n3 cr1

Visby
Yield - Temperature

Coefficient of determination

in Y=a+b*X

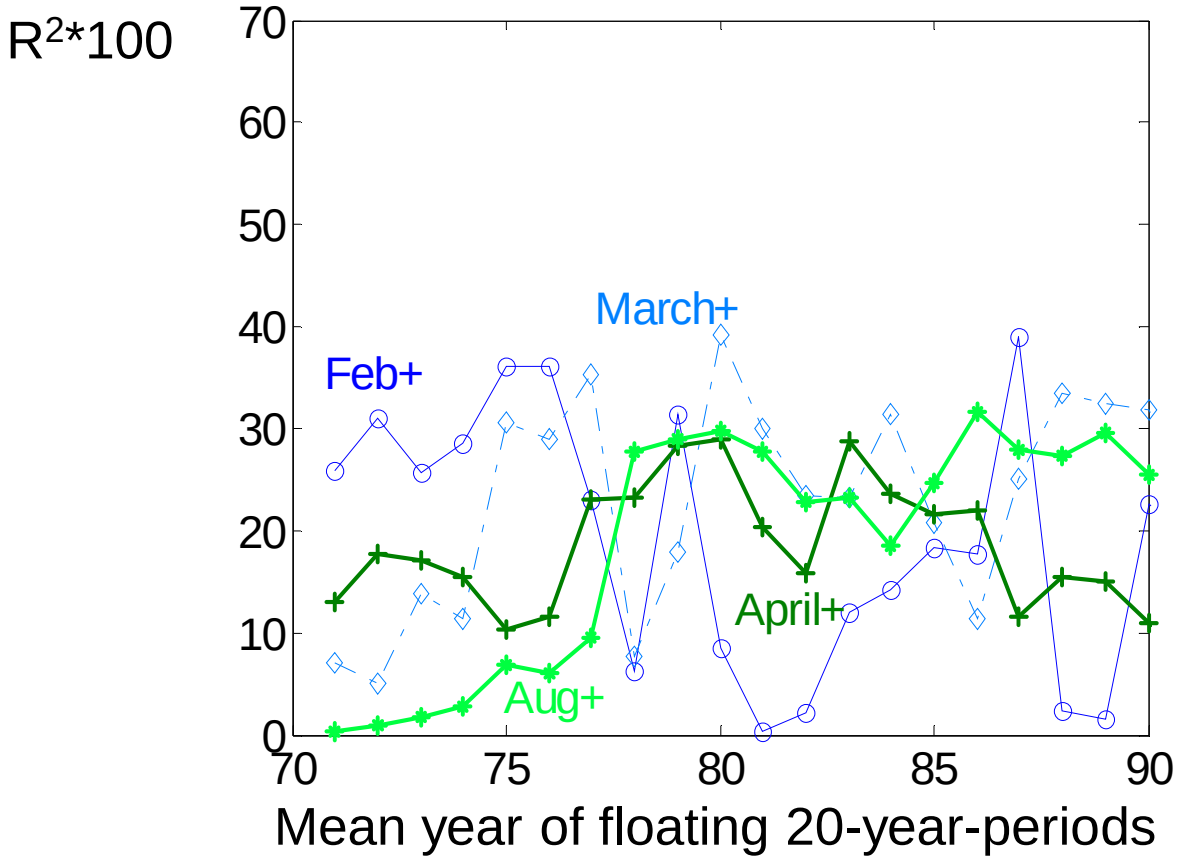
Y= yield, X=Temperature of single month



Winter wheat
Stenstugu n3 cr1

Lund,
Yield - Temperature

Coefficient of determination
in Y=a+b*X
Y= yield, X=Temperature of single month



Winter wheat
Borgeby pcPea cr1

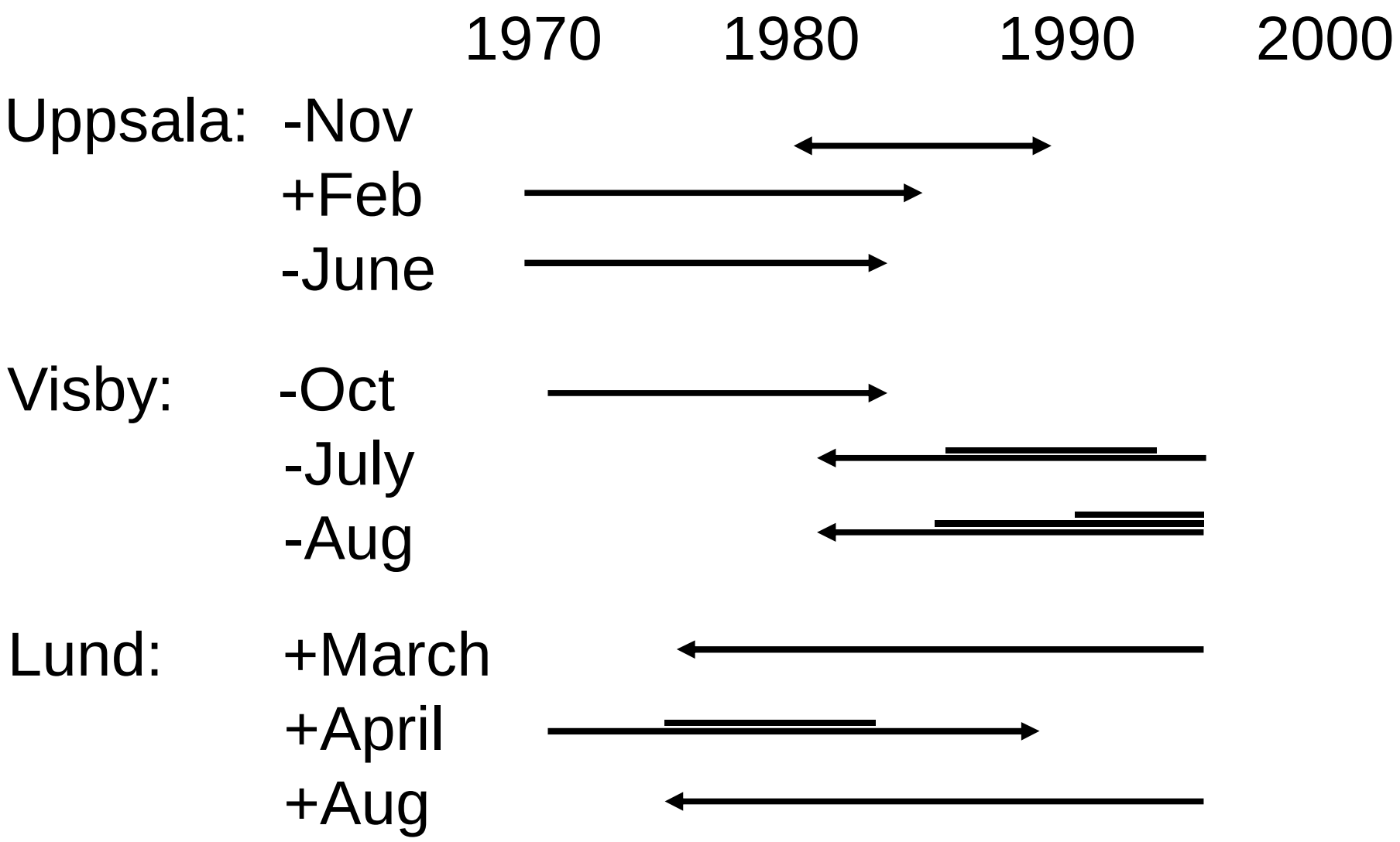
Important temperatures differed between locations

Uppsala: -Nov +Jan+Feb -June

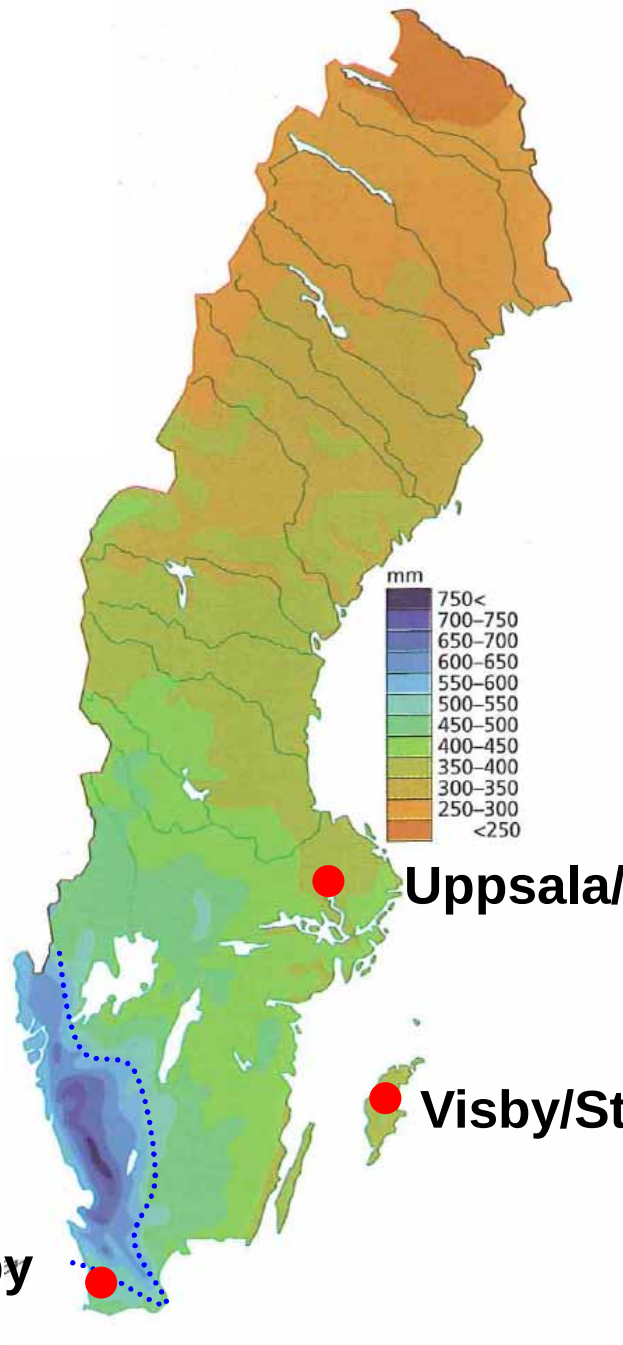
Visby: -Oct -July-Aug

Lund: +March+April +Aug

Important temperatures changed over time



Precipitation during vegetation period



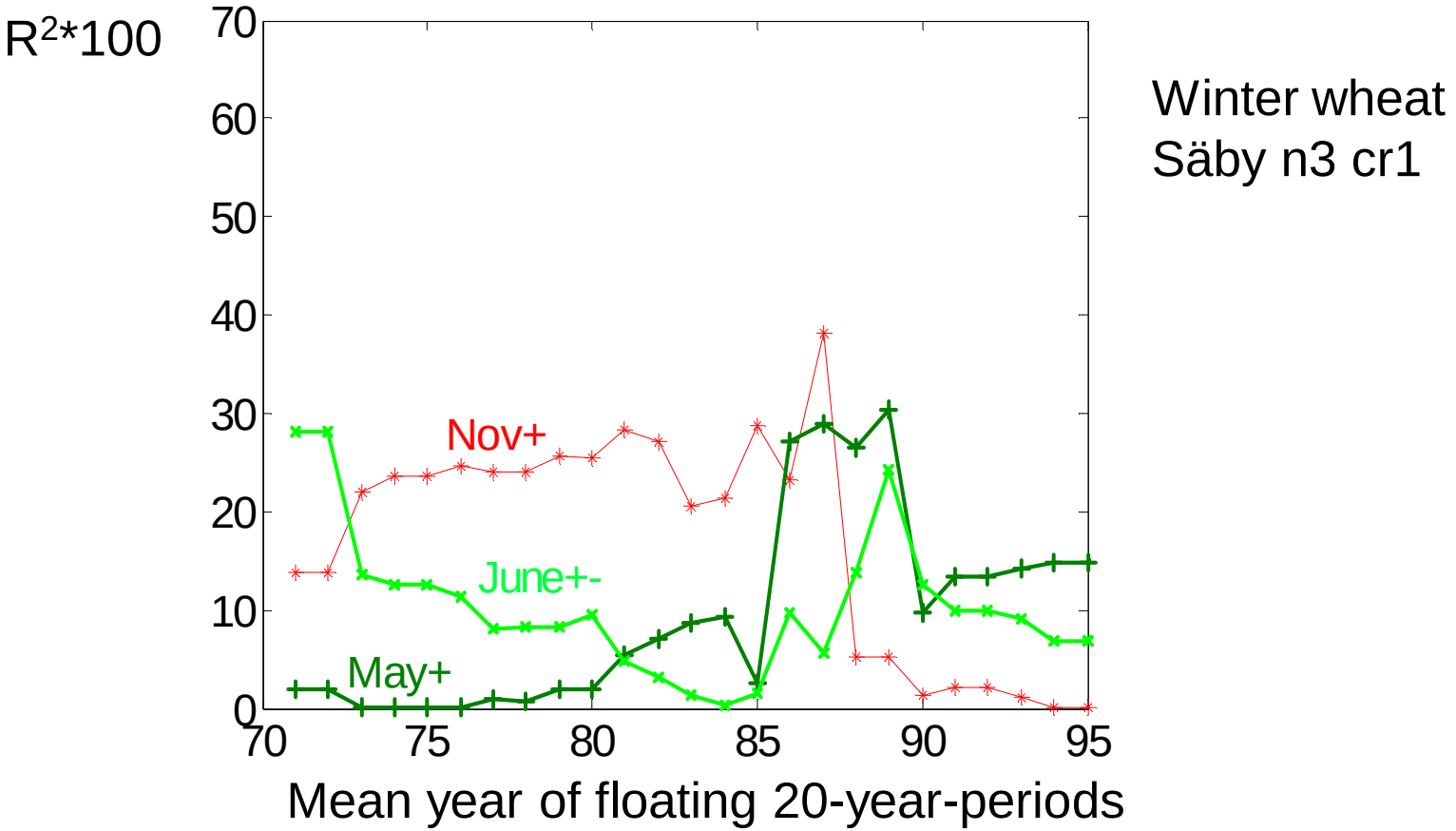
Fogelfors m fl., 2001

Yield - Precipitation Uppsala

Coefficient of determination

in Y=a+b*X

Y= yield, X=Precipitation of single month

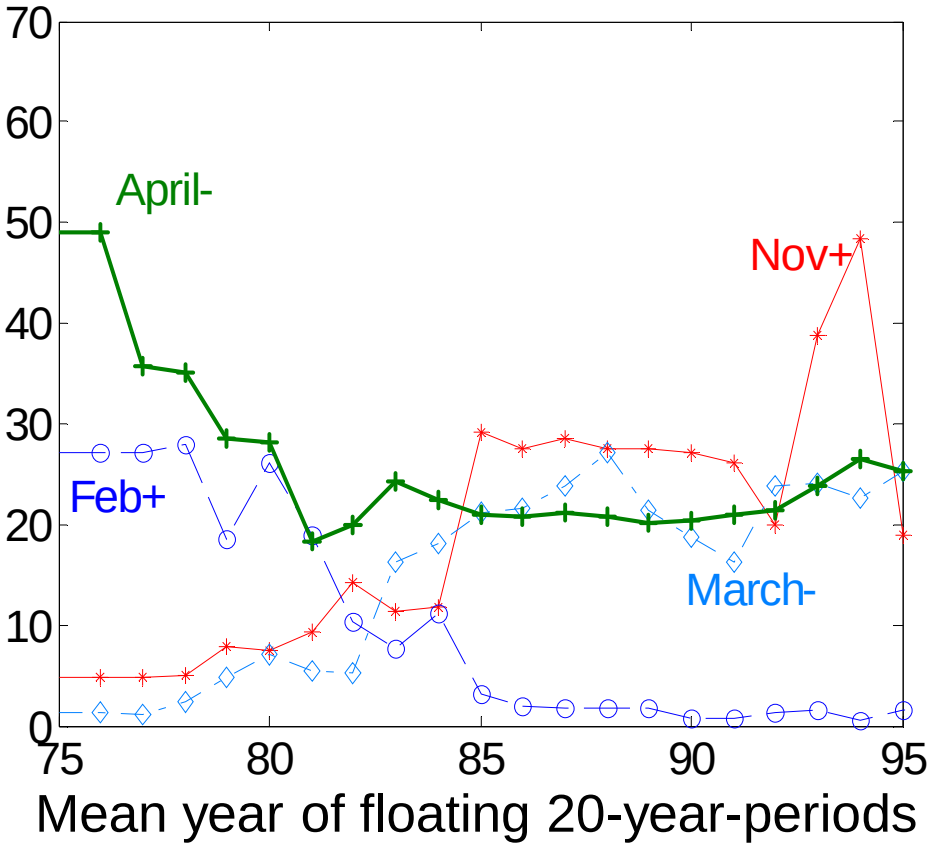


Winter wheat
Säby n3 cr1

Visby
Yield - Precipitation

Coefficient of determination
in Y=a+b*X
Y= yield, X=Precipitation of single month

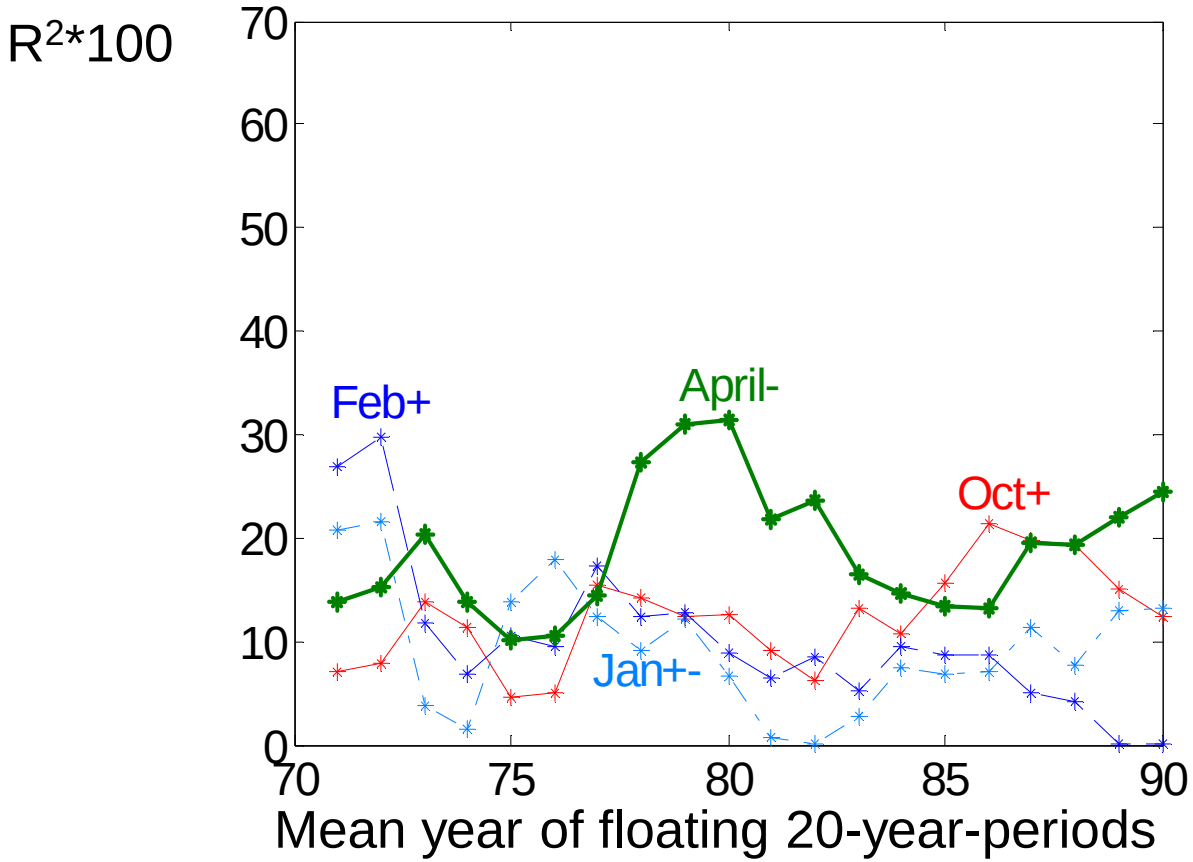
R^2*100



Winter wheat
Stenstugu n3 cr1

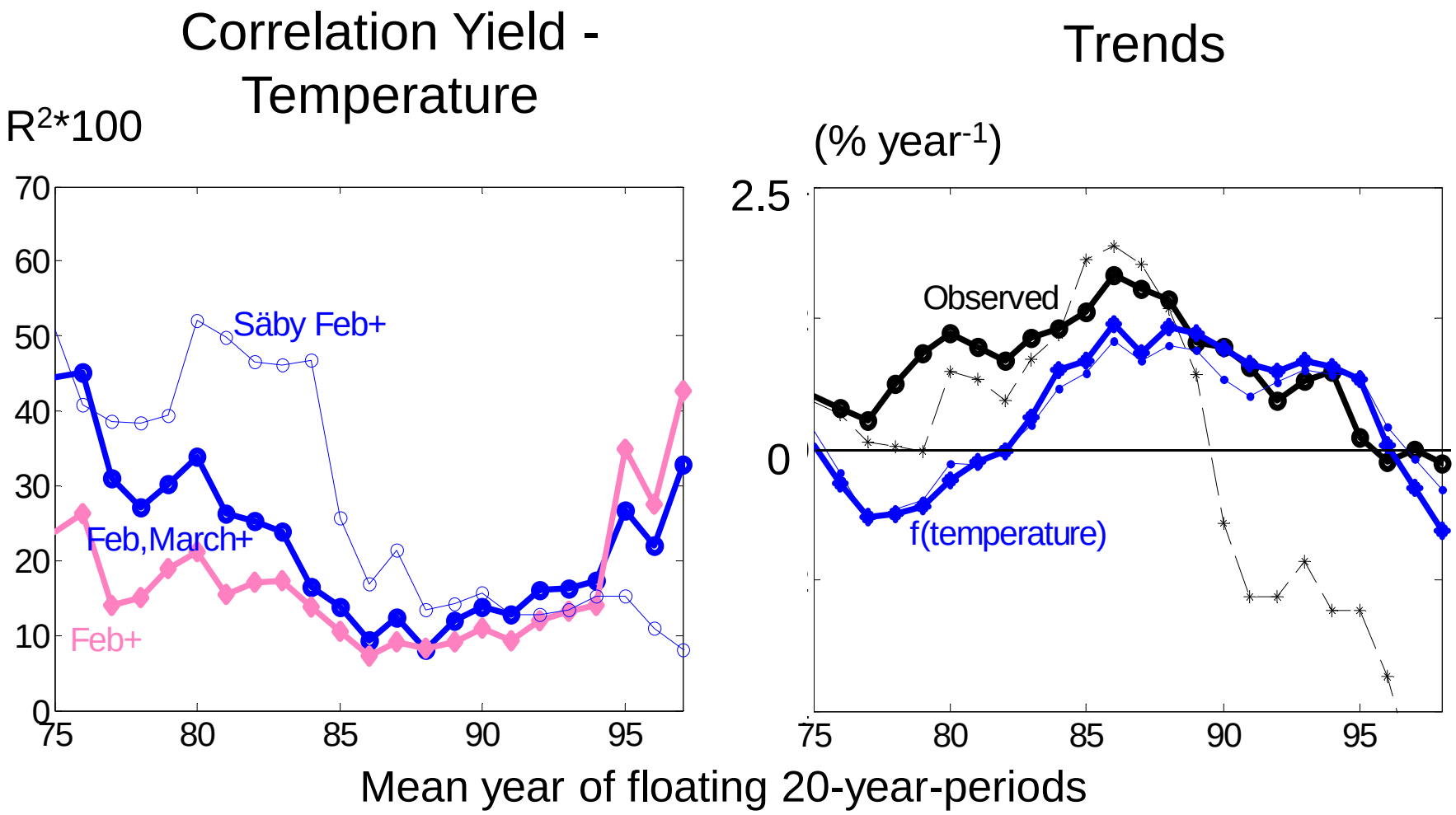
Lund
Yield - Precipitation

Coefficient of determination
in Y=a+b*X
Y= yield, X=Precipitation of single month



Winter wheat
Borgeby pcPea cr1

Regional winter wheat yields Uppsala



In summary,

for winter wheat

-Winter temperature is a good predictor of yield, in the north and in the past

-In the dry location further south, high summer temperatures increasingly reduce yield

-In the less dry location, high temperatures are not related to reduced yields

-Influence of precipitation on yield is less clear, but wet autumn seems good and wet spring bad

-Remains: to test combined models


Thank you