



# Europe's precipitation in a changing climate





# Precipitation



## Observed trends

### Annual precipitation

Annual precipitation since 1960 shows an increasing trend of up to 70 mm per decade in north-eastern and north-western Europe. Mean summer precipitation has significantly increased of up to 18 mm per decade in parts of northern Europe. Mean winter precipitation has increased in most of Western and Northern Europe (20 to 40%).

### Extreme events

There is compelling evidence for statistically significant trends, during the last century, for increasing frequency and total precipitation of rainfall extreme events over North and Western Europe.

More precipitation

More extreme events

Events more extreme

Trends are different between the north and south of Europe.

Events more extreme

Less precipitation

Less extreme events

Annual precipitation since 1960 shows a decrease of up to 90 mm per decade in some parts of southern Europe. Mean summer precipitation has significantly decreased by up to 20 mm per decade in most of southern Europe. Southern Europe and parts of Central Europe were characterized by drier winters.

From 1950 to 2008 there is a trend of a decrease of the number of extreme precipitation events in the in the south.



## Precipitation



Observed trends

More heavy precipitation events

The number of days with very heavy precipitation over Europe has increased on average by about 45% in observations in the period 1981-2013 compared to 1951-1980.

Heavy precipitation more intense

For Europe as a whole, also the intensity of extreme precipitation has increased, even for areas with a decrease in mean precipitation, such as Central Europe and the Mediterranean.

Most events that can lead to flash flooding

Despite considerable decadal variability, analyses indicate that 1-day and 5-day precipitation events that occurred on average once in 5, 10 and 20 years in the 1950s and 1960s generally are more common now. 1-day events are important for flash floods on local scales. 5-day events may result in high river water levels.

Seasonal differences

Trends are different for summer and winter (trends in spring and autumn are not significant).



# Precipitation



Future projections

## Annual precipitation

According to the IPCC, precipitation increases averaged over northern Europe for April - September by 3-4% for 2050 (intermediate - high-end climate change. For October through March this projected increase is 8-11%.

## Extreme events

Under a scenario of moderate climate change for the period 2021-2050 compared with 1971-2000 an increase of the number of heavy precipitation events in the summer is projected for:

- Central Europe (the east of France, Germany, Austria, Czech Republic, Slovenia, north of Italy) by 40%
- Northern Germany, Belgium and the Netherlands by >30%

More precipitation

More extreme events

Events more extreme

Events more extreme

Less precipitation

Less extreme events



# Precipitation



## Future projections

### Annual precipitation

**Annual precipitation may increase** in 2071-2100 (compared with 1971-2000) up to about 25% in large parts of Central Europe and Northern Europe.

According to the IPCC, precipitation increases averaged over northern Europe for April - September by 5-8% for 2100 (intermediate - high-end climate change). For October through March this projected increase is 11-20%.

### Extreme events

**The frequency of precipitation extremes increases** by a factor of 2 to 5 over Northern Europe in winter. The corresponding numbers for Central Europe are from no change to a frequency increase by a factor of about 2.

**Very high daily precipitation may increase strongly** over western, central and northern Europe at the end of the 21st century, by 20-70 % (low - high-end scenario of climate change).

Strongest increases in heavy precipitation are projected for **Central and Eastern Europe** (up to 35% under a high-end scenario of climate change).

Most of the continent will get wetter in winter, while during summer drying is expected in the South and in Central Europe.

More precipitation

More extreme events

Events more extreme

Less precipitation

Less extreme events

Events more extreme

**Annual precipitation may decrease** in 2071-2100 (compared with 1971-2000) by about 5-30% in Southern Europe and the Mediterranean.

In southern Europe, both the **number of wet days and total precipitation is generally projected to decrease.**

At the same time there are extensive areas in southern Europe that are likely to experience **relatively more intense precipitation.**

