Assessment of Climate Change for the Baltic Sea Basin - The BACC Project - 22-23 May 2006, Göteborg, Sweden

Detection of Past and Current Climate Change

1) Atmosphere: Temperature and Precipitation

Air Temperature

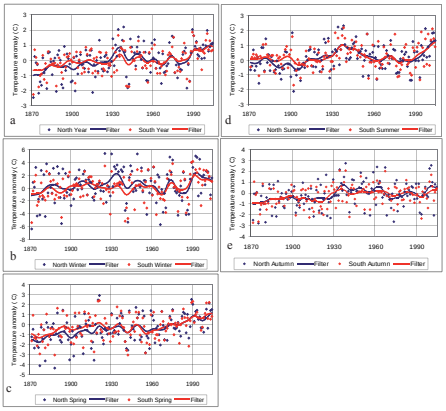

Fig. 1: Anomaly time series of annual and seasonal mean air temperature for the Baltic Sea catchment area from 1871 to 2004, calculated from 5° by 5° latitude, longitude box averages taken from the CRU dataset based on land stations (a=annual, b=winter (DJF), c=spring (MAM), d=summer (JJA), e=autumn (SON)). Blue colour comprises the area to the north of 60 °N, and red colour to the south of that latitude. The dots represent individual years, and the smoothed curves highlight variability on timescales longer than 10 years.

Frost Days

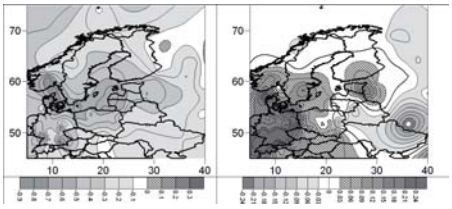

Fig. 2: Annual trends of frost days (on the left) and hot days (on the right), days/year. The ECA dataset for the period from 1951 to 2000 (Klein Tank et al., 2002a) and five Polish stations (Wibig and Głowicki, 2002) were used.

Precipitation

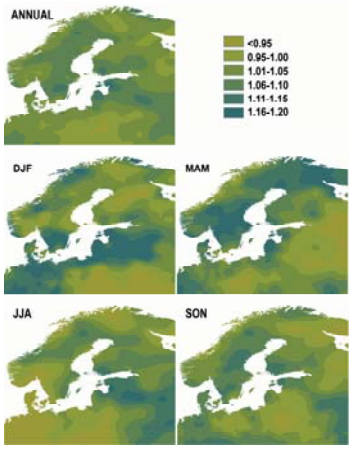

Fig. 4: Annual and seasonal precipitation ratios of the periods 1976-2000, relative to 1951-1975. The darker the greenish colour, the stronger the increase in precipitation. Based on VASClimO data (Beck et al. 2005).

The Baltic area has become warmer

- Annual warming trends over the years 1871 to 2004 for the northern and southern Baltic catchment area, being 1.0 and 0.7 °C per 100 years, respectively, are somewhat larger than the trend for the entire globe.
- The warming has not occurred gradually. In the annual mean temperatures, there was an early 20th century warming that culminated in the 1930s. This was followed by a smaller cooling that finished in the 1960s, and then another strong warming until the present day.
- Spring is the season showing the most linear and strongest warming, whereas wintertime temperature increase is intermittent but larger than in summer and autumn.
- The longest measured temperature records from the Baltic area cover about 250 years. They show that there were warm periods during the latter half of the 18th century, and that the19th century was a relatively cool period.
- Warming is characterised by a pattern where mean daily minimum temperatures have increased more than mean daily maximum temperatures.
- A general tendency is that the climatic seasons in the spring half-year (e.g. spring, growing season, summer) start earlier, whereas the climatic seasons in the autumn half-year (e.g. autumn, frost season, winter) start later.
- Changes in extreme temperatures have broadly followed changes in mean temperatures. The number of frost days has decreased at the same time as the number of hot days has increased.

The Baltic area has become wetter

- Over the latter part of the 20th century, on average, northern Europe has become wetter, although, the increase in precipitation is not spatially uniform.
- Within the Baltic Sea basin, the largest increases have occurred in Sweden and the eastern coast of the Baltic Sea.
- Seasonally largest increases have occurred in winter and spring. Changes in summer are characterised with increases in the northern and decreases in the southern parts of the Baltic Sea basin.
- The long precipitation records covering 100 years or more show a clear increase in annual precipitation in Sweden and Denmark, while only weak increases are observed e.g. in the Baltic states, Finland and Poland. In Sweden, the long-term increasing trend arises mainly from the cold half-year.
- In wintertime, there is an indication that the number of heavy precipitation events has increased.

Precipitation

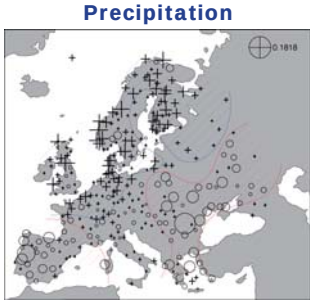

Fig. 5: Change in the number of heavy one-day precipitation events in winter. Shown is the linear trend above 90th percentile (baseline 1961-90) during the period 1958–2000. A '+' signifies an increase (blue shaded) and a 'o' shows a decrease (red shaded). The size of the symbol is linearly proportional to the magnitude of the trend. Units are days/year and the maximum trend magnitude is shown in the top right (from Haylock and Goodess, 2004).

Air Temperature

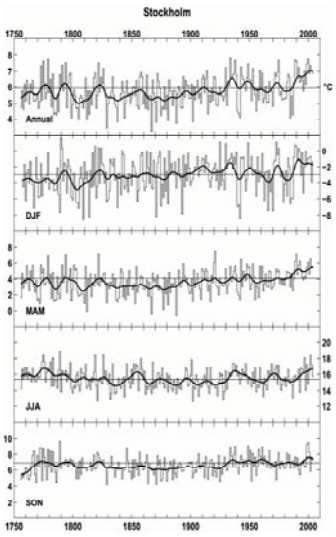

Fig. 3: Annual and seasonal mean air temperatures in Stockholm from 1756 to 2004, calculated from the homogenized daily mean temperature series by Moberg et al. (2002), after a correction for a suspected positive bias in summer temperatures before 1859 (Moberg et al. 2003). Correction is the same as used by Moberg et al. (2005). Smoothed curves highlight the variability on timescales longer than 10 years.

Precipitation

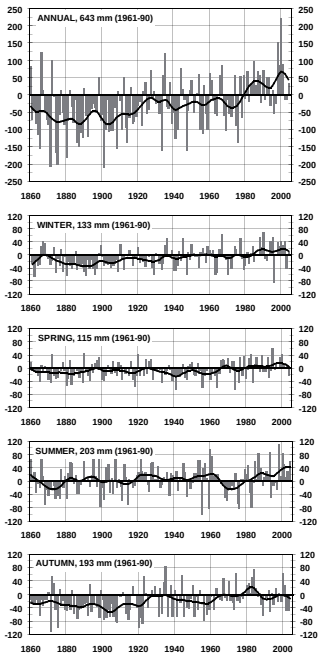

Fig. 6: Anomaly time series of annual and seasonal precipitation over Sweden, from 1860 to 2004 (reference period 1961-90). Curves represent variations in the time scale of about ten years (updated from Alexandersson 2004).

Organised by: Göteborg University, GKSS, BALTEX

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