



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

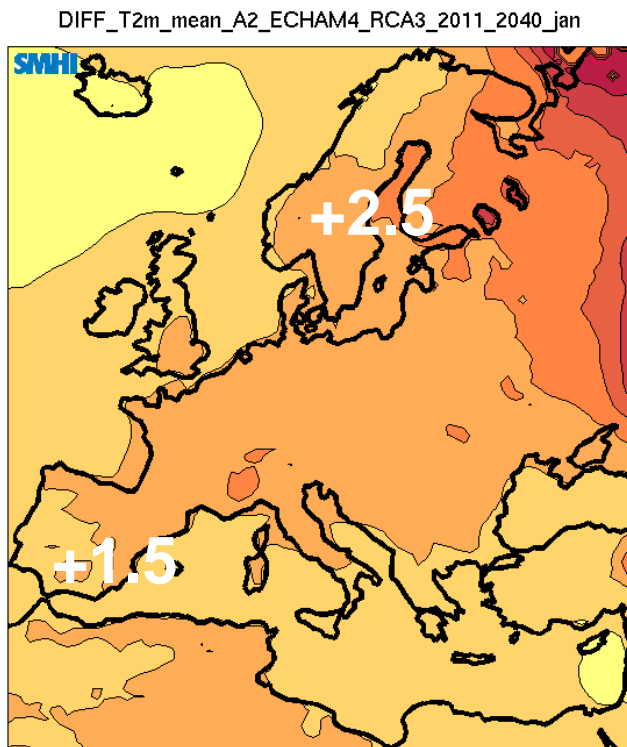
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Crop Production Ecology
SLU, Uppsala

(2008-October)

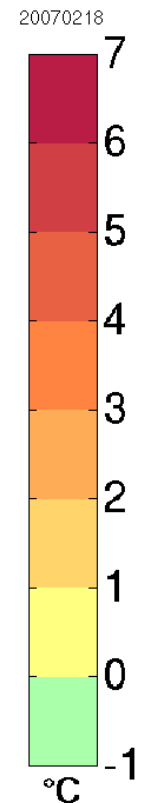
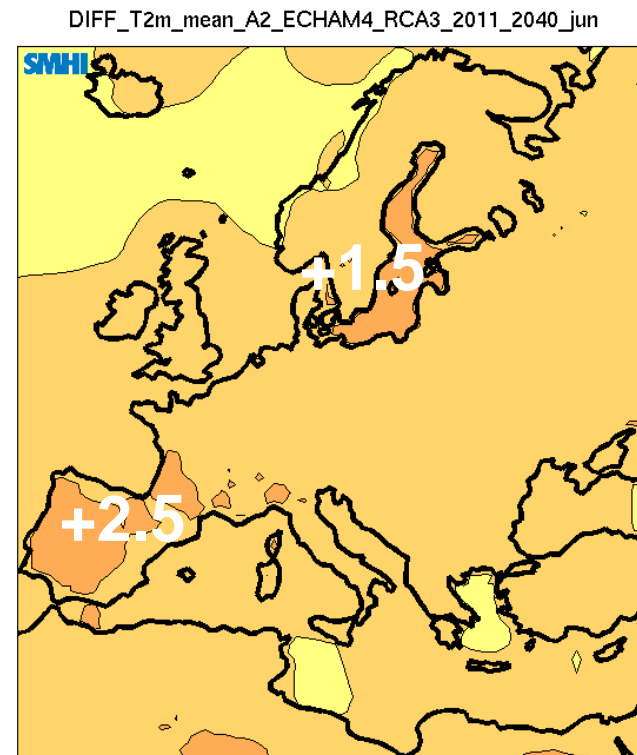
Foto Johanna Sjöberg

Climate change scenario for ~2025_{A2}

January

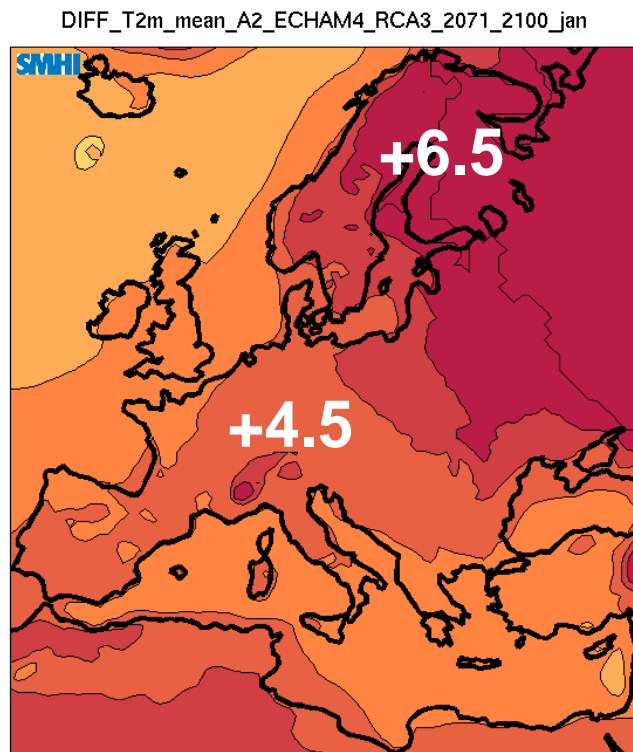


June

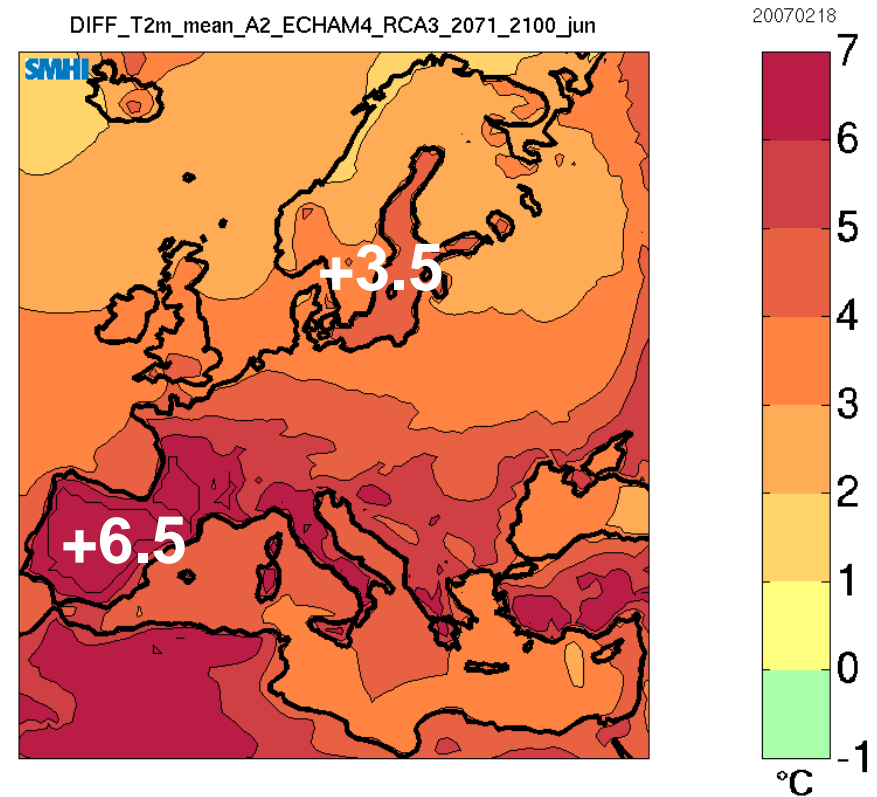


Climate change scenario for ~2085 A2

January

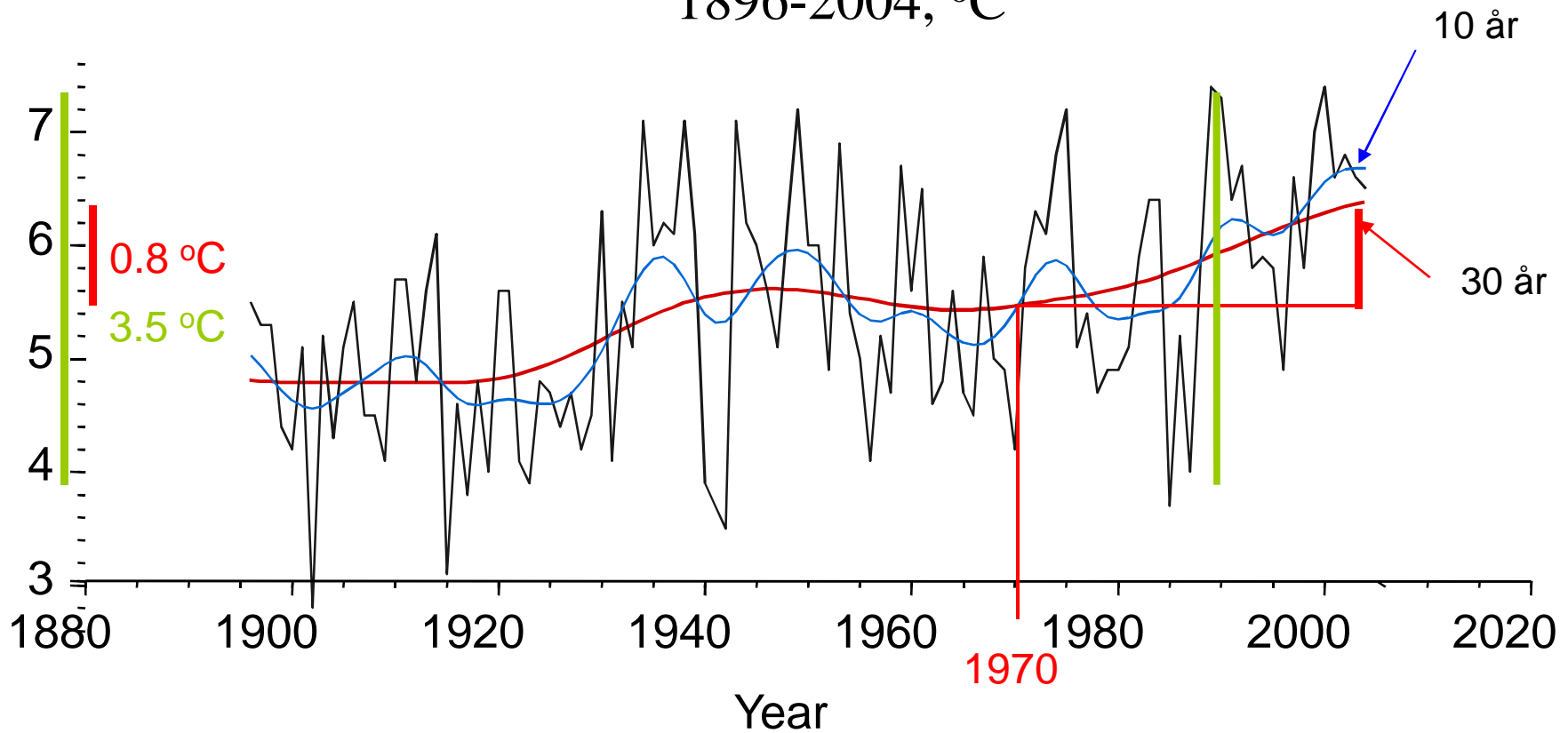


June



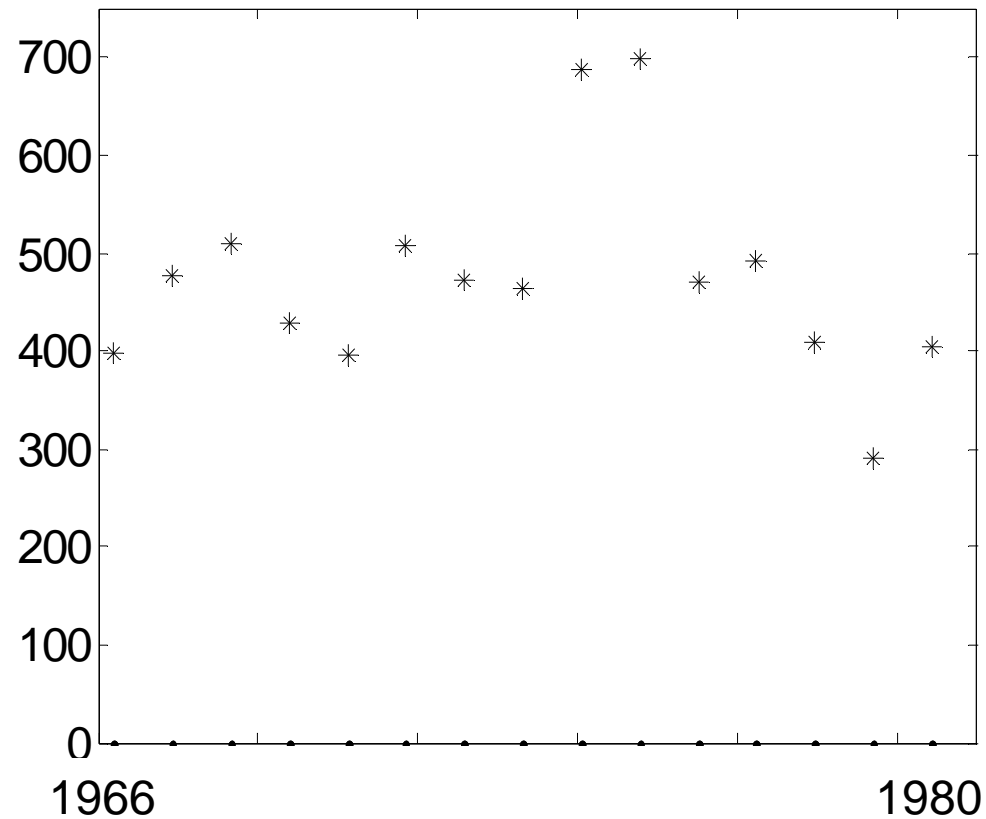
Ultuna - Uppsala

Annual mean air temperature
1896-2004, °C



Winter wheat yield varies between years

Observed yield
g m⁻² y⁻¹

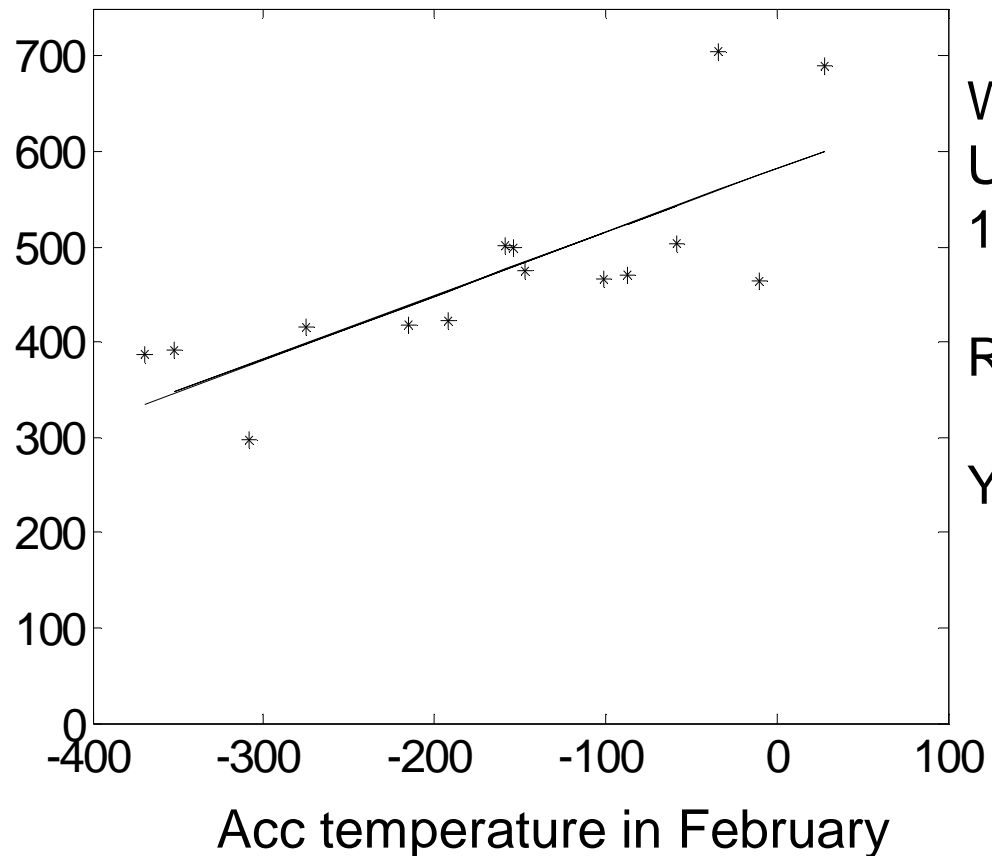


Uppsala/Säby n3 cr1

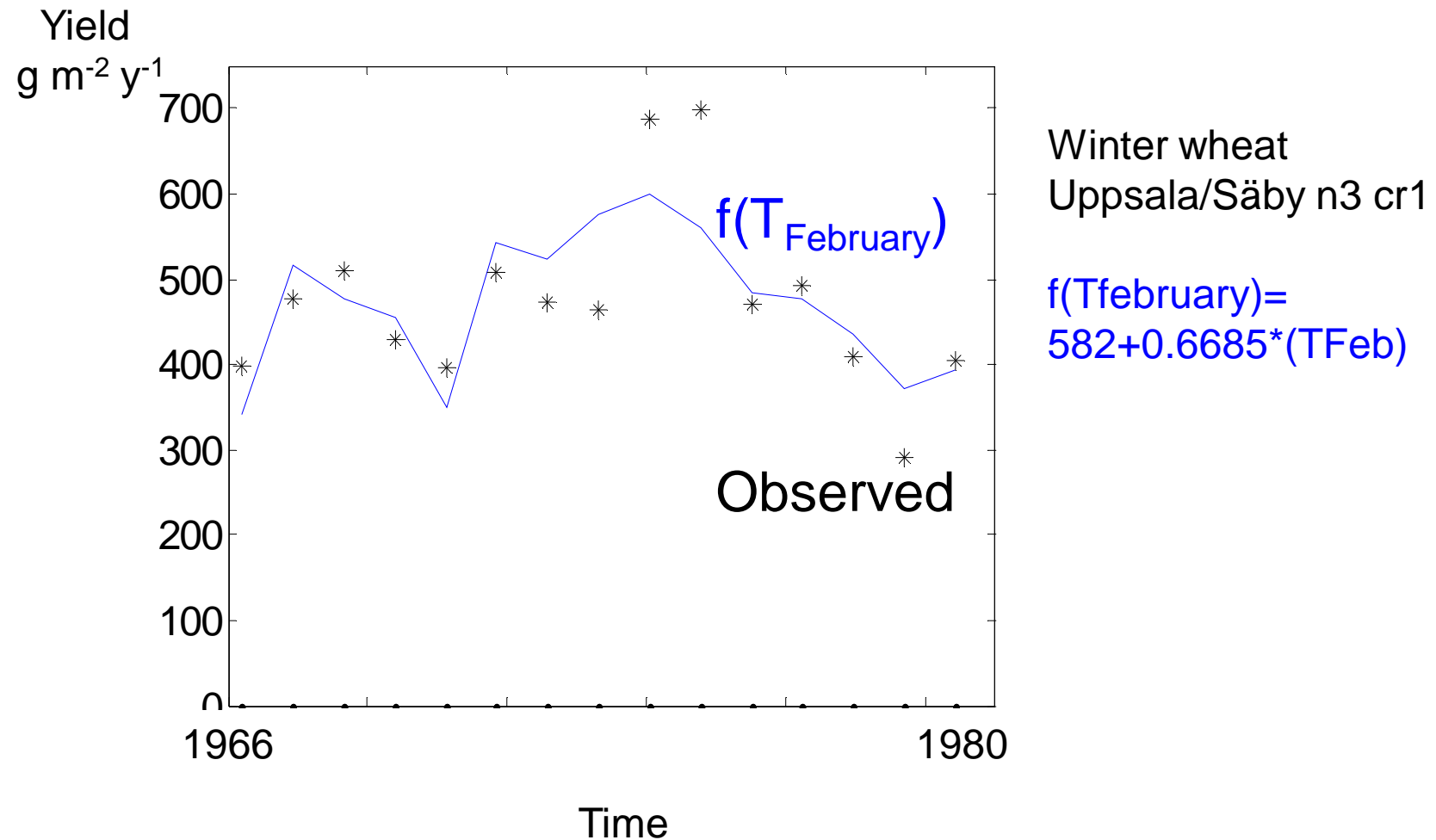
Time

Yield and temperature are correlated

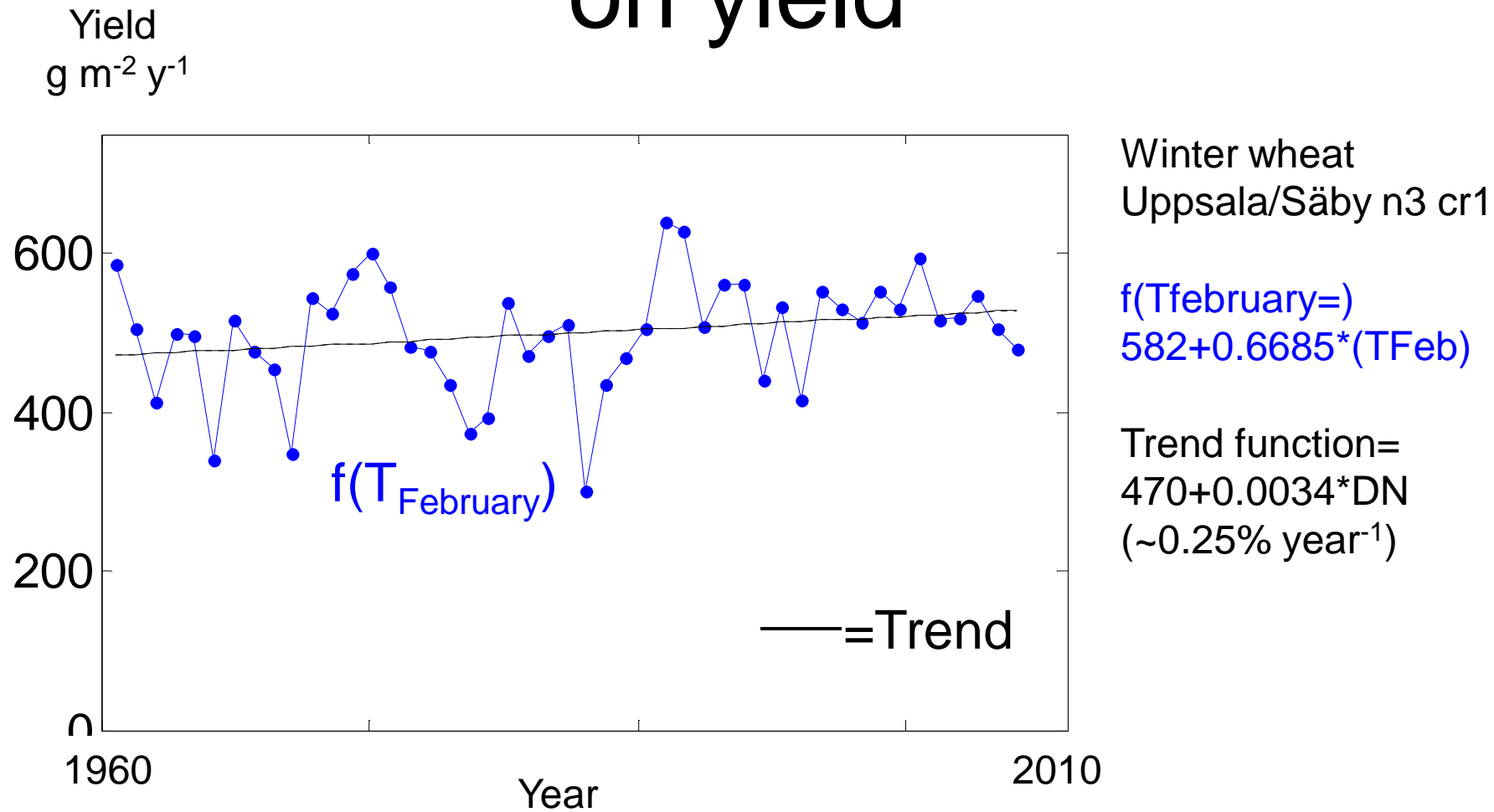
Yield
 $\text{g m}^{-2} \text{y}^{-1}$



Yield = f(temperature)

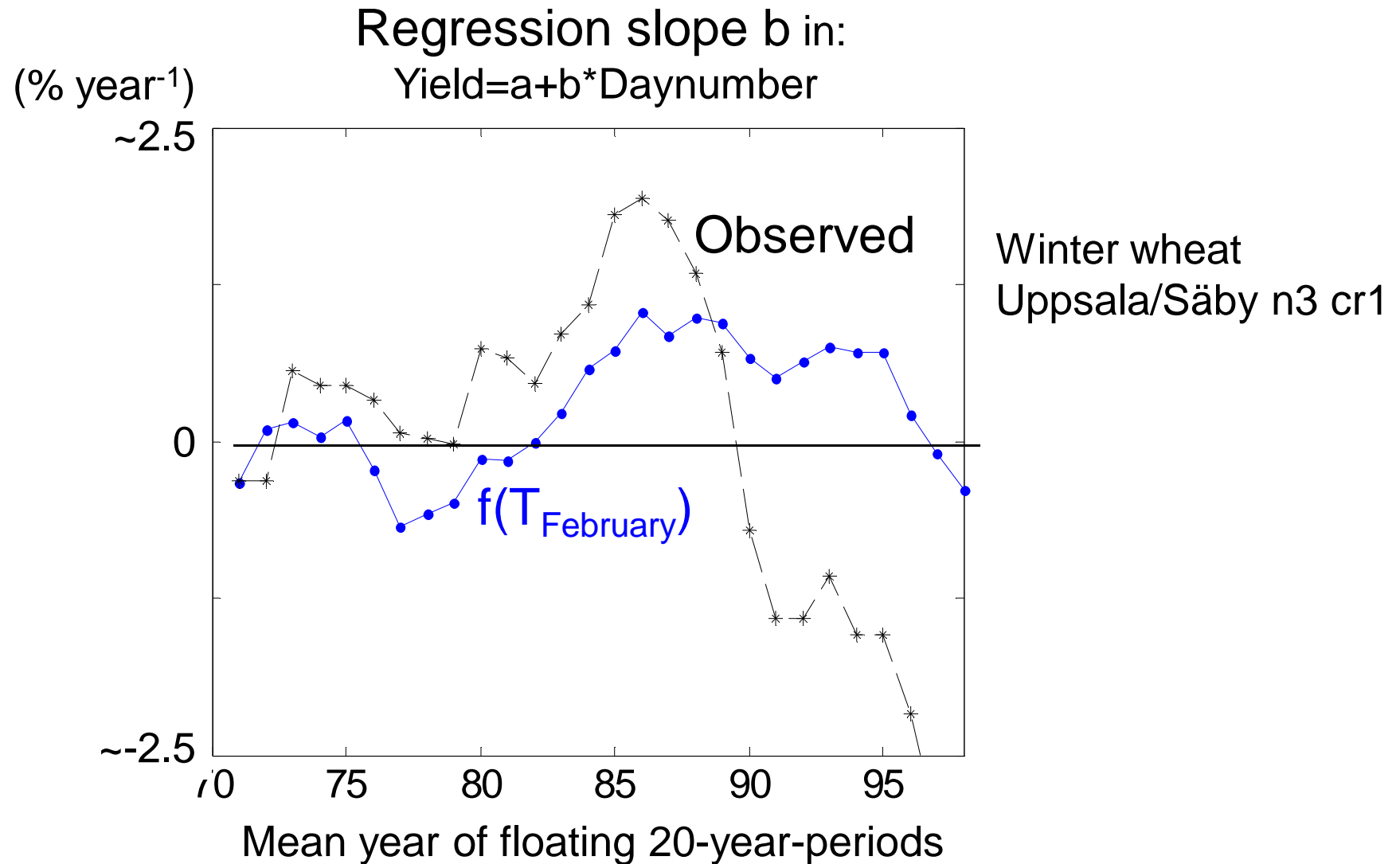


The temperature effect on yield



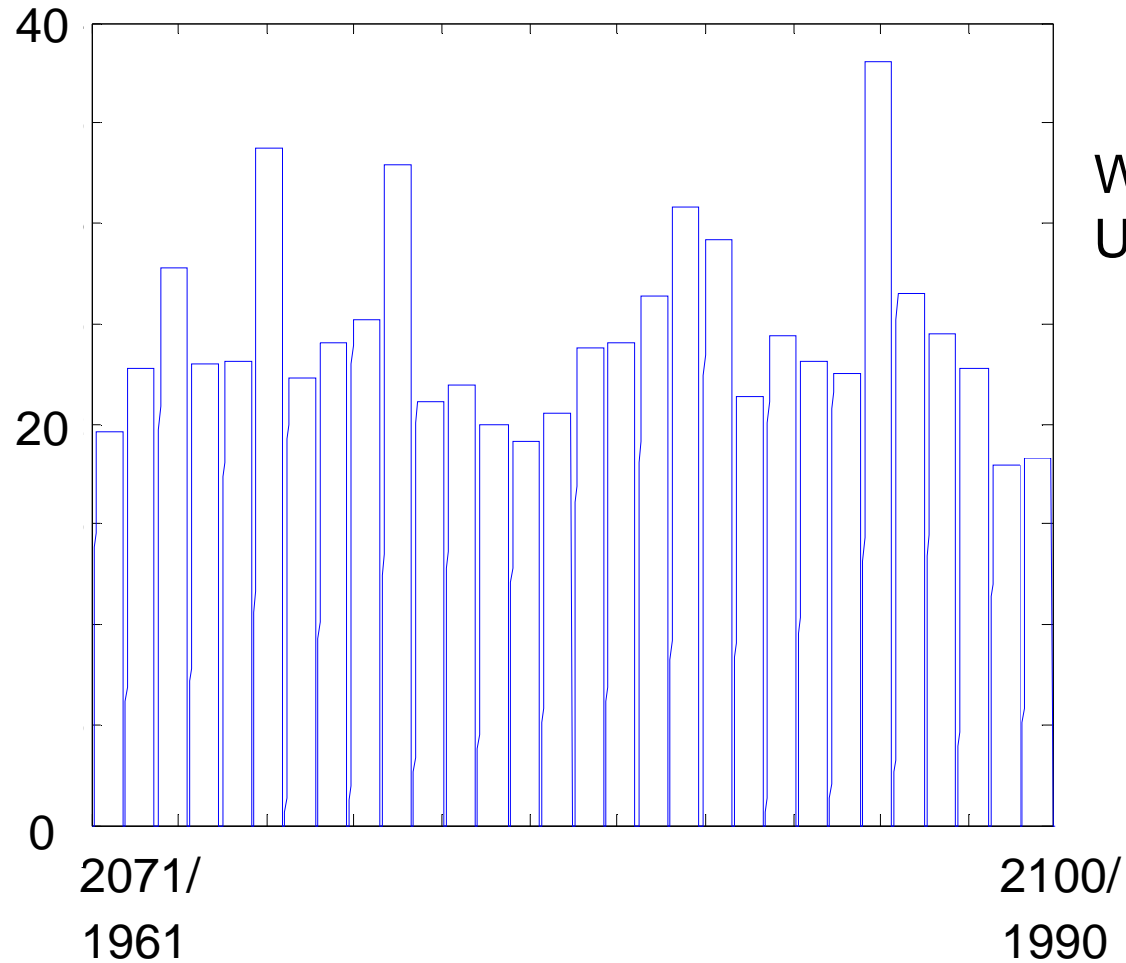
Trends in yield

due to temperature, and observed



Climate change assessment for ~2085 A2

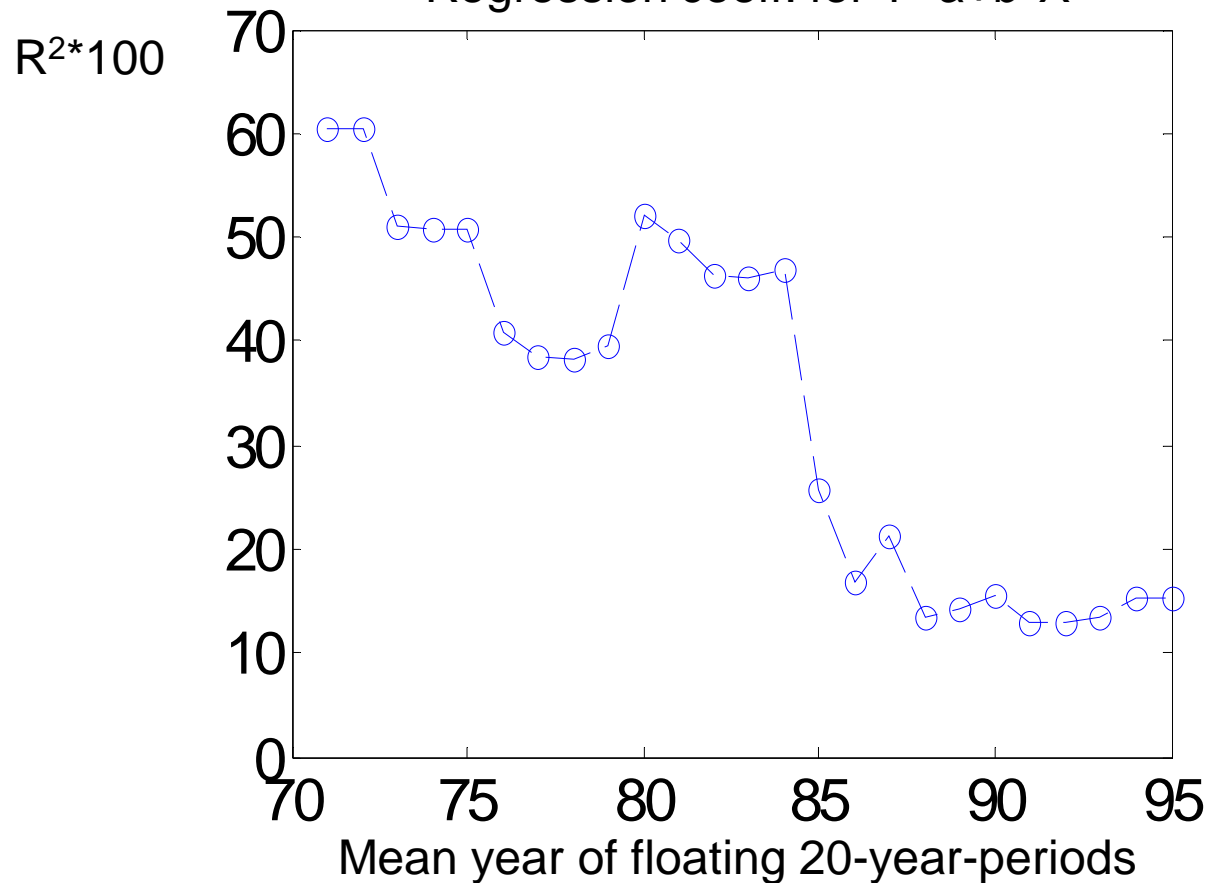
Yield
% increase



Winter wheat
Uppsala/Säby n3 c

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

Y=Winter wheat yield
X=Temperature sum of February
Regression coeff. for $Y=a+b*X$



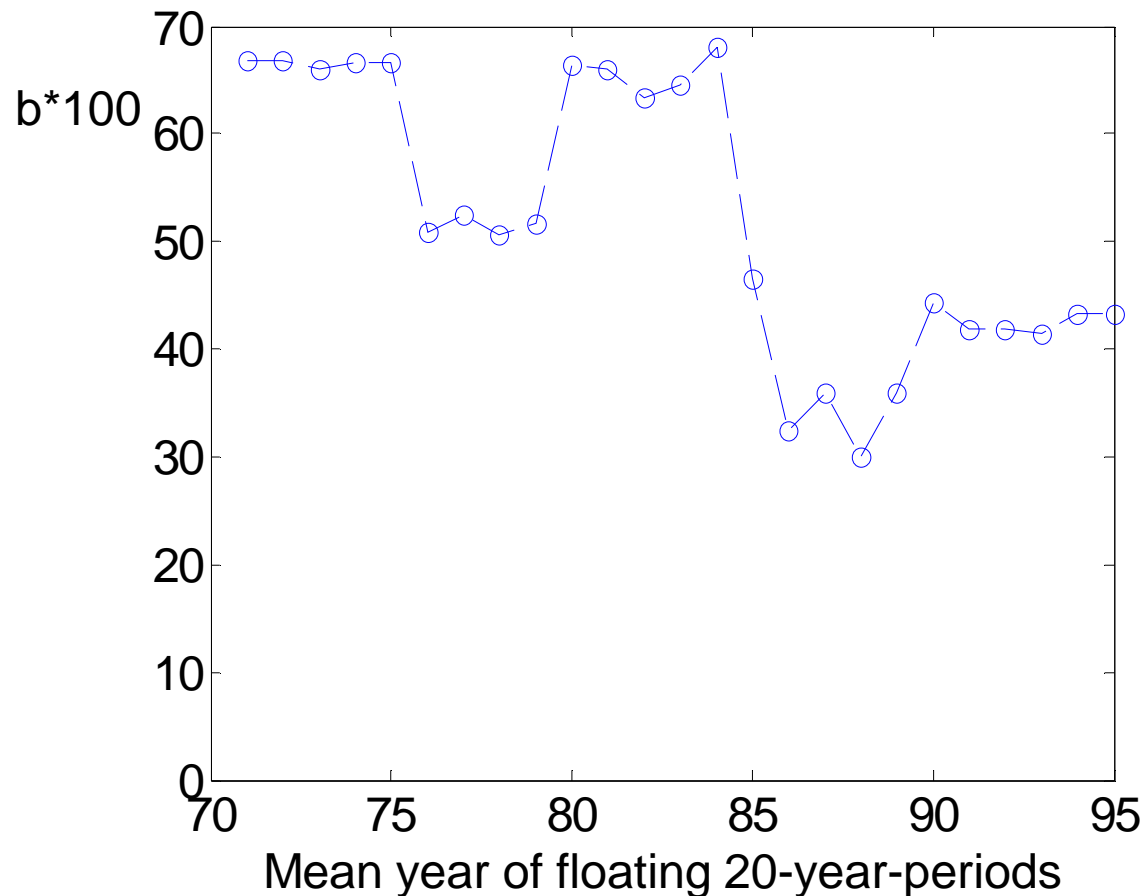
Winter wheat
Uppsala/Säby n3 cr1

Yield relation to temperature

Regression slope b

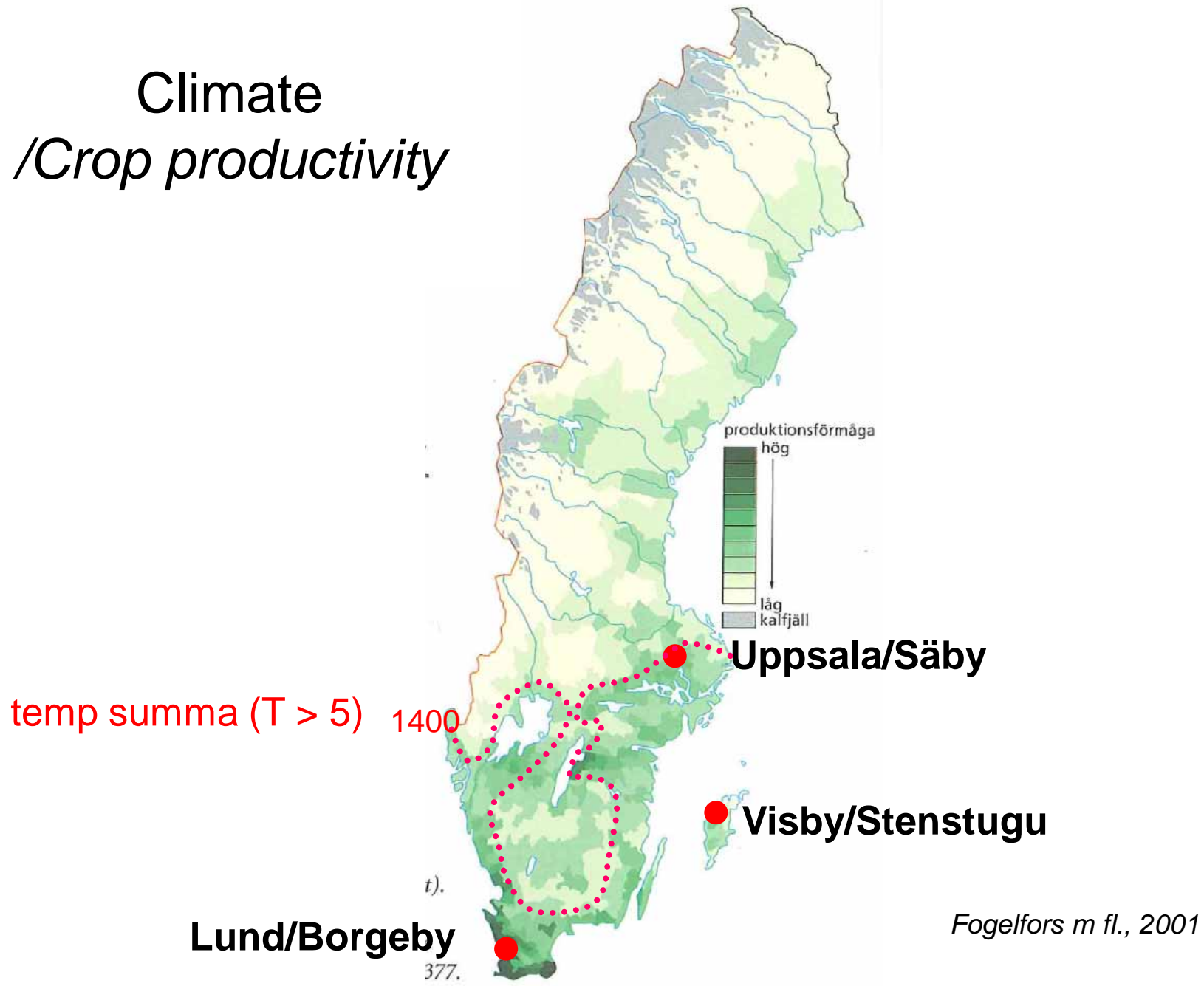
in $Y=a+b*X$

Y =Winter wheat yield, X =Temp in February



Uppsala/Säby n3 cr1

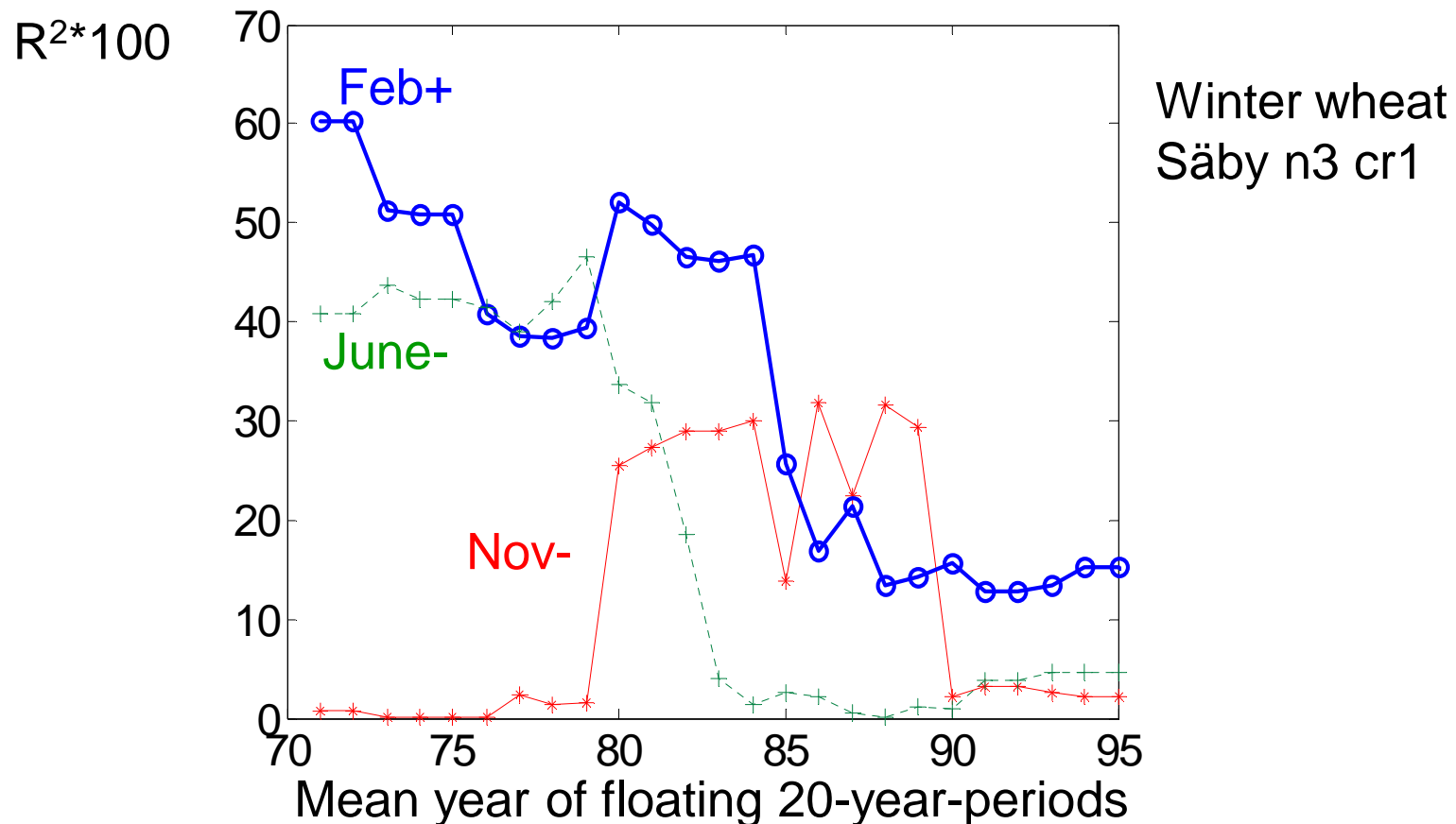
Climate /Crop productivity



Yield correlation to temperature shifts over time, Uppsala

Coefficient of determination
in $Y=a+b*X$

Y = yield, X = Temperature of single month

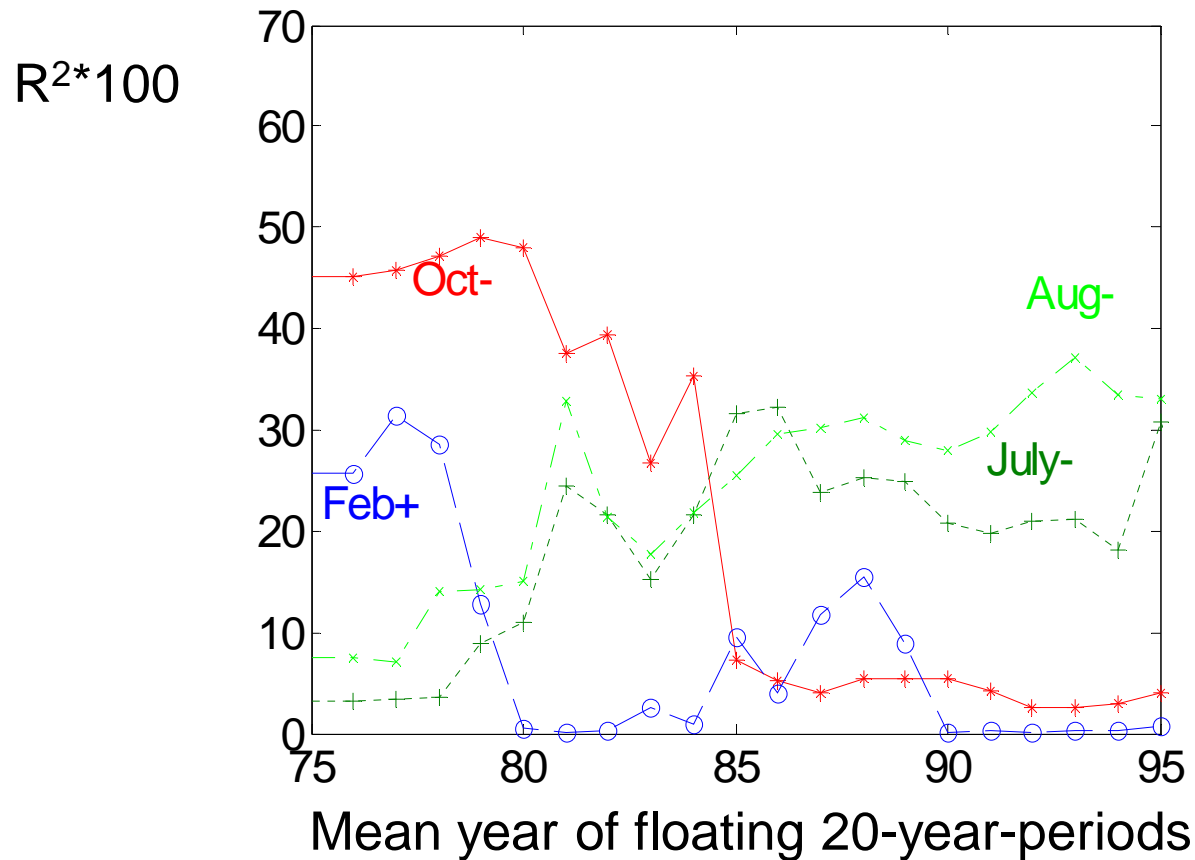


Visby

Yield - Temperature

Coefficient of determination
in $Y=a+b*X$

Y = yield, X =Temperature of single month

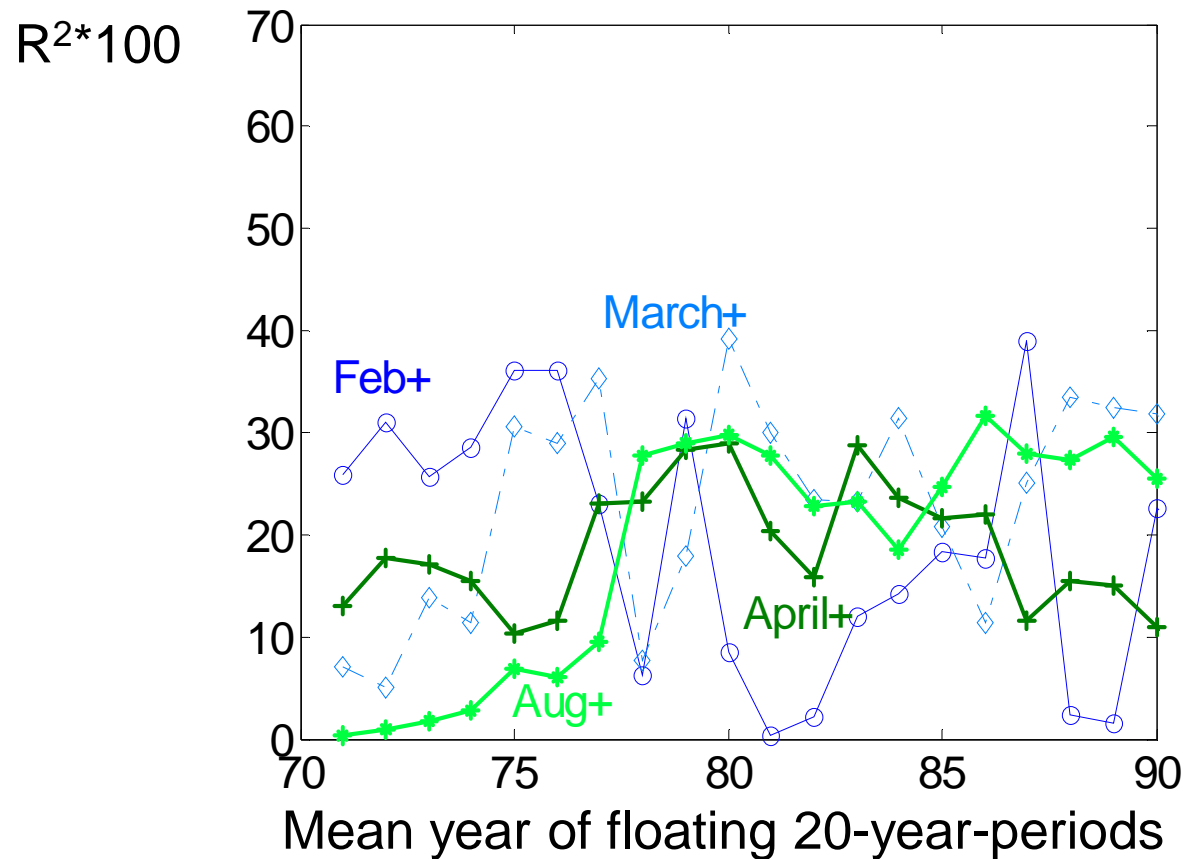


Winter wheat
Stenstugu n3 cr1

Lund, Yield - Temperature

Coefficient of determination
in $Y=a+b*X$

Y = yield, X =Temperature of single month



Winter wheat
Borgeby pcPea cr1

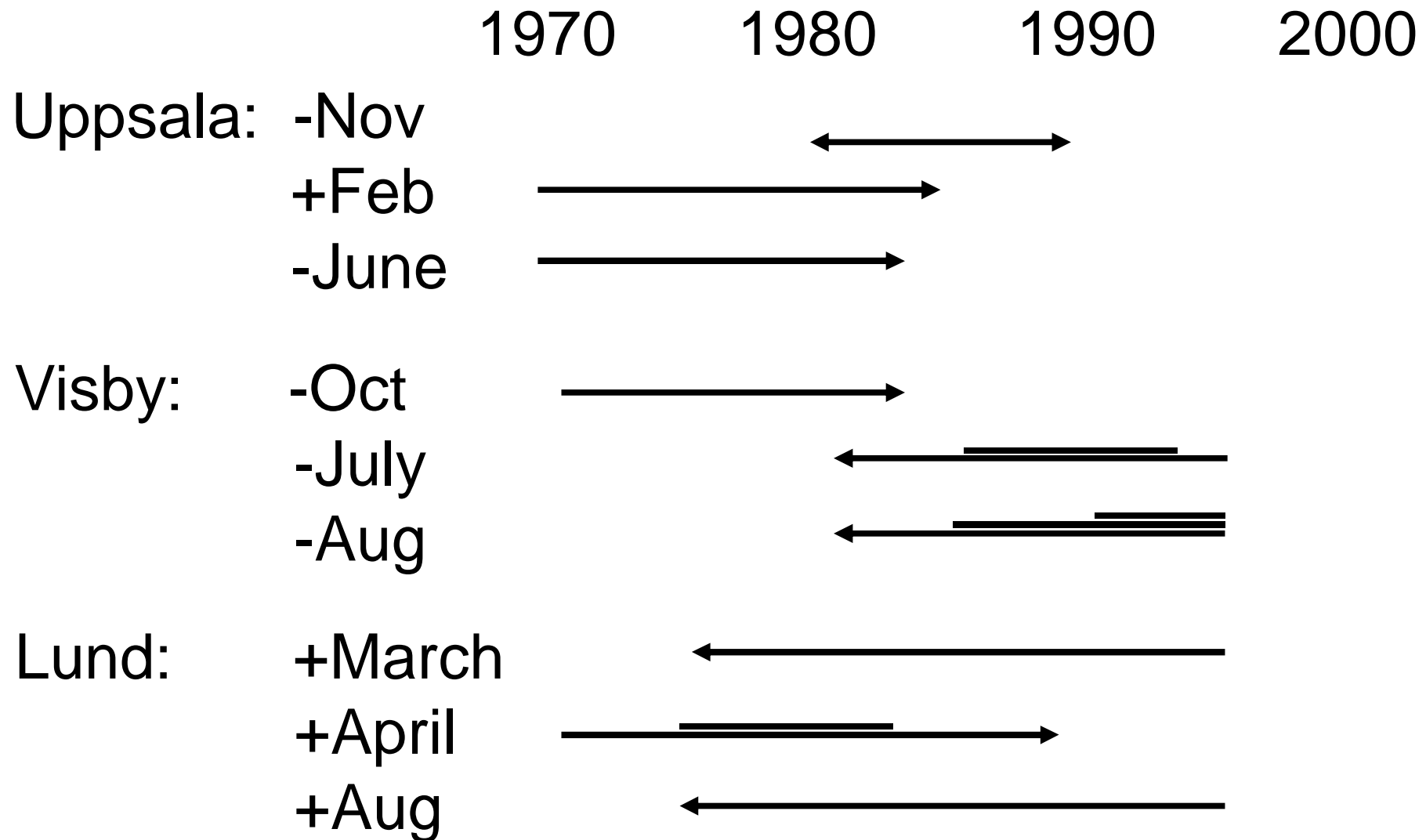
Important temperatures differed between locations

Uppsala: -Nov +Jan+Feb -June

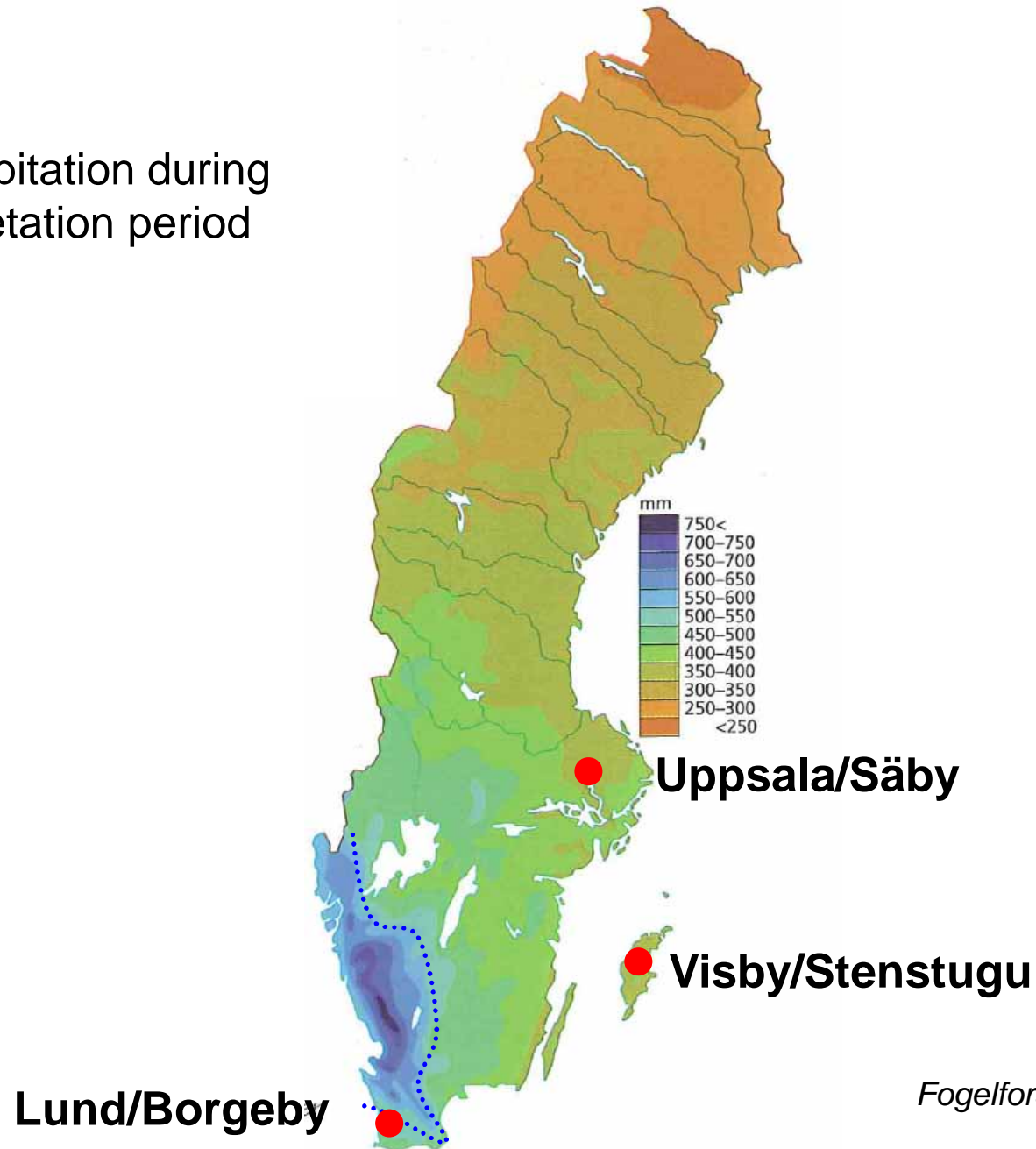
Visby: -Oct -July-Aug

Lund: +March+April +Aug

Important temperatures changed over time



Precipitation during vegetation period

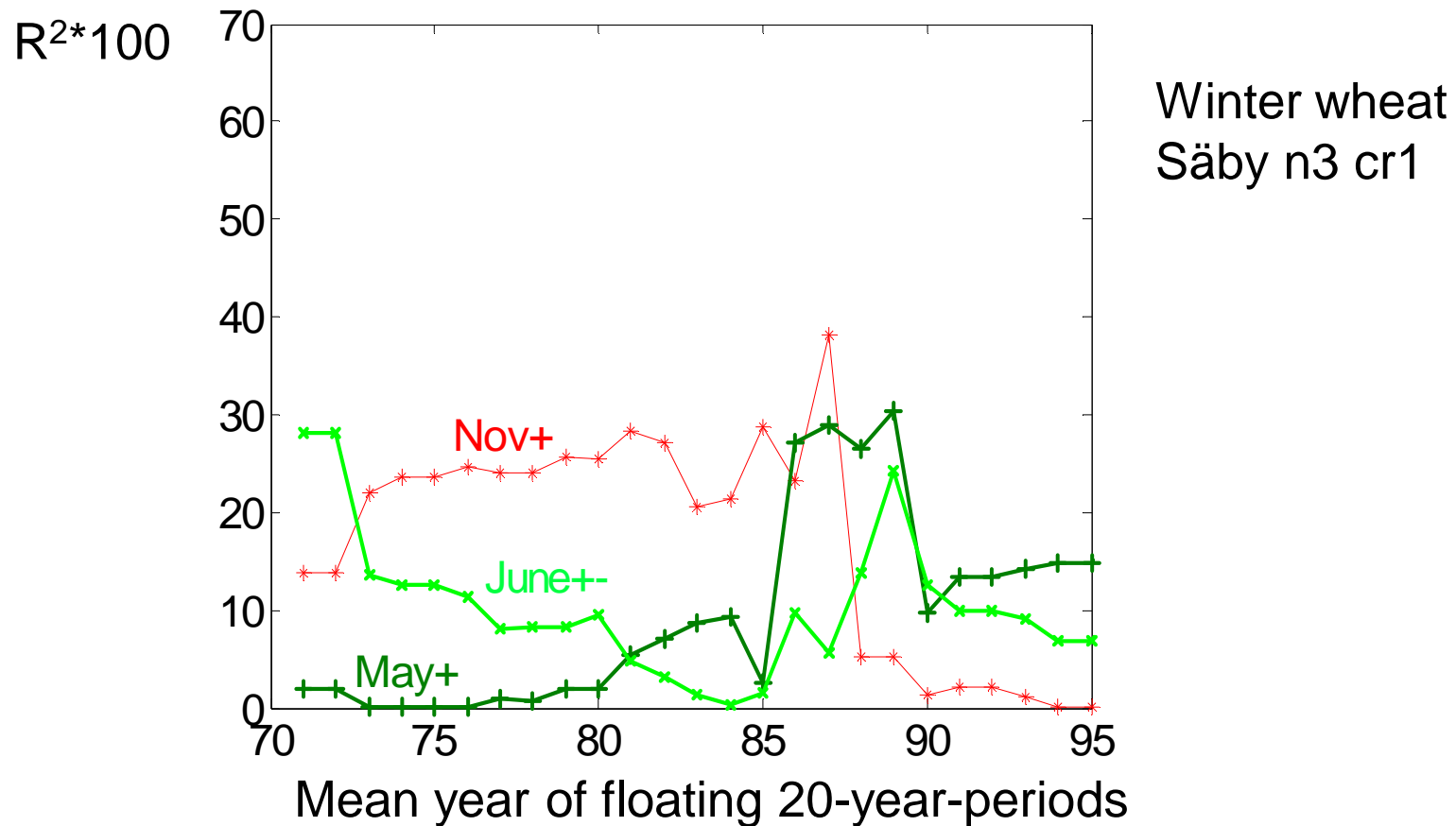


Fogelfors m fl., 2001

Yield - Precipitation Uppsala

Coefficient of determination
in $Y=a+b*X$

Y = yield, X = Precipitation of single month

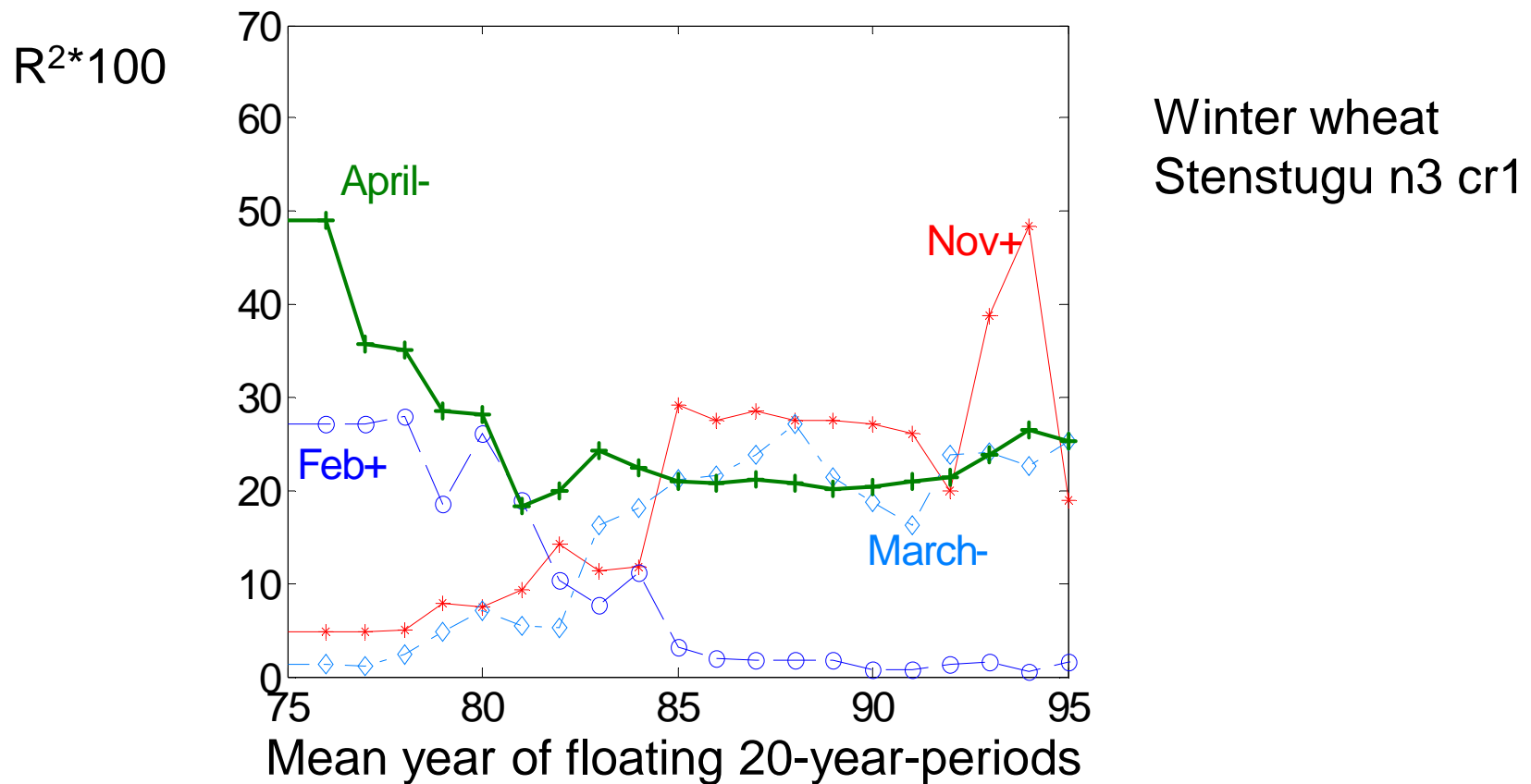


Visby

Yield - Precipitation

Coefficient of determination
in $Y=a+b*X$

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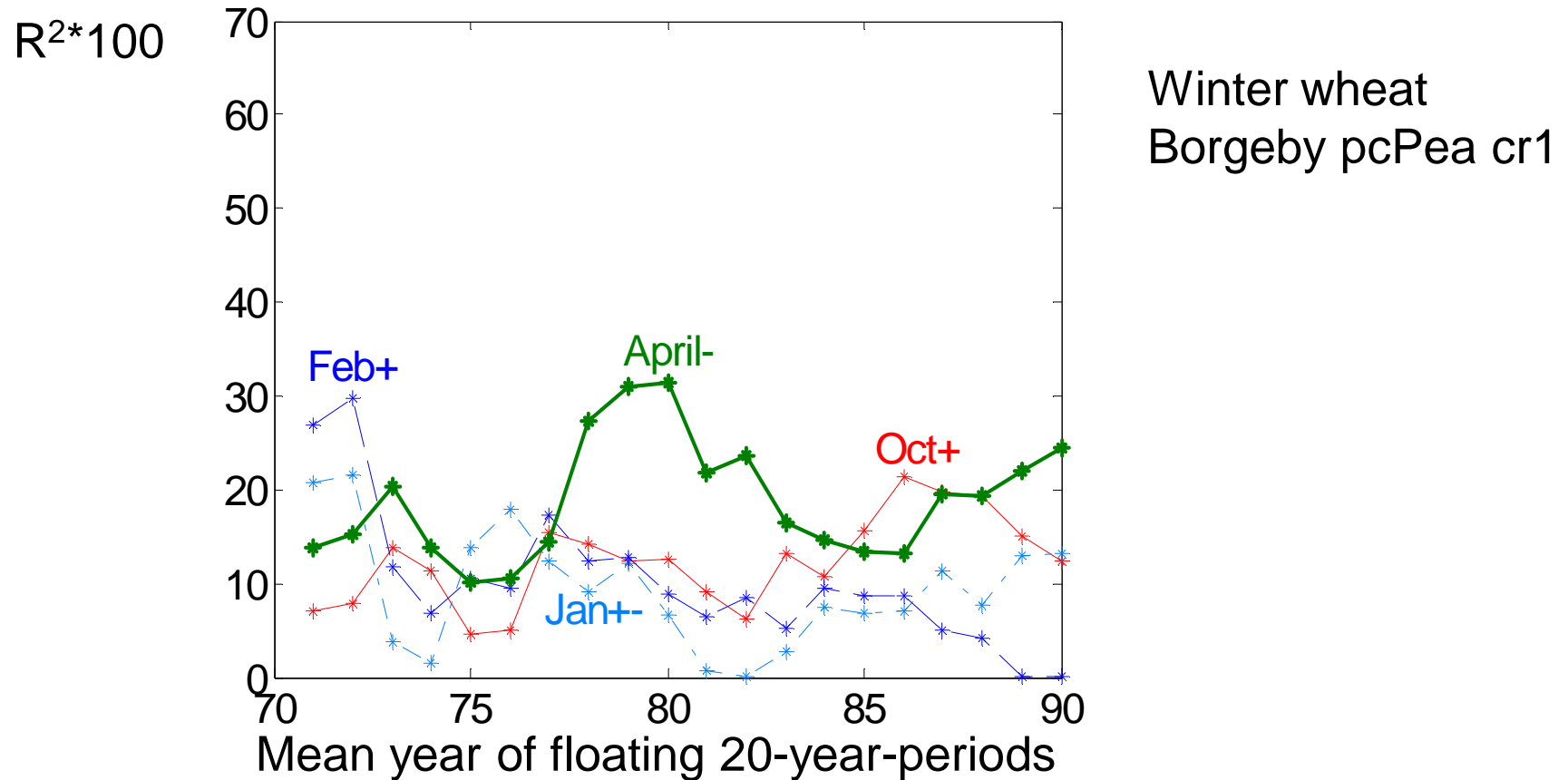


Lund

Yield - Precipitation

Coefficient of determination
in $Y=a+b*X$

Y = yield, X =Precipitation of single month

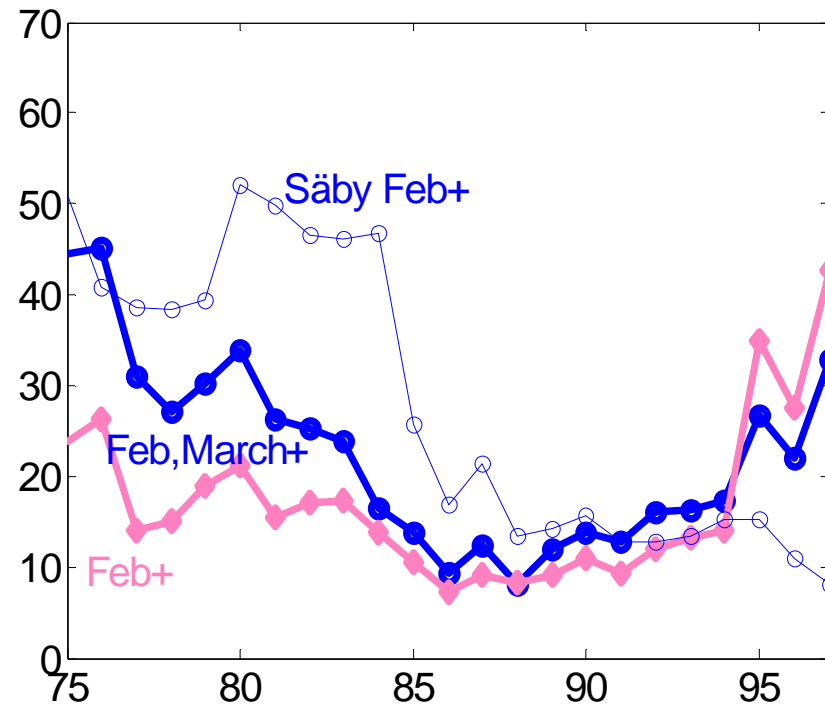


Regional winter wheat yields

Uppsala

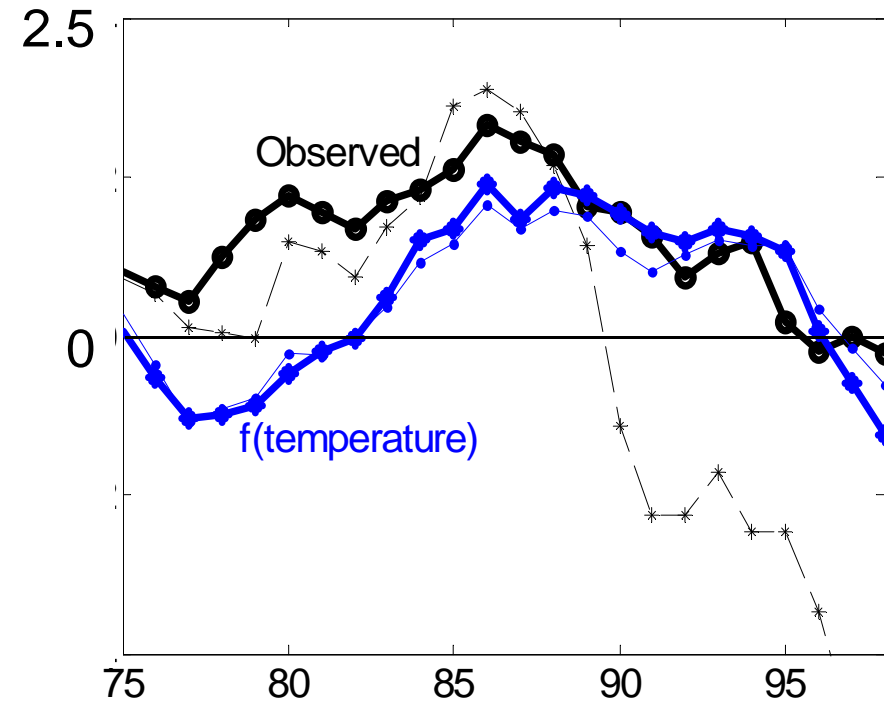
Correlation Yield - Temperature

$R^2 * 100$



Trends

(% year⁻¹)



Mean year of floating 20-year-periods

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