

# WHY IS GLOBAL WARMING ABOVE 1.5°C A PROBLEM? [3/3]

## TIPPING POINTS – ATMOSPHERIC & OCEANIC CURRENTS

**What are tipping points?** The Paris Agreement's long-term goal is "to keep the rise in mean global temperature well below 2°C and preferably limit the increase to 1.5°C". Exceeding "tipping points" is one of the main reasons why this commitment was made. Just like a tree branch can only withstand a certain amount of pressure before it breaks, some planetary systems exposed to climate change impacts may reach their tipping point and change into something different as a result.

**Tipping points in atmospheric and oceanic currents.** Global warming may disrupt the balance in the system of oceanic and atmospheric currents and lead to significant (and irregular) weather changes on most continents. The position of the atmospheric and oceanic currents on the map is just symbolic: their precise localization is nearly impossible because the mass of water and air moves dynamically.

### 01 GULF STREAM

The Gulf Stream is a strong warm ocean current which affects the climate in Western Europe and the east coast of North America, making the winters there less severe. It is a part of a global system of surface and deep-water currents (thermohaline circulation), which distributes heat around the planet. Measurements show that the **Gulf Stream** has been **getting weaker** since 1950. It might stop completely in the future, e.g. if a large amount of water is released to the north Atlantic from melting glaciers in Greenland.

The speed of global warming will determine how strong the current will be. Simulations for different emission scenarios predict that it will be **11-54% weaker** by 2100.

### 02 EL NIÑO – SOUTHERN OSCILLATION

In the South Pacific region, cold and warm periods (El Niño & La Niña) come irregularly every three to ten years. This South Pacific oscillation affects air currents and rainfall on the American and Australian coast, bringing **extreme weather (floods as well as droughts)** and **having an impact on crops**.

The global warming leads to more frequent and stronger El Niño (if the global temperature rises by 1.5°C, El Niño will occur twice as often).

### 05 WEST AFRICAN MONSOON

This monsoon is a system of regular winds, which affect weather and rainfall in the Sahel region and in West Africa.

If the global temperature rises by 2 to 3°C, the West African Monsoon may **become stronger**, which may result in **renewed vegetation cover** in the Sahel and in the western Sahara. However, this would also increase the temperature stress, which is why a green Sahara would not be more livable for people.

### 03 JET STREAM & POLAR VORTEX

Jet stream and polar vortex are two interrelated atmospheric currents, which keep cold arctic air over the North Pole. The jet stream is getting weaker now and meanders more as a result – and so we experience more frequent situations in which cold arctic air goes down towards the equator and very hot tropical air moves the opposite way: towards the pole. This leads to **rapid cooling** for several days or weeks in various regions in Europe, Asia or America (e.g. -30°C in Chicago in February 2019) or **rapid warming** (recent heat waves in Europe).

If the global mean temperature keeps rising, the jet stream will probably grow even weaker and we can expect **extreme temperatures more frequently**.

### 04 INDIAN MONSOON

The regular Indian monsoon brings up to 90% of precipitation to the region. Global warming, land use changes and the amount of aerosols released to the air may cause the monsoons to be unstable on the Indian subcontinent, sometimes weak and sometimes very strong, which will lead to **extreme floods in some years and severe droughts in other years**.

The temperatures in this infographic refer to global warming above pre-industrial levels. The current warming is approx. 1.2°C.