

# Framtidsspaning – var är Bolmen om 30 år?

Kenneth M Persson, forskningschef Sydvatten

Mycket hinner att hända på 30 år



sweden  
water  
research



**LUND**  
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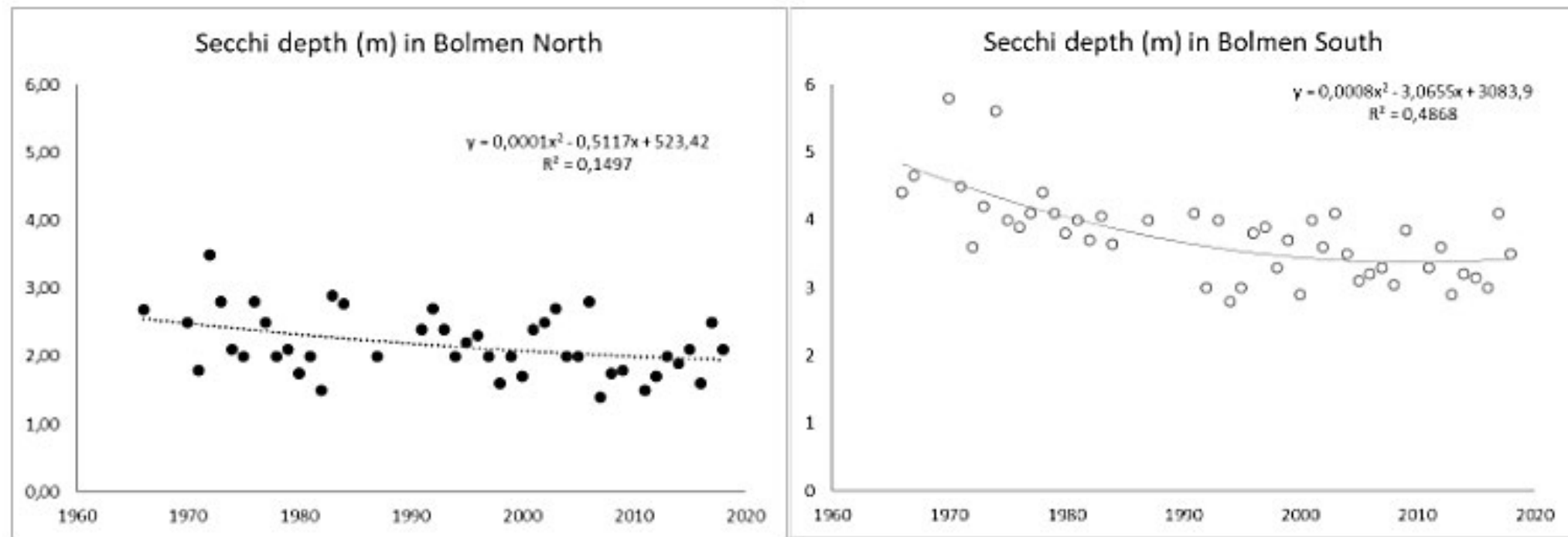
# Lake Bolmen

## Past, present and future

ANNA BORGSTRÖM

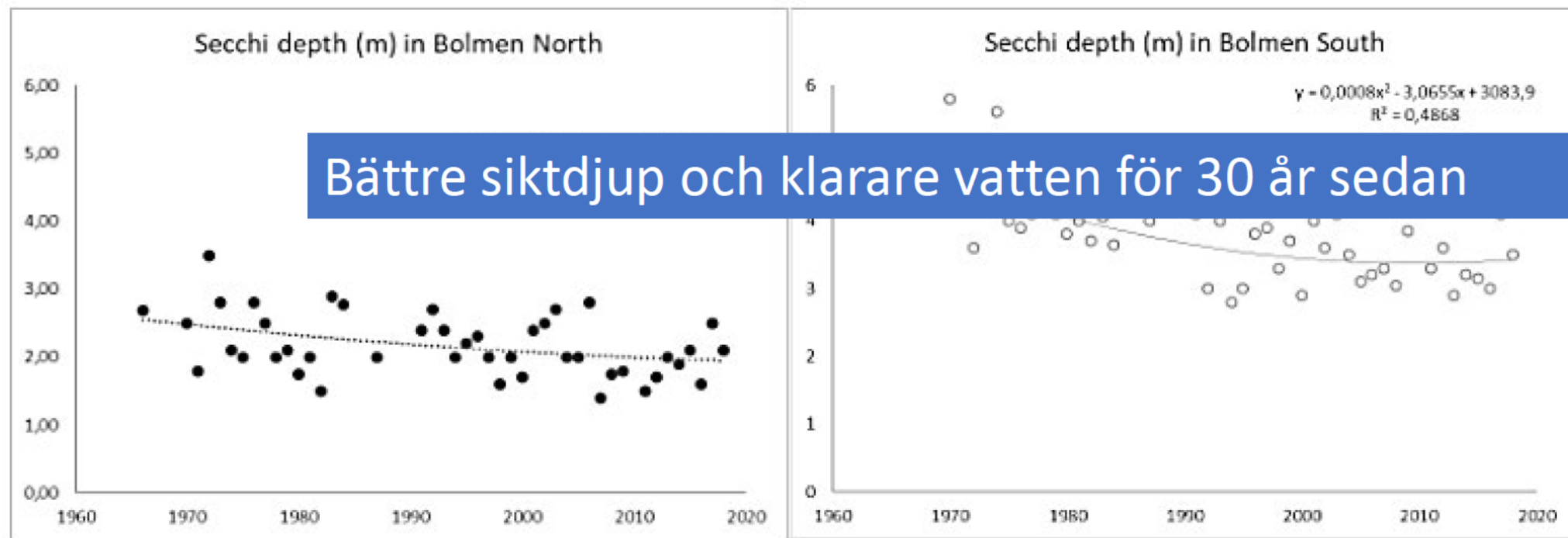
AQUATIC ECOLOGY, DEPARTMENT OF BIOLOGY, LUND UNIVERSITY, 2020

Hur såg Bolmen ut för 30 år sedan?

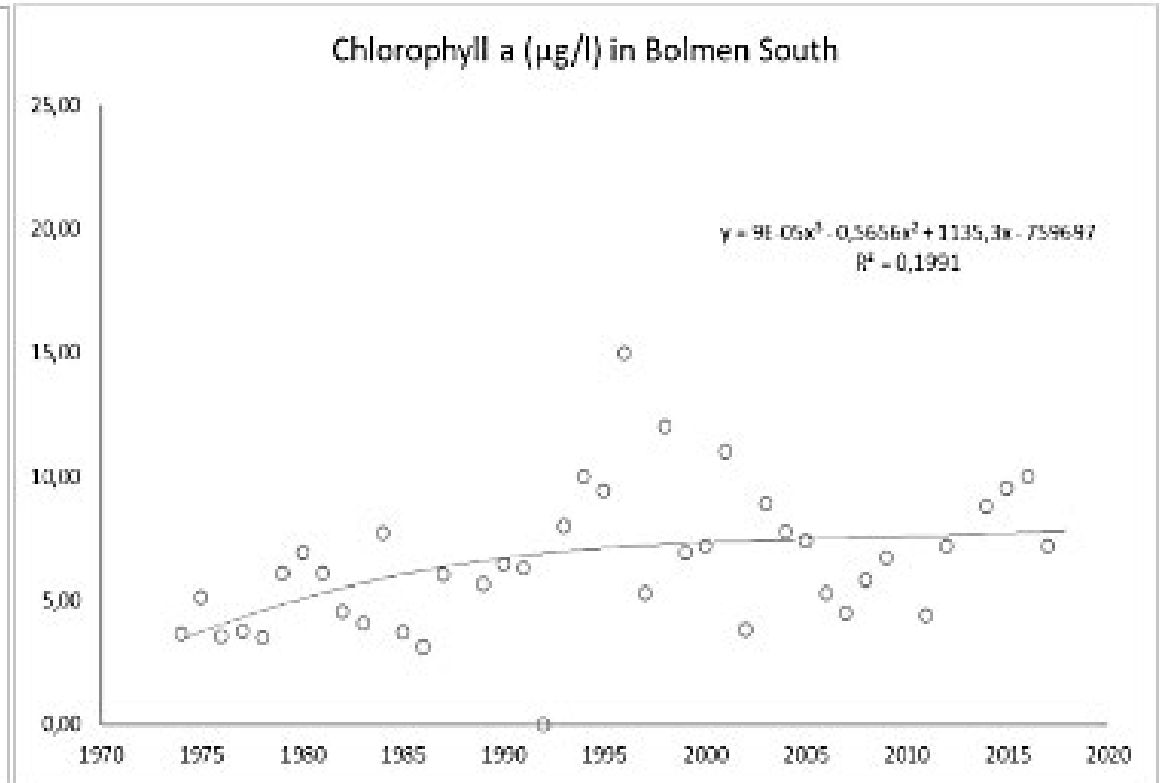
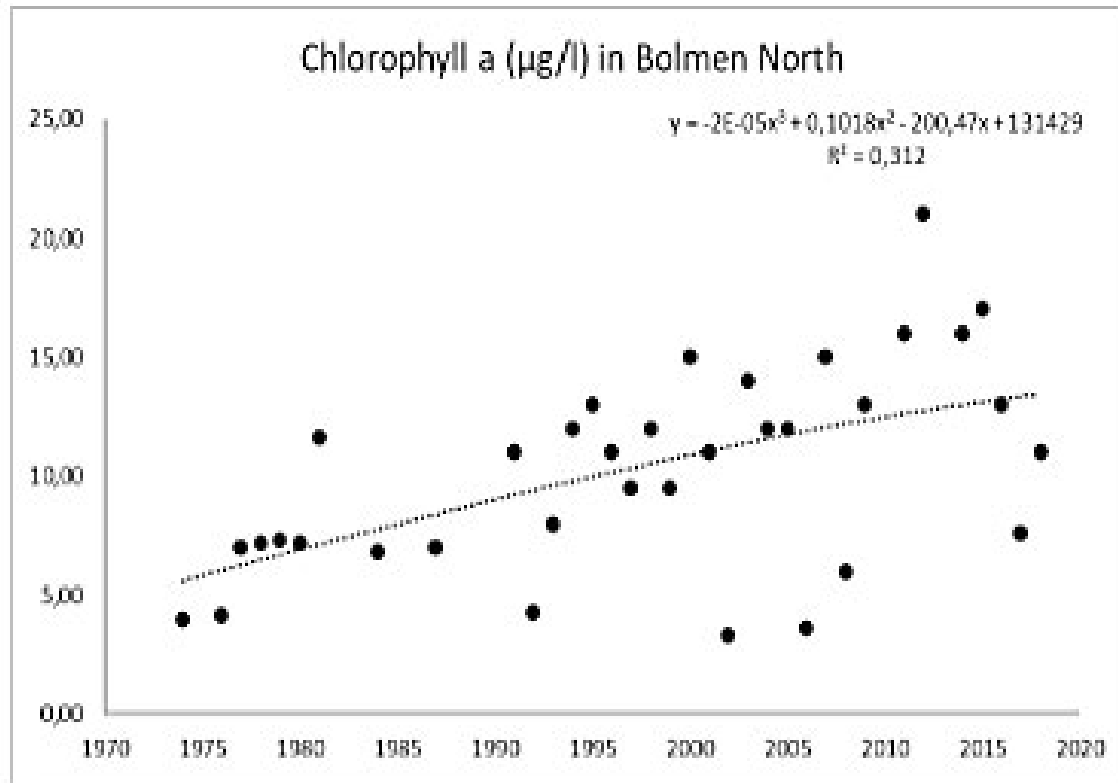


*Figure 5 Secchi depth in the North (left) and South part (right) of Lake Bolmen, with a clear difference in Secchi depth between the two parts. Secchi depth is higher at Bolmen South. For both parts of the lake, Secchi depth has been decreasing although during 2017 and 2018 Secchi depth increased for both parts of the lake. Years with October values used for Secchi depth for Bolmen North is 1970 – 1972 and 1974 – 1979 whilst years for Bolmen South is 1970 – 1971, 1974 – 1979. There is also an uncertainty in whether or not a water telescope has been used to measure Secchi depth during the period 1966 – 1990. However, from 1991 and onward values measured with the help of a water telescope are used.*

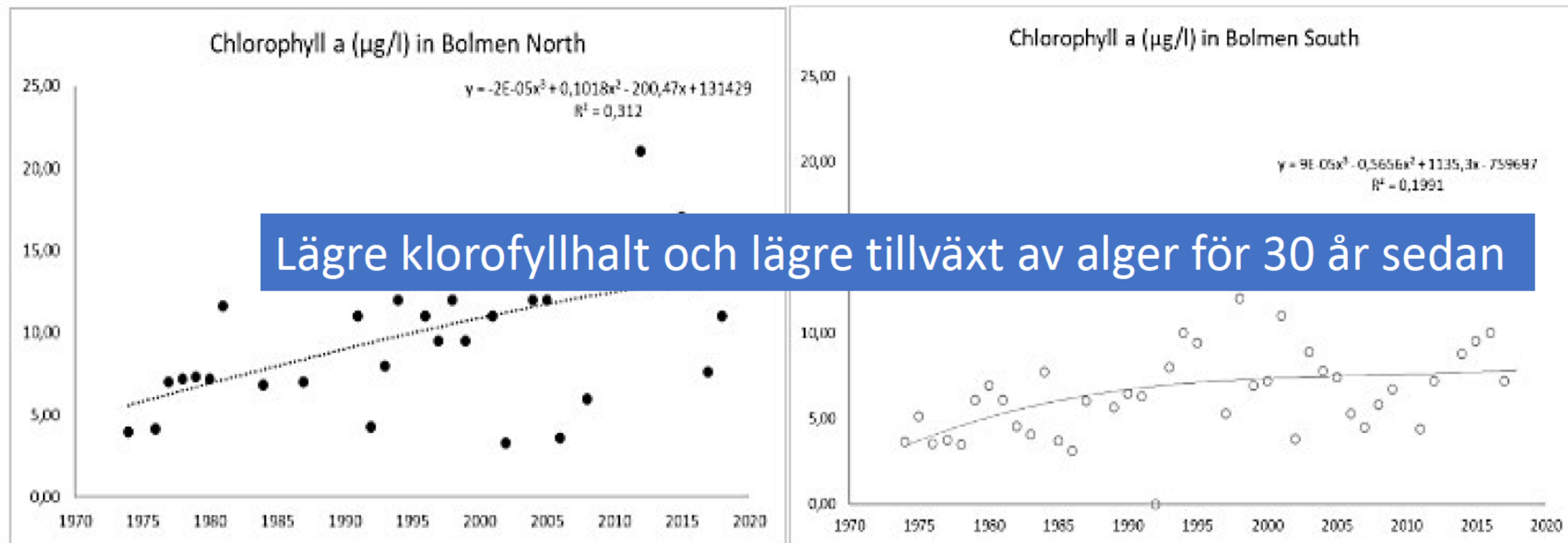




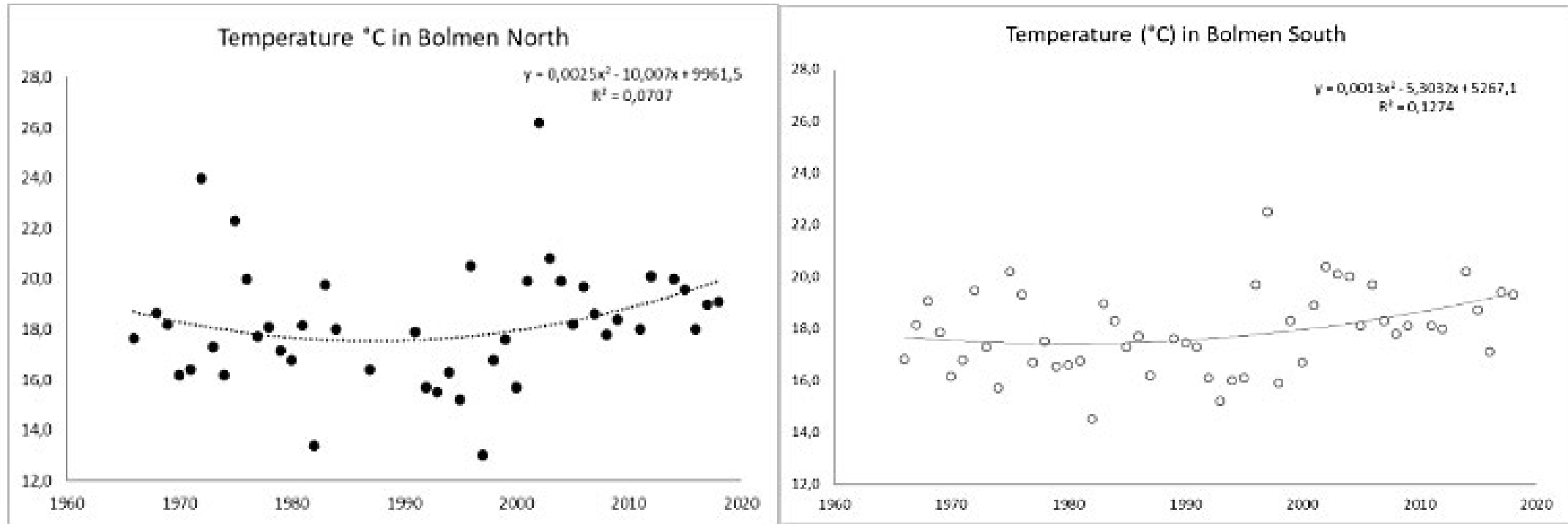
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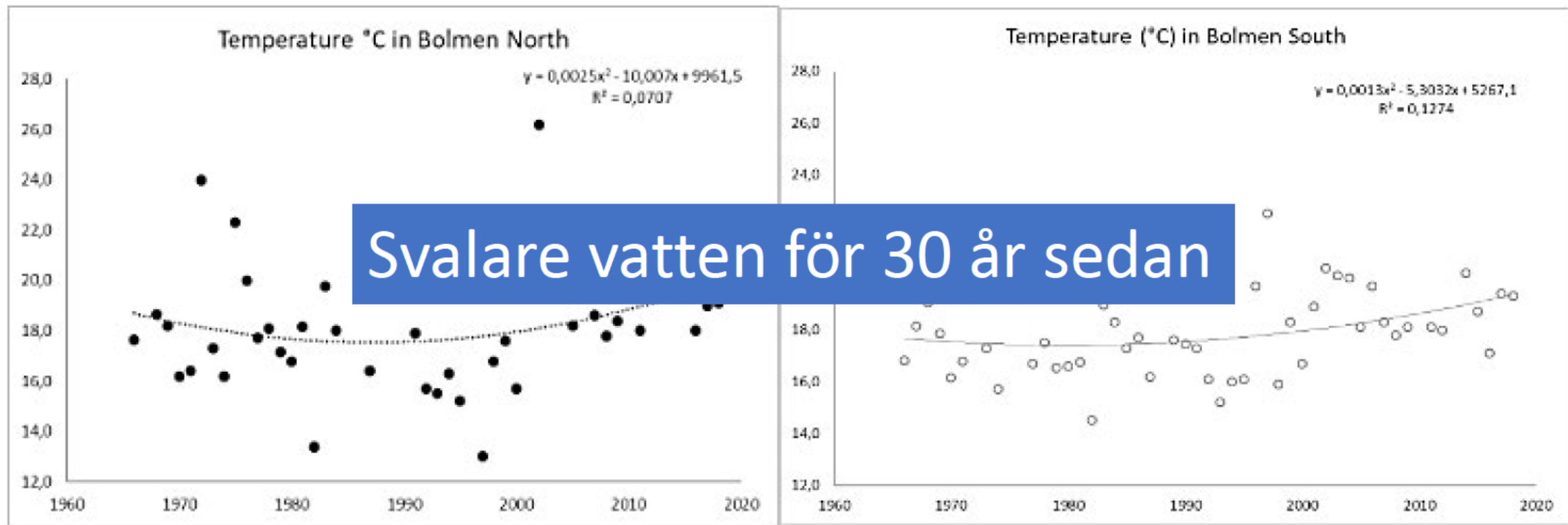
*Figure 6 There are higher values of chlorophyll a measured in Bolmen North (left) than in Bolmen South (right). In Bolmen South the chlorophyll a has varied a lot between different years whereas in Bolmen North the variation has been less pronounced, instead chlorophyll a often has shown high levels in Bolmen North. During the last three years, chlorophyll a has decreased in Bolmen North.*



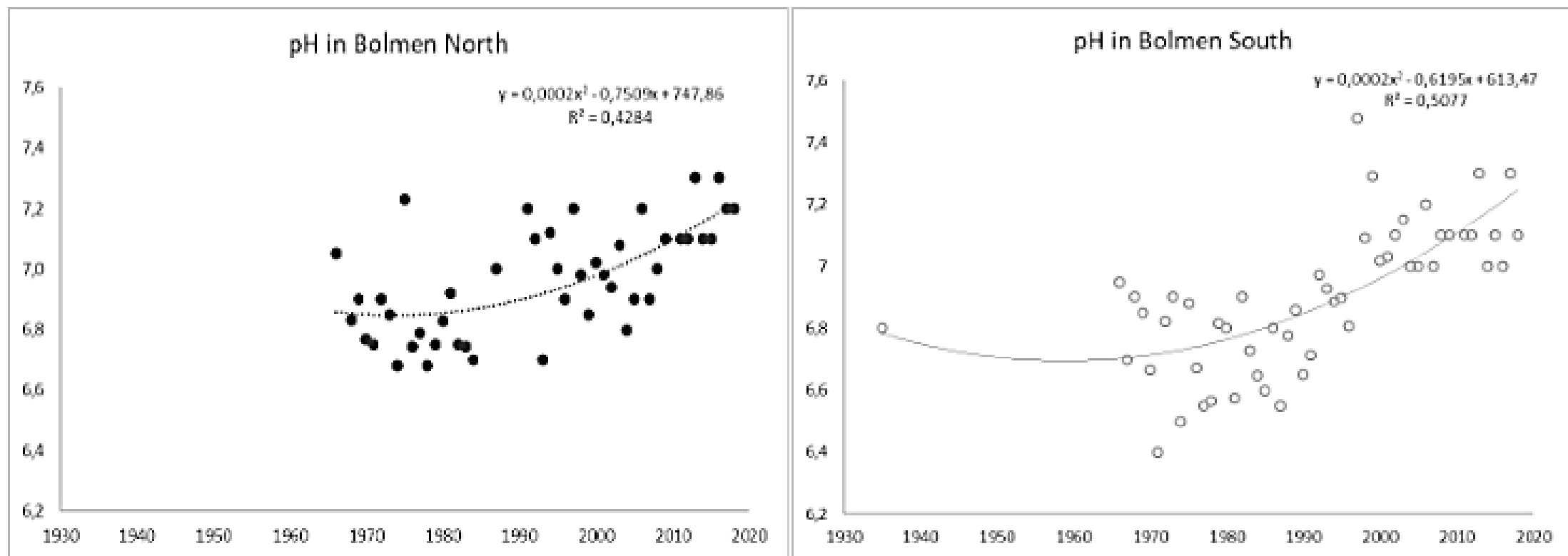
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*Figure 8 Temperature in the water for Bolmen North (left) and Bolmen South (right). Between the two parts of the lake there is not a lot of variability in the water temperature, however there are more scattered values for Bolmen North with temperatures reaching below 14°C and above 24°C. Water temperature is showing an increasing trend for both parts of Lake Bolmen.*

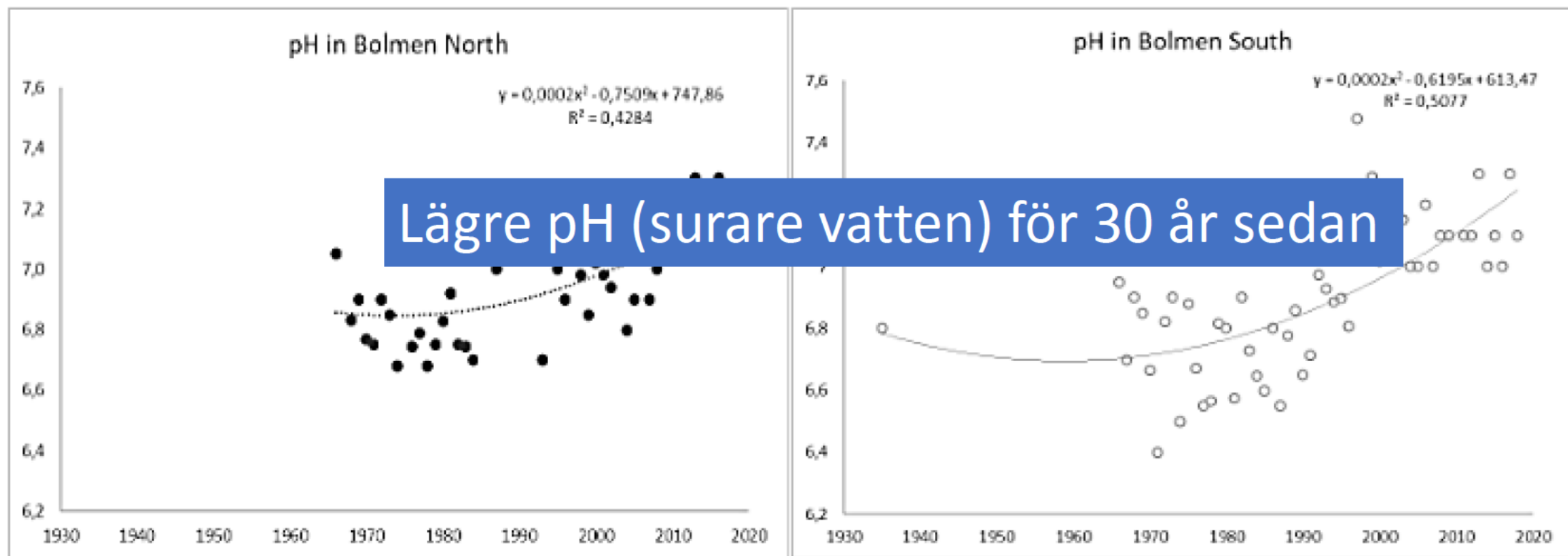


*Figure 8 Temperature in the water for Bolmen North (left) and Bolmen South (right). Between the two parts of the lake there is not a lot of variability in the water temperature, however there are more scattered values for Bolmen North with temperatures reaching below 14°C and above 24°C. Water temperature is showing an increasing trend for both parts of Lake Bolmen.*

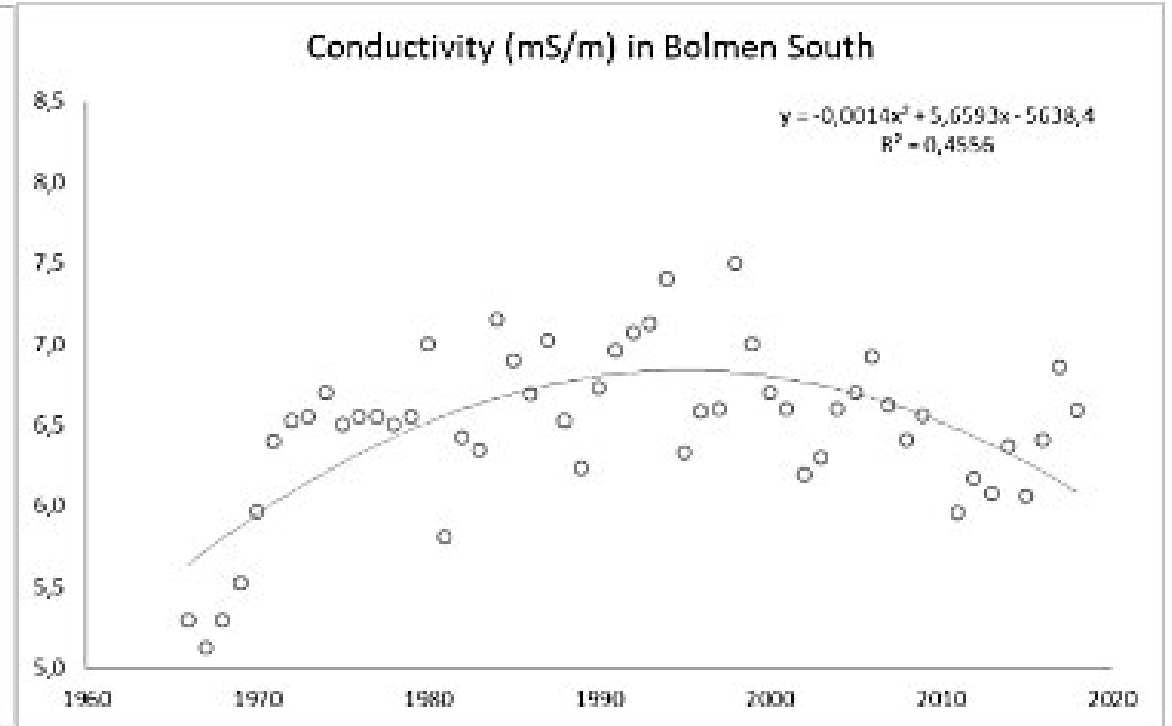
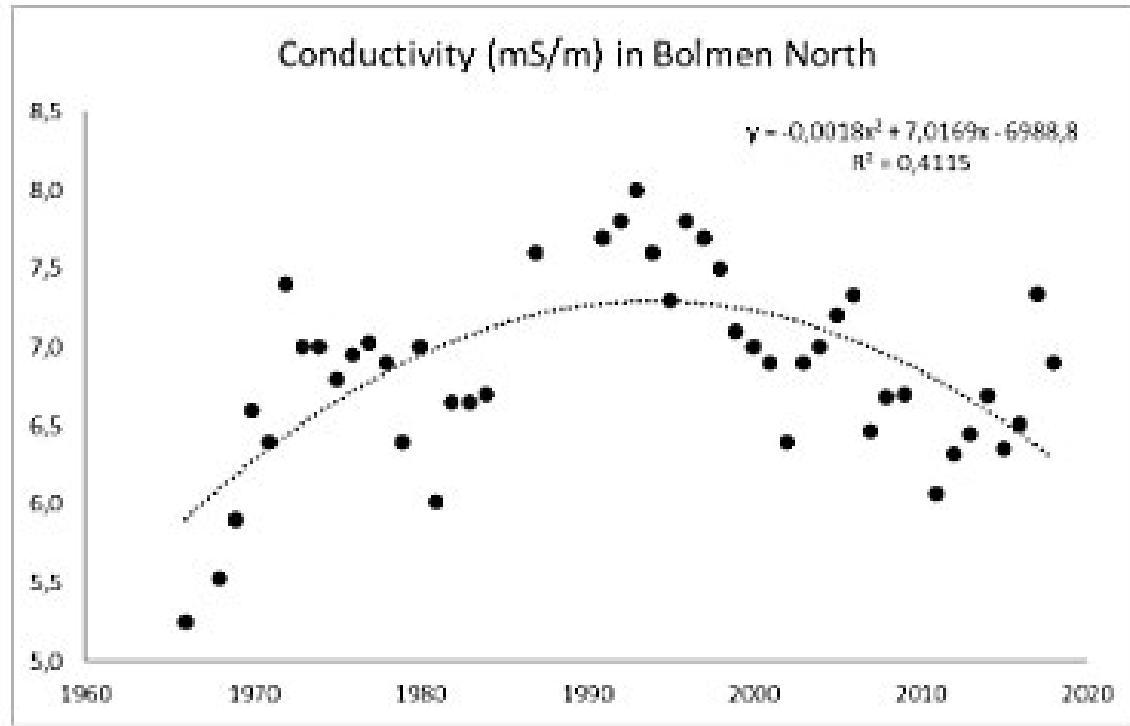


*Figure 9 pH in Bolmen North (left) and Bolmen South (right). pH has been increasing in both Bolmen South and Bolmen North since end of 1970s and pH still shows an increasing trend in both parts of Lake Bolmen. In the south part of Lake Bolmen there is a single pH value of 6,8 from 1935, which is included in the figure.*

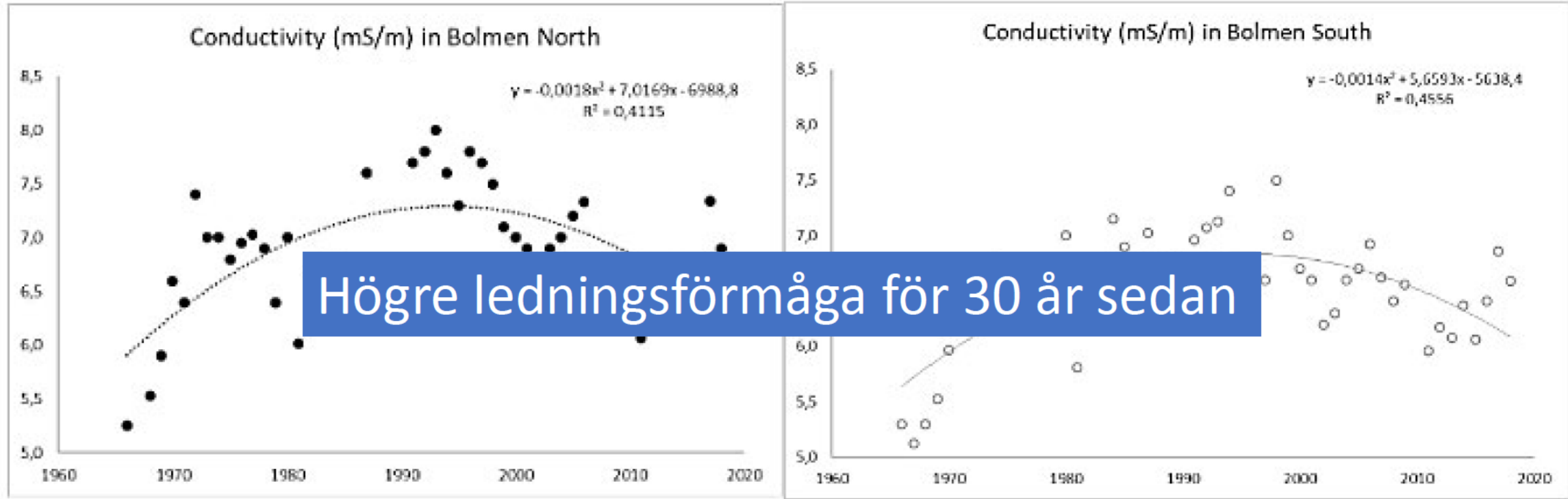




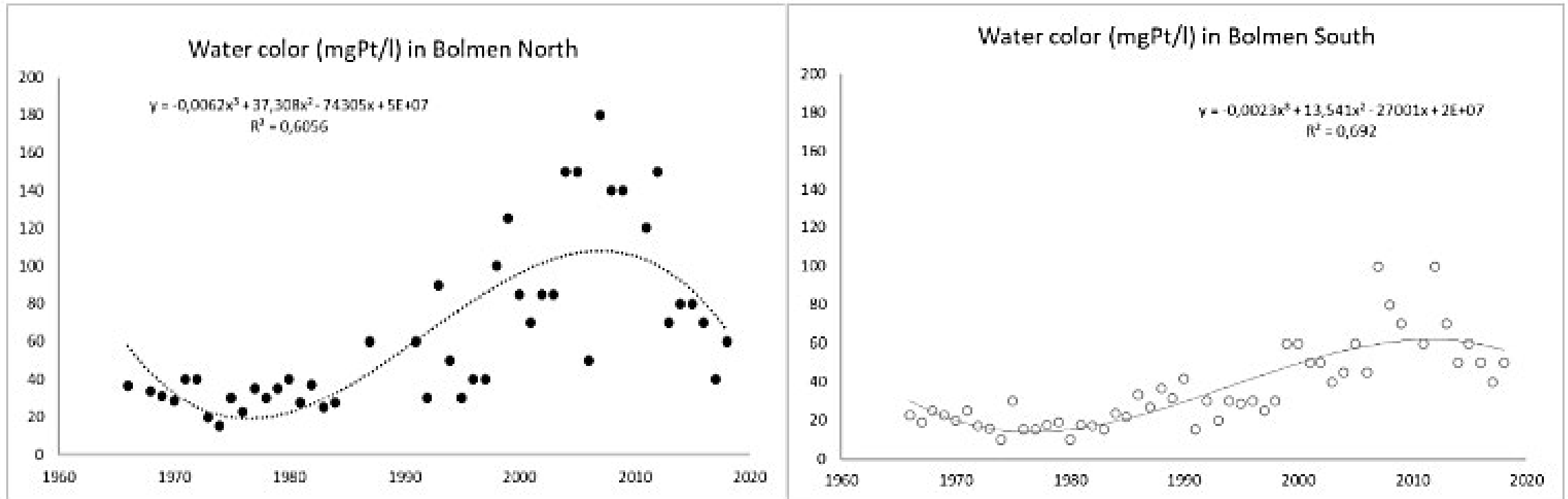
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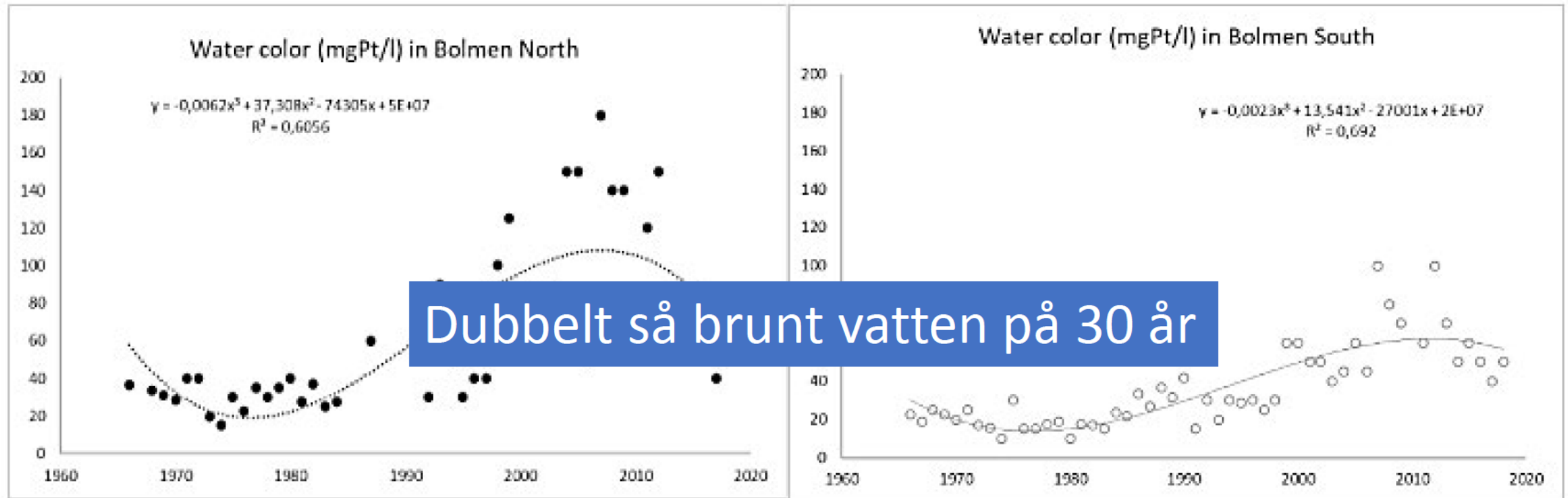
*Figure 11 Conductivity is increasing for both the north (left) and south part (right) of Lake Bolmen. In both Bolmen South and Bolmen North, there is a peak in conductivity levels between the years 1990 and 2000. The conductivity levels are generally higher and varies more in Bolmen North.*



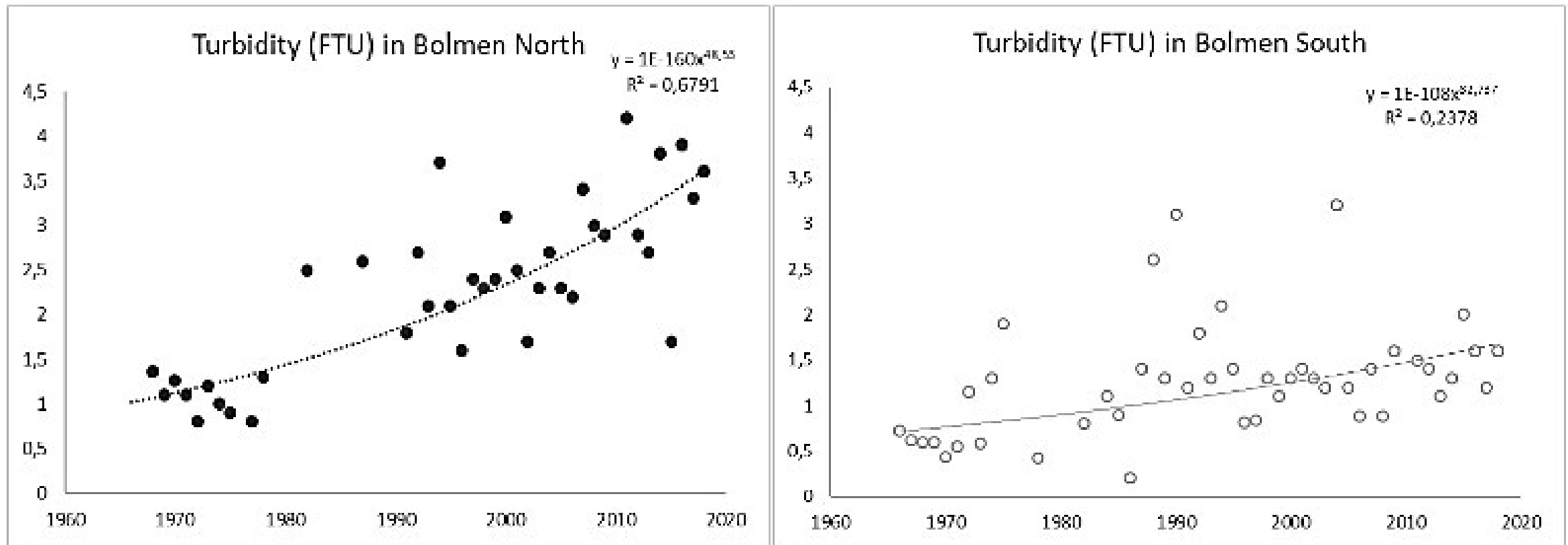
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*Figure 12 Water color levels have increased in Lake Bolmen, for both the north (left) and south part (right). For the last 10 years, water color is decreasing in both parts of Lake Bolmen. Water color shows an increasing trend that decreases during the last 10 years. Water color levels are lower in Bolmen South, with no value above 100 mgPt/l whilst in Bolmen North a lot of values are above 100 mgPt/l from end of 1990 and onwards with values reaching as high as 180 mgPt/l.*

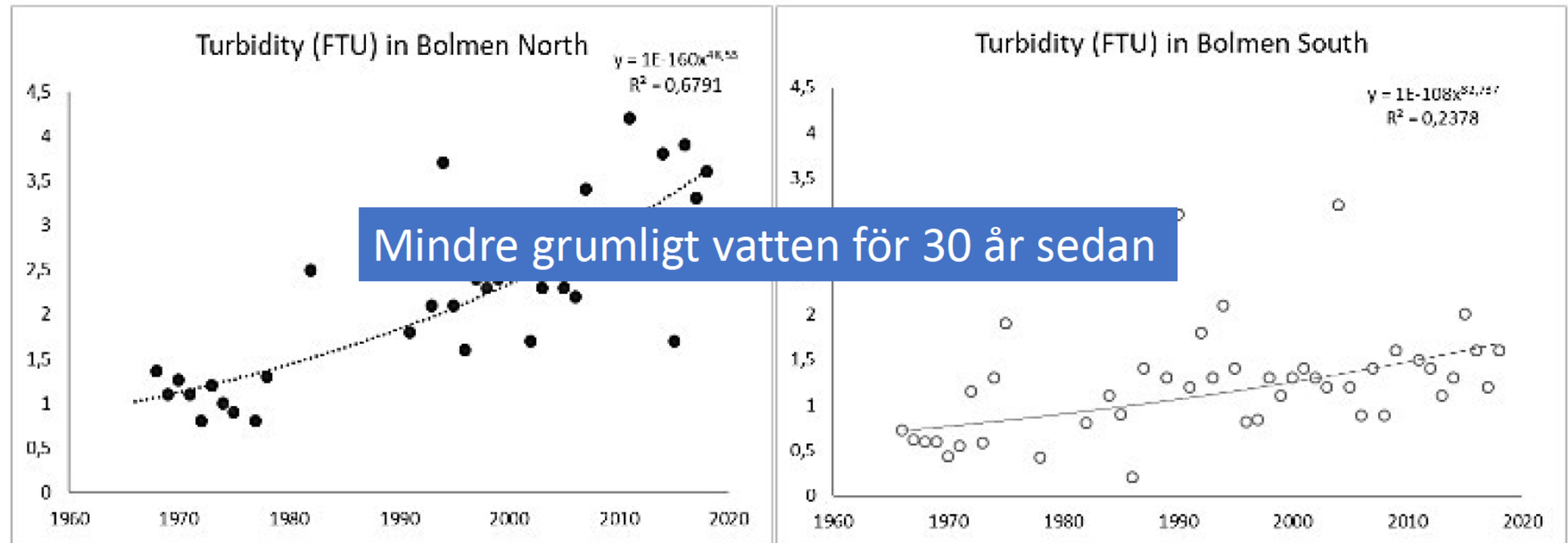


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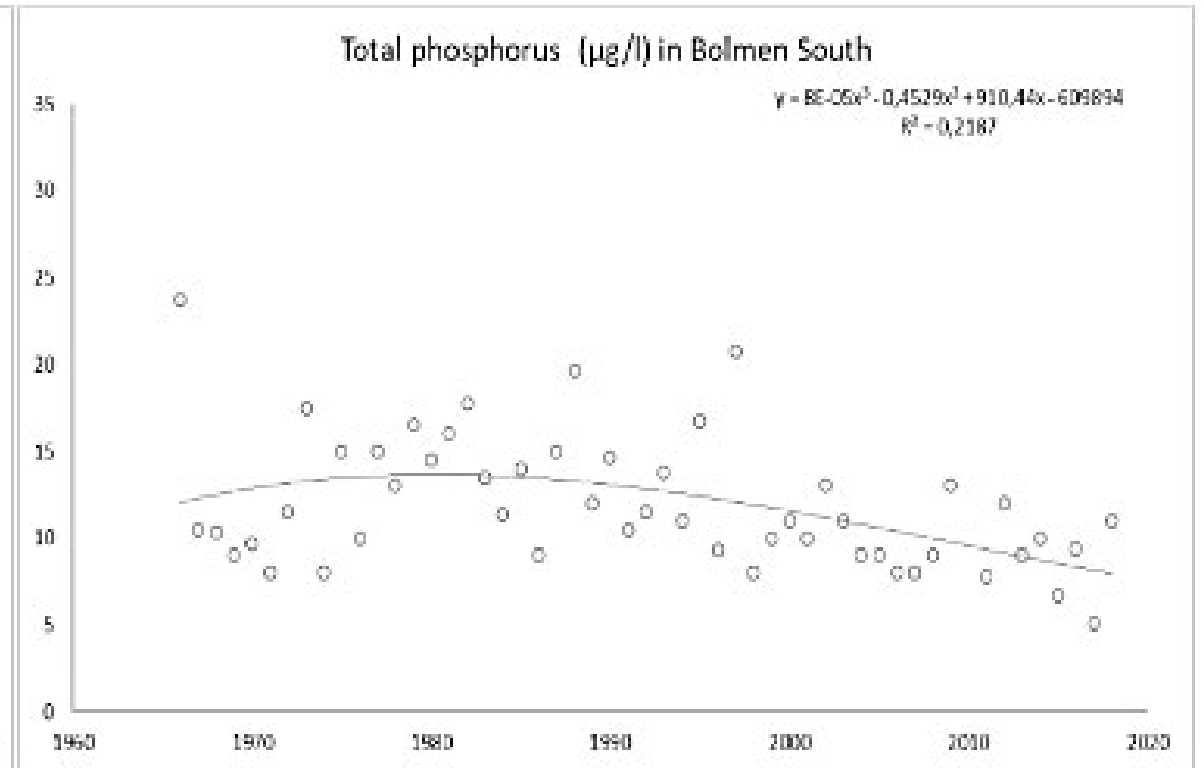
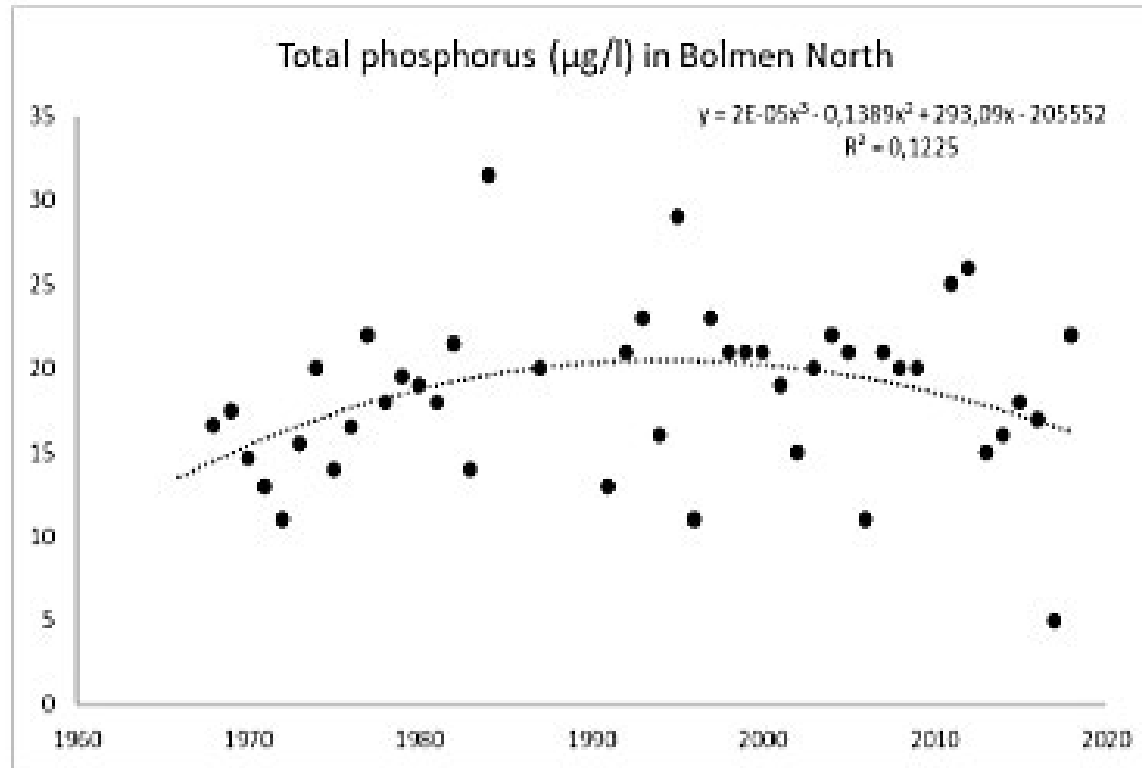


*Figure 13 Turbidity is increasing both in Bolmen North (left) and Bolmen South (right) and it is also showing an increasing trend, although much steeper in Bolmen North compared to Bolmen South. Bolmen North has higher turbidity, often reaching above 1,5 FTU, than Bolmen South.*

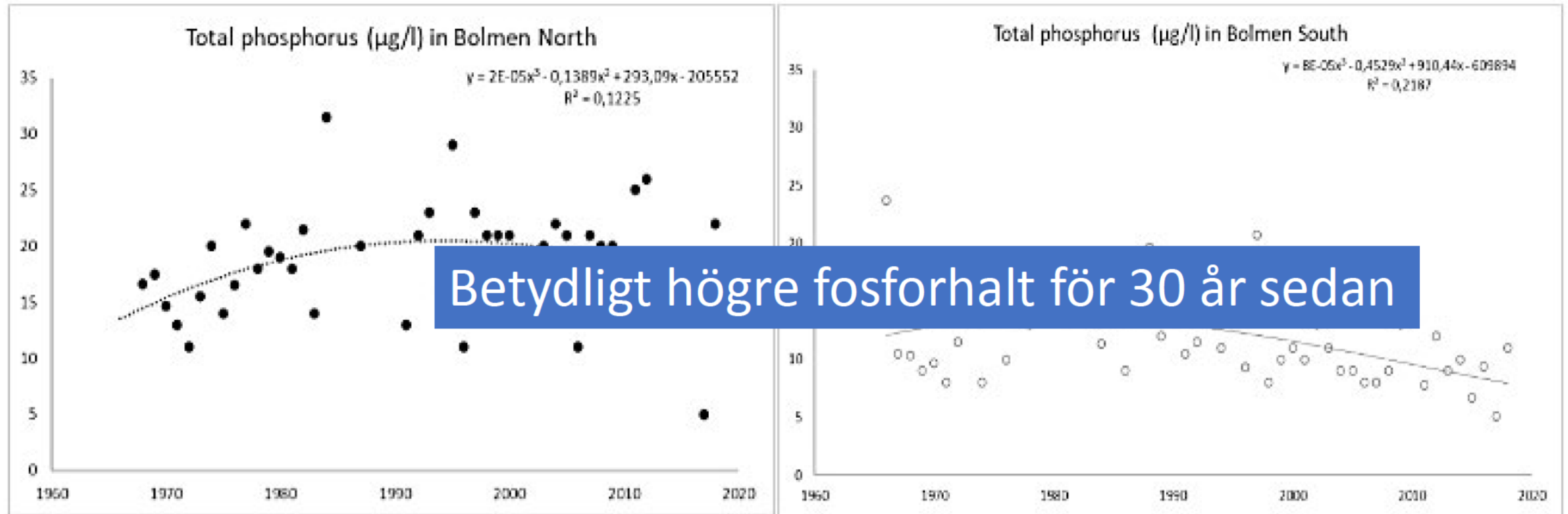




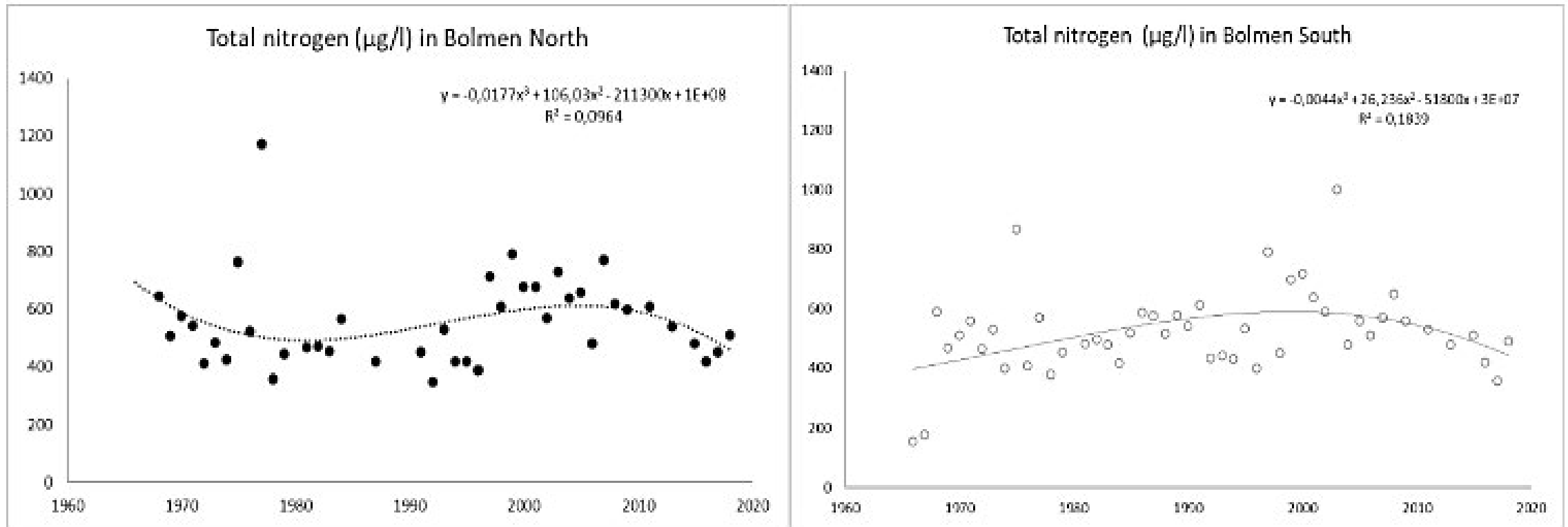
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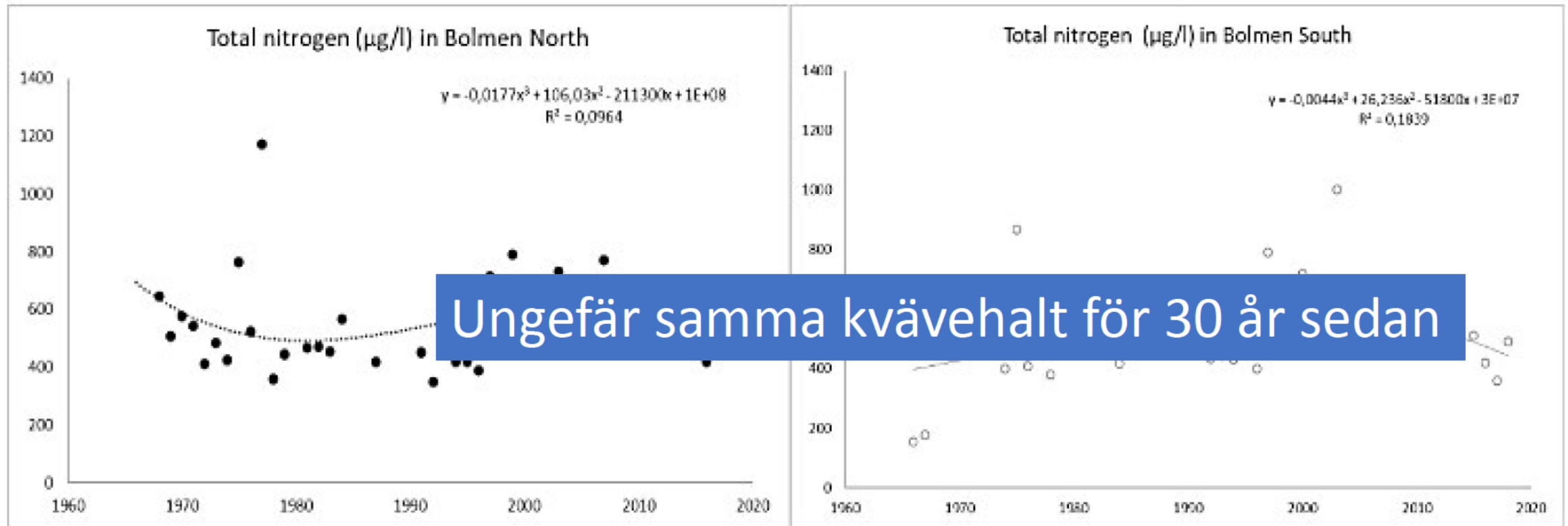
*Figure 16 Total phosphorus shows a decreasing trend in Bolmen South (right). In Bolmen North (left) there is an increasing trend until approximately the year 2000 when the trend starts to show a decrease in total phosphorus. Values for total phosphorus are generally higher in Bolmen North, with values often above 15  $\mu\text{g/l}$ , than in Bolmen South, with values rarely above 15  $\mu\text{g/l}$ .*



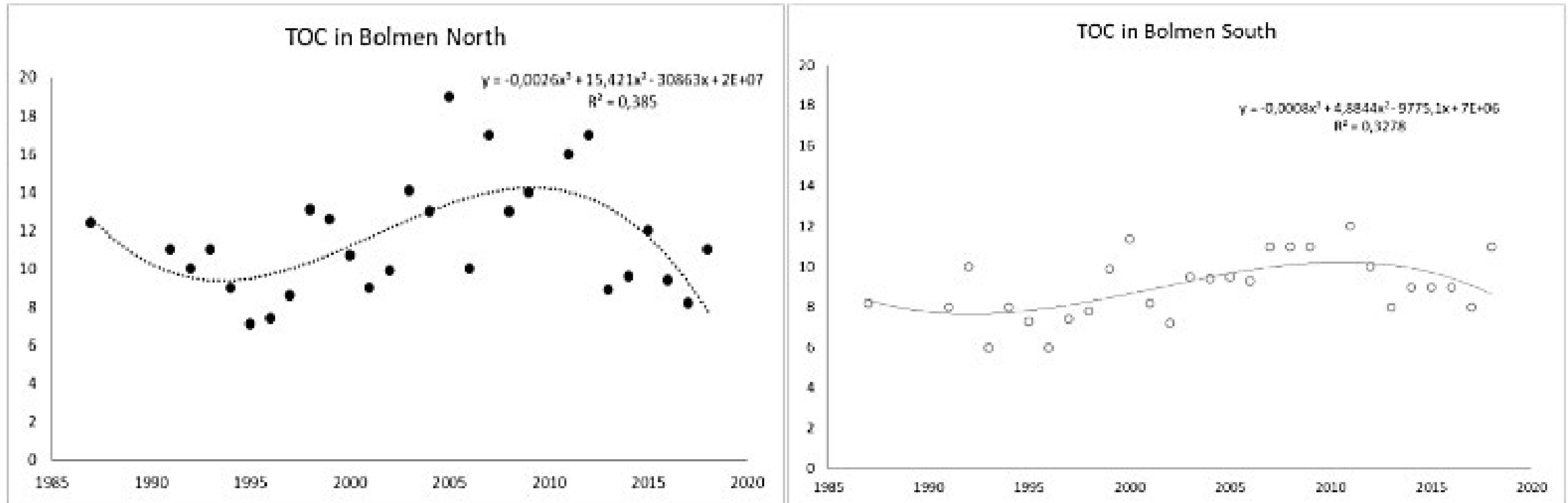
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*Figure 17 Total nitrogen shows a fluctuating trend in the north part of Lake Bolmen (left) whilst the trend shows a slight increase until approximately 2000 when the trend shows a slight ongoing decrease in the south part of Lake Bolmen (right). Total nitrogen is relatively constant with values commonly between 400 and 600  $\mu\text{g/l}$  in both Bolmen South and North, however between the mid-1990 and mid-2000 there is a peak in increasing nitrogen with values reaching above 600  $\mu\text{g/l}$  in both parts of Lake Bolmen, with some values reaching closer to 800  $\mu\text{g/l}$  in Bolmen North.*

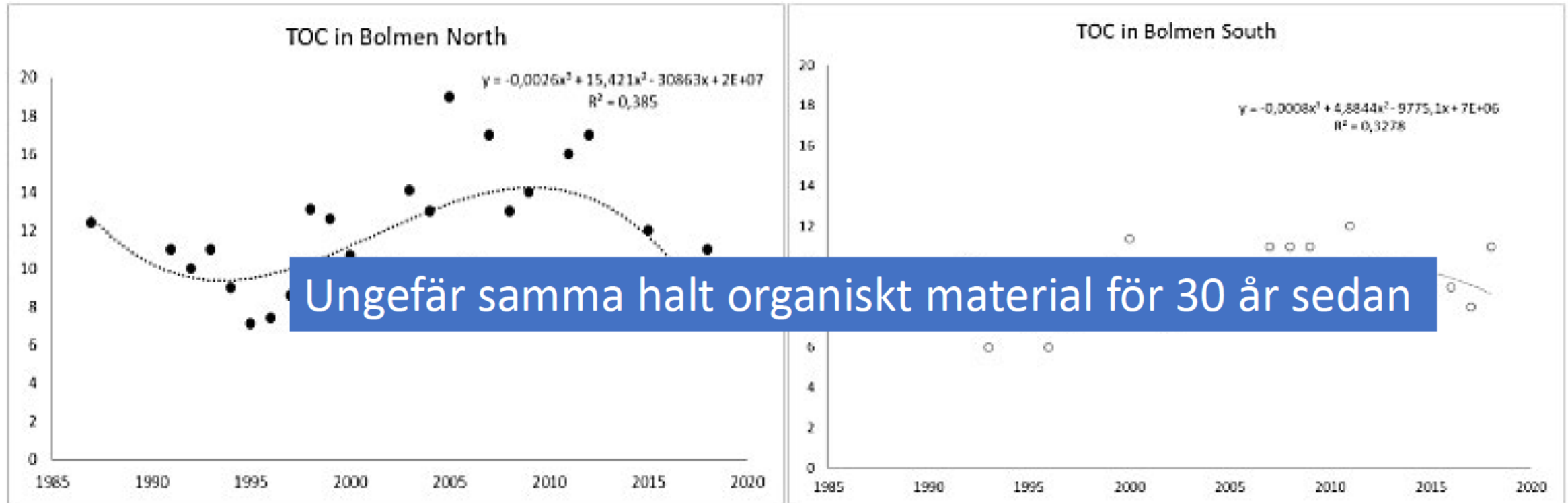


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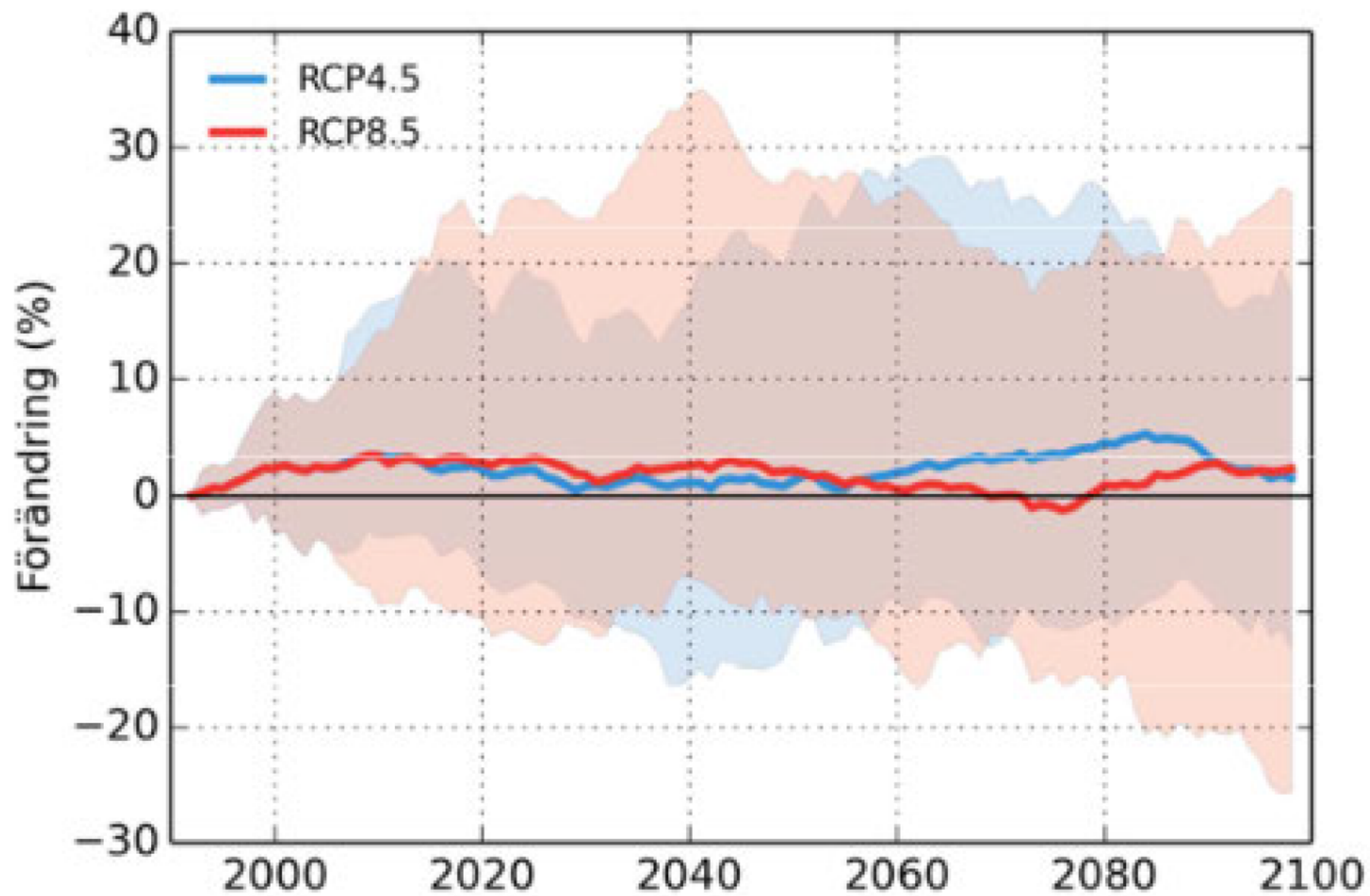


*Figure 18 Total organic carbon (TOC) is showing an increasing trend between 1995 until 2010, whereas after the trend is showing a decrease in TOC in both the northern and southern basin of Lake Bolmen. In Bolmen South (right), TOC values are under 12 whilst at Bolmen North (left), values for TOC often are above 12. In Bolmen North, values for TOC varies more than in Bolmen South. There was a peak of TOC in Bolmen North between 2005 and 2012, with TOC values above 16. From 2013 and onwards TOC values are below 12 in Bolmen North.*

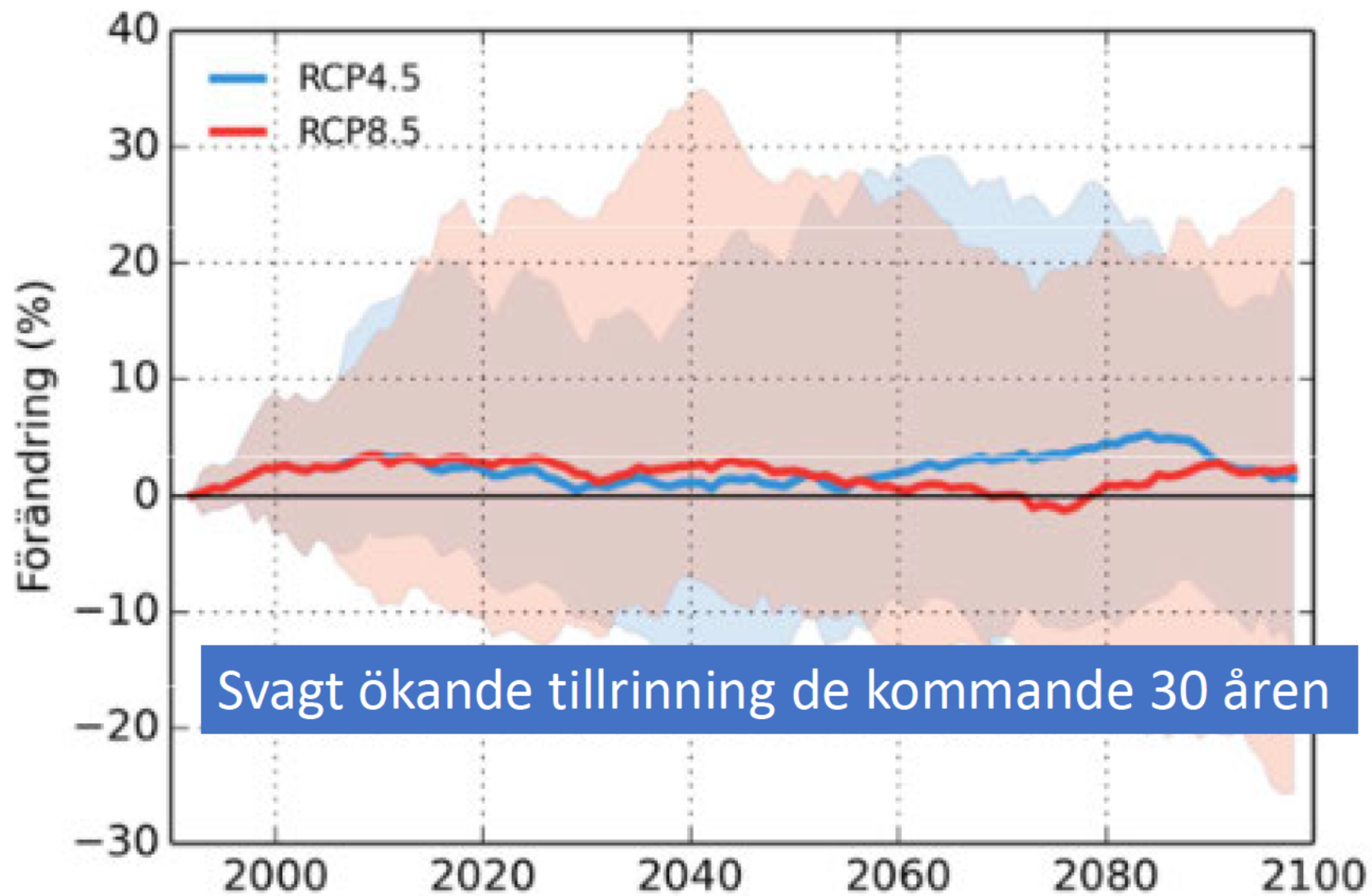




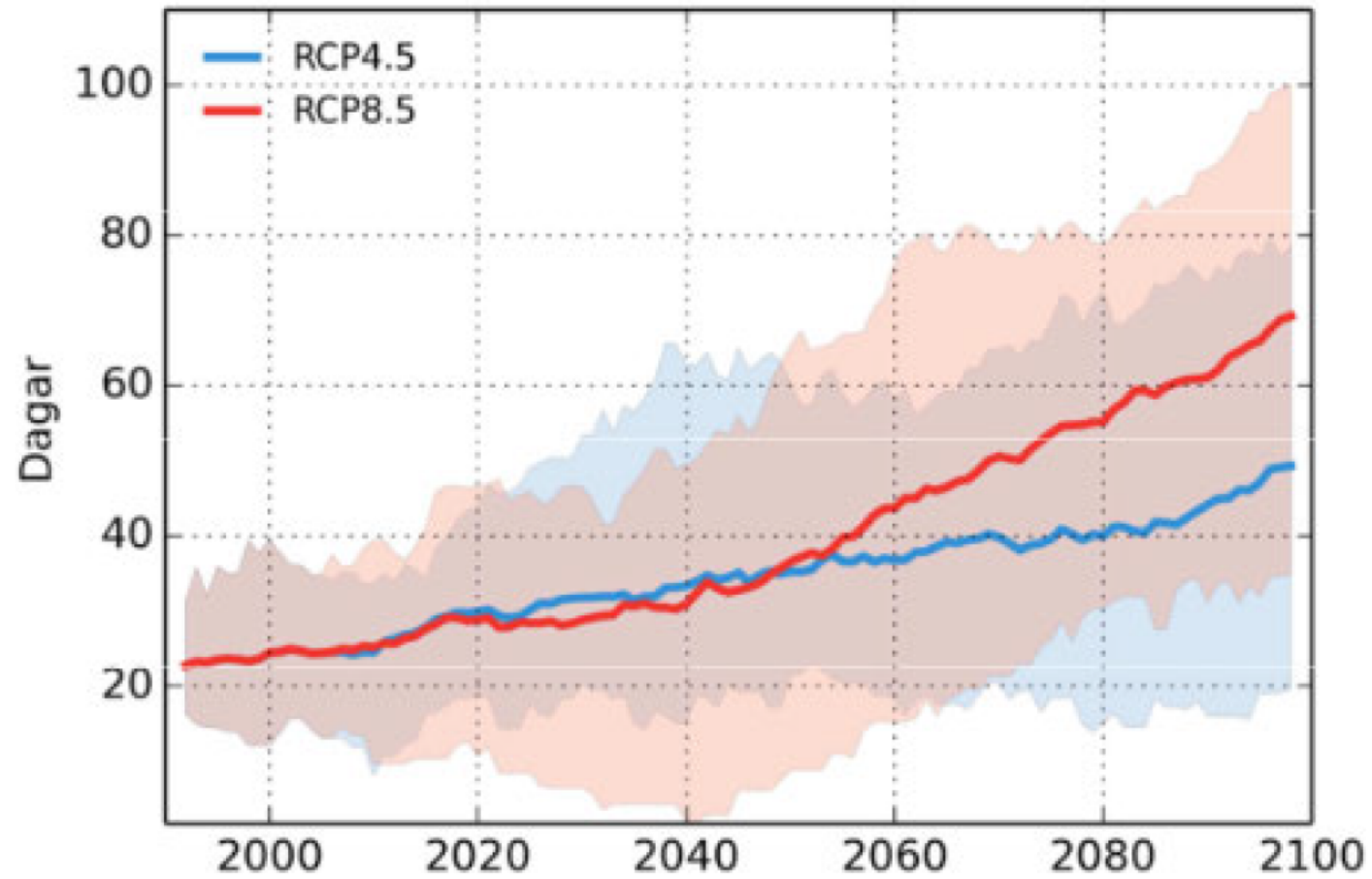
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*Förändring i medeltillrinning till Bolmen fram till 2100.*

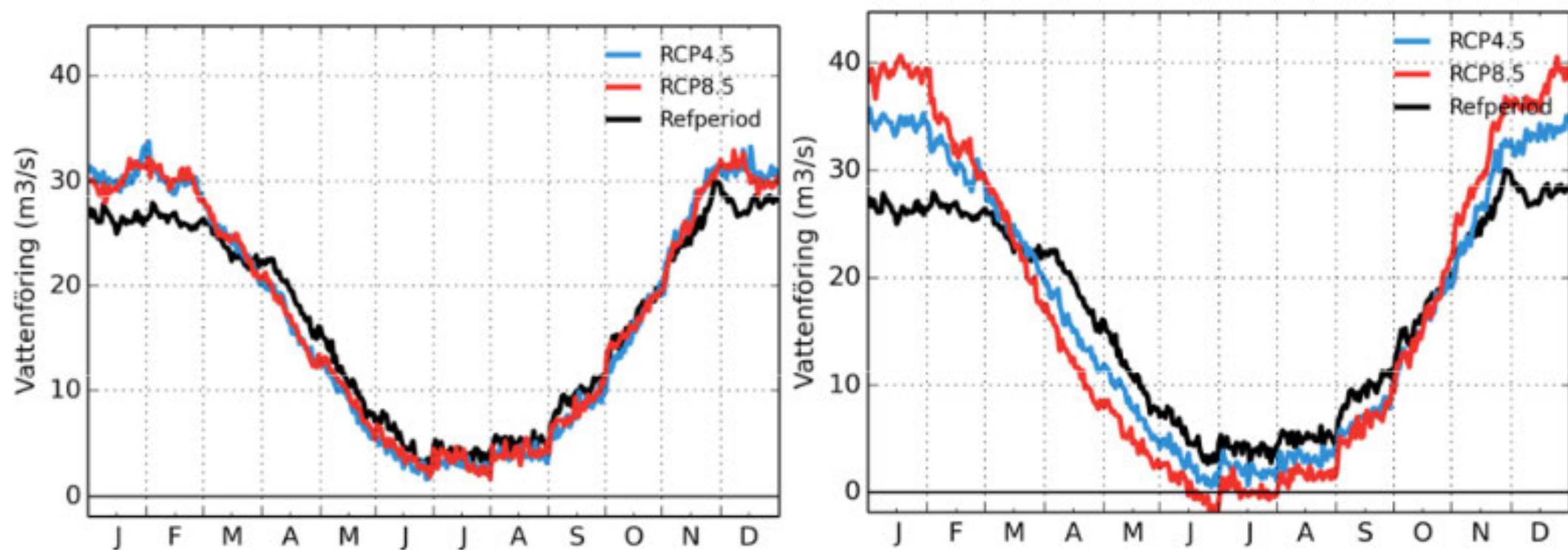


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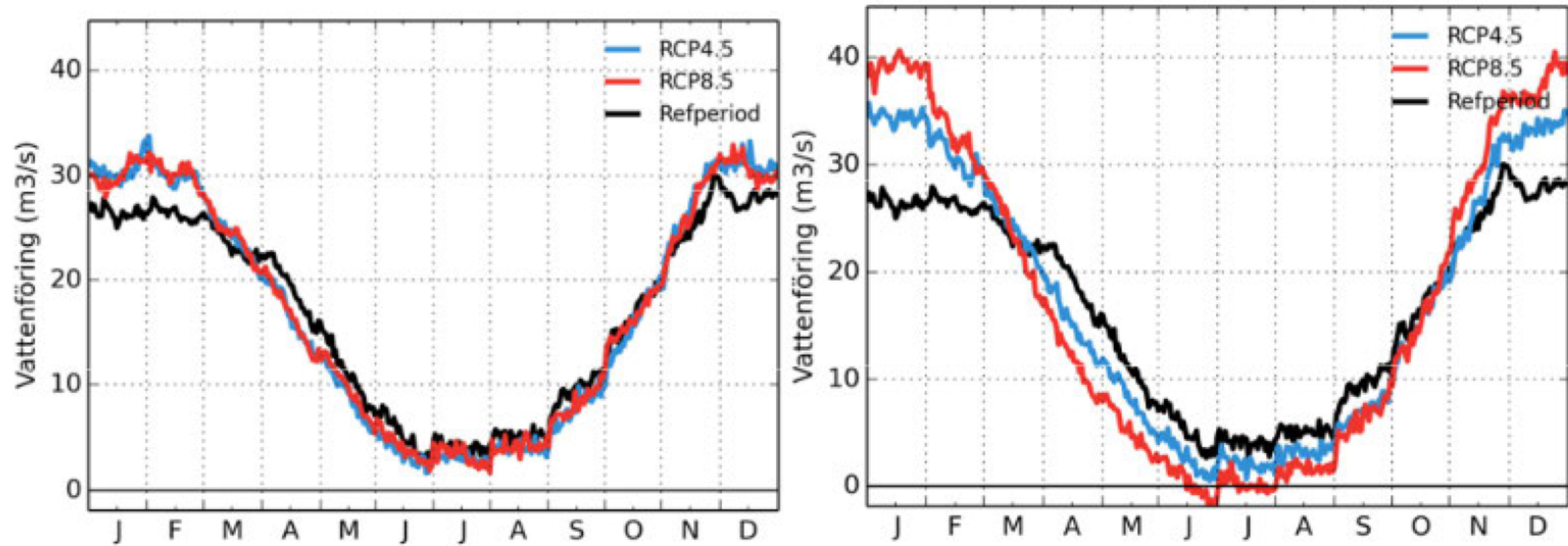


*Antal dagar med låg lokal tillrinning till Bolmen fram till 2100.*





*Figur 4.11 Till vänster visas tillrinningens årsdynamik för Bolmen för perioden 2021-2050 för RCP4.5 (blå) och för RCP8.5 (röd). Till höger visas tillrinningens årsdynamik för Bolmen för perioden 2069-2098 för RCP4.5 (blå) och för RCP8.5 (röd). Som jämförelse visas tillrinningens årsdynamik för perioden 1961-1990 (svart). Beräkningarna är baserade på resultat från nio globala klimatmodeller och för de båda utsläppscenarierna RCP4.5 och RCP8.5.*



Figur 4.11 Till v **Mera vatten vintertid men mindre sommartid** RCP4.5 (blå) och för RCP8.5 (röd). Till höger visas tillrinningens årsdynamik för domren för perioden 2069-2098 för RCP4.5 (blå) och för RCP8.5 (röd). Som jämförelse visas tillrinningens årsdynamik för perioden 1961-1990 (svart). Beräkningarna är baserade på resultat från nio globala klimatmodeller och för de båda utsläppscenarierna RCP4.5 och RCP8.5.



# Hydrophysical processes governing brownification

## A case study of Lake Bolmen, Sweden

by Clemens Klante



**LUND**  
UNIVERSITY

DOCTORAL DISSERTATION  
Faculty opponent: Prof. Rolf David Vogt

# Omfattande vetenskapliga studier

- August Bjerken (LTH) – Framtagande av en dynamisk vattenbalans för Lagans avrinningsområde
- Jasmin Borget (Högskolan i Halmstad) – Dikesförvaltning i Muråns avrinningsområde
- Anna Borgström (Akvatisk ekologi, LU) — Lokala åtgärder mot globala hot: Säkerställande av inlandsvattens ekosystemfunktion och service i ett framtida klimatscenario
- Laura Giese (Psykologiska inst. LU)— Pedagogisk verksamhet — ett verktyg för framtida kompetensförsörjning?
- Clemens Klante (LTH)— Hydrologins betydelse för brunifiering av vattendrag och sjöar (klar juni 2023)

# Var är Bolmen om 30 år?

- Konkurrensen om vattenresurserna ökar, speciellt på sommaren
- Bolmens forskningsstation och de mätningar som görs kopplat till SITES behövs i allt större omfattning för kvalitetsövervakning och vattenvård
- Samverkan inom Lagans vattenråd kommer att bli allt viktigare
- Samverkan med Smålands sjörike blir allt viktigare
- Den kartläggning som görs av och kring Bolmen kan (och måste) leda till nya, smartare och klokare vattenhushållningsåtgärder





# Bolmens forskningsstation – vad vill vi åstadkomma

- En samlingspunkt för forskning i sjöar för hela södra Sverige.
- Håll vattnet kvar i landskapet
- Kunskapscentrum för åtgärder mot brunifiering
- Ledande kring förvaltning av sjöar omgivade markområden
- Nya tvärvetenskapliga projekt, som fiskeförvaltning, arbete mot invasiva arter, kartläggning av biologisk mångfald, arbete för återvätning av landskapet.







# Välkommen till Vattenkonferensen på Forskningsstation Bolmen 25-26 maj 2053

