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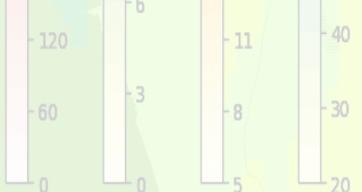
Updated: 25.08.2020 8:00 - Now: 25.08.2020 14:08

- +0 HEAT INDEX 25.08.2020 08:00
- +0 Total irradiance (W/m2)
- +0 Windspeed (m/s)
- +0 Air temperature (°C)
- +0 Relative humidity (%)
- +0 HEAT INDEX 25.08.2020 11:00
- +3 Total irradiance (W/m2)
- +3 Windspeed (m/s)
- +3 Air temperature (°C)
- +3 Relative humidity (%)
- +6 HEAT INDEX 25.08.2020 14:08
- +6 Total irradiance (W/m2)
- +6 Windspeed (m/s)
- +6 Air temperature (°C)
- +6 Relative humidity (%)
- +9 HEAT INDEX 25.08.2020 17:00
- +9 Total irradiance (W/m2)
- +9 Windspeed (m/s)
- +9 Air temperature (°C)
- +9 Relative humidity (%)

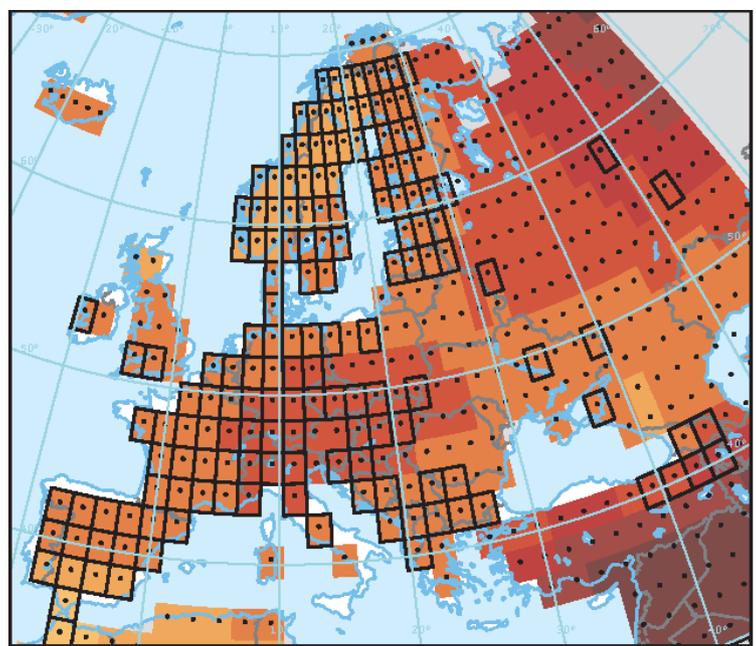
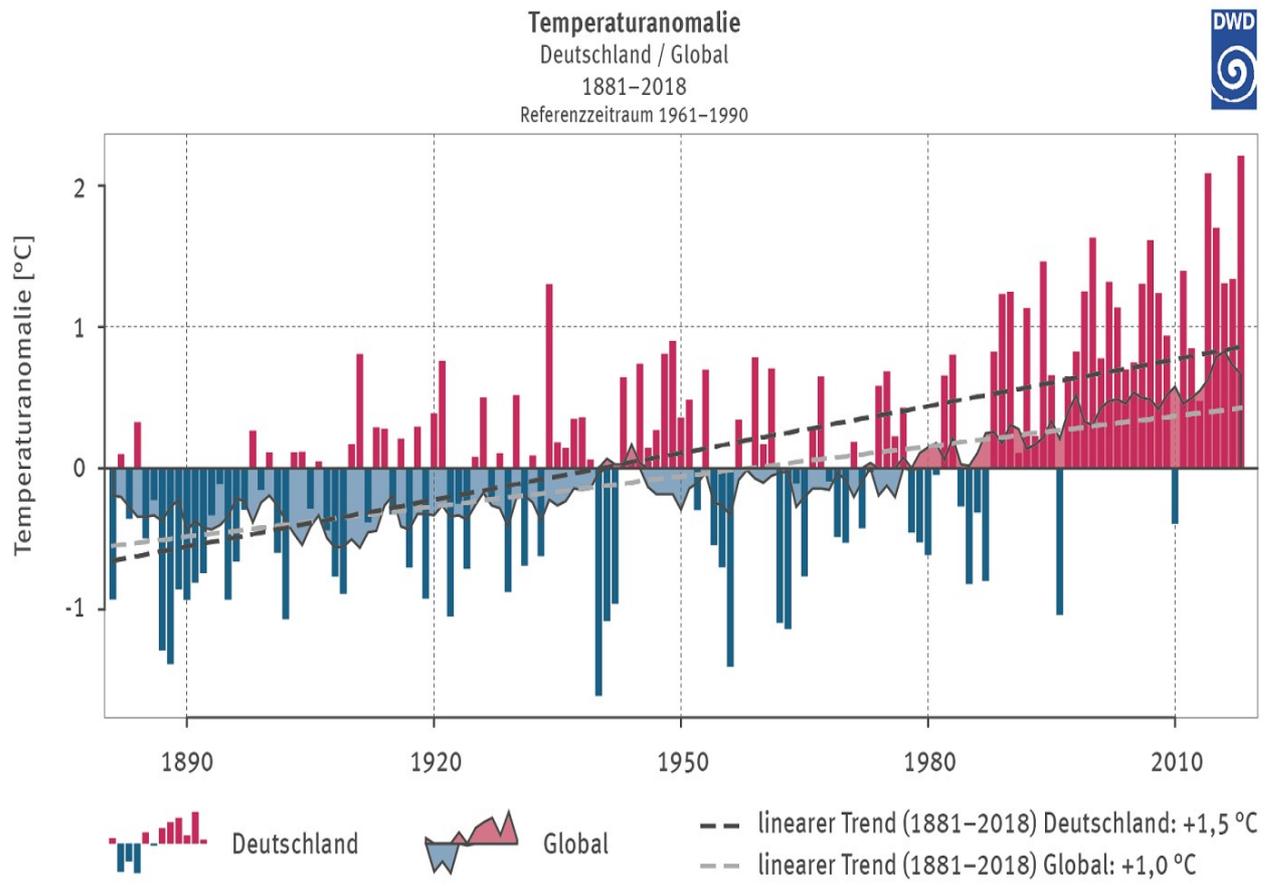
# Heat waves and heat stress in Schleswig Holtstein : a high resolution internet forecasting application



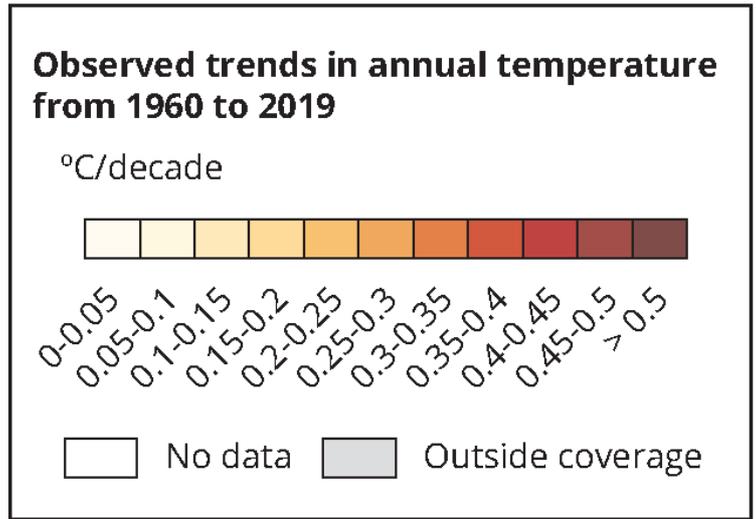
Dr. Olaf Duteil – Duteil Environmental Numerics  
[od@duteil-nerumerics.com](mailto:od@duteil-nerumerics.com)



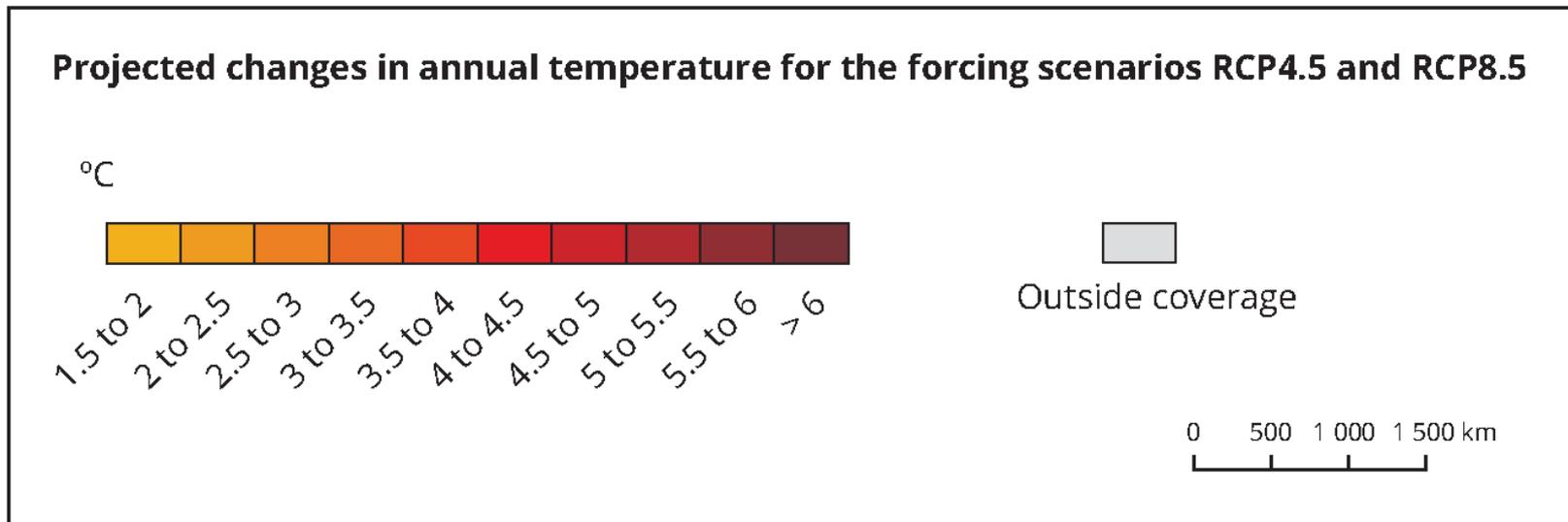
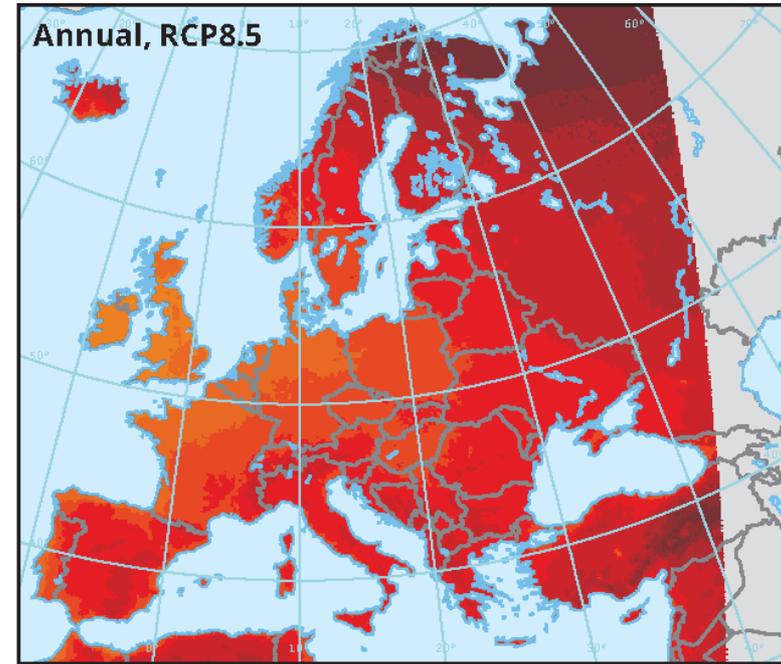
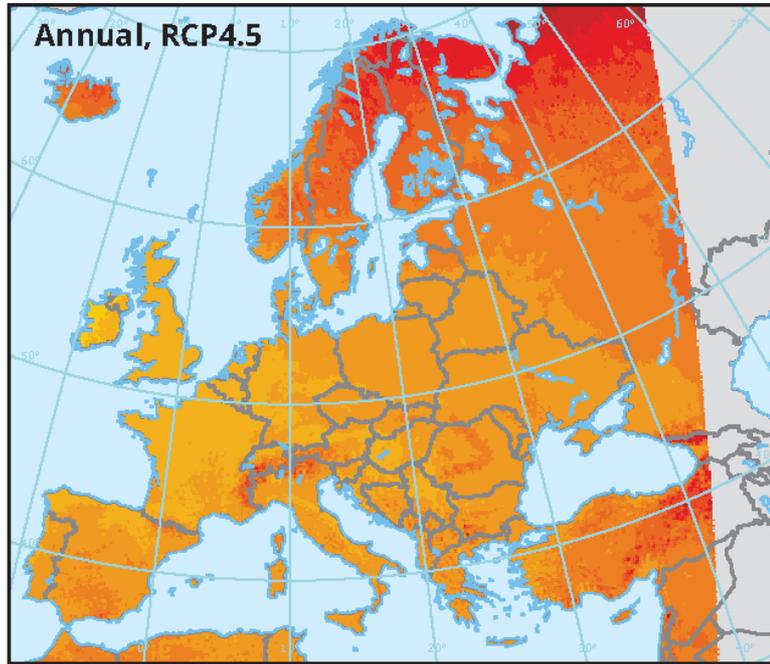
# General context : a warming climate since 1880



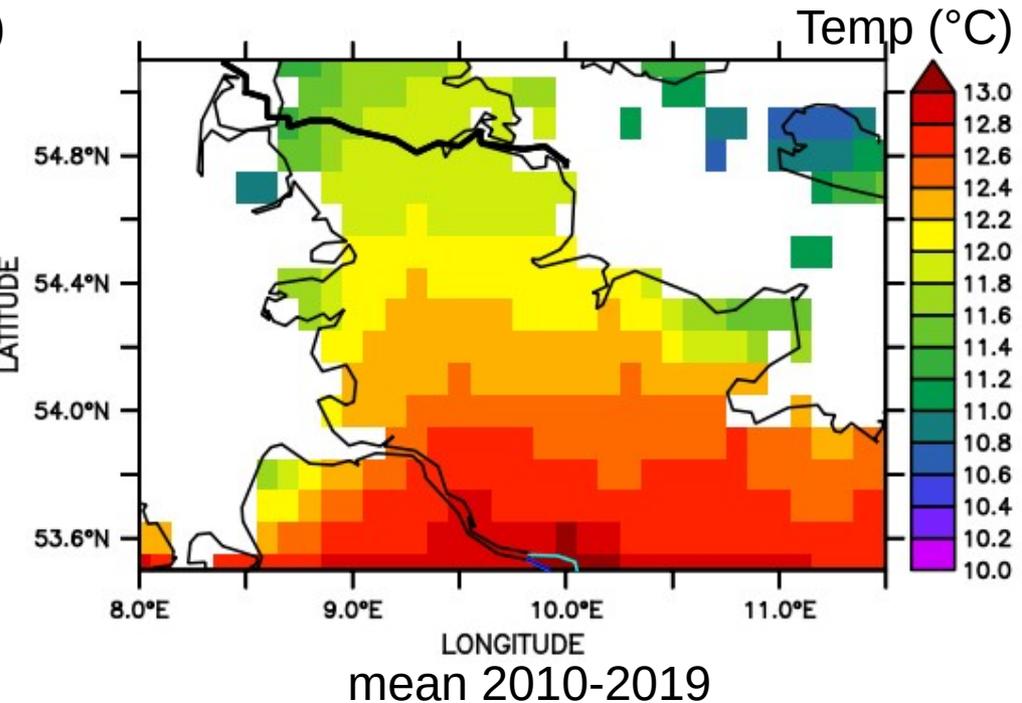
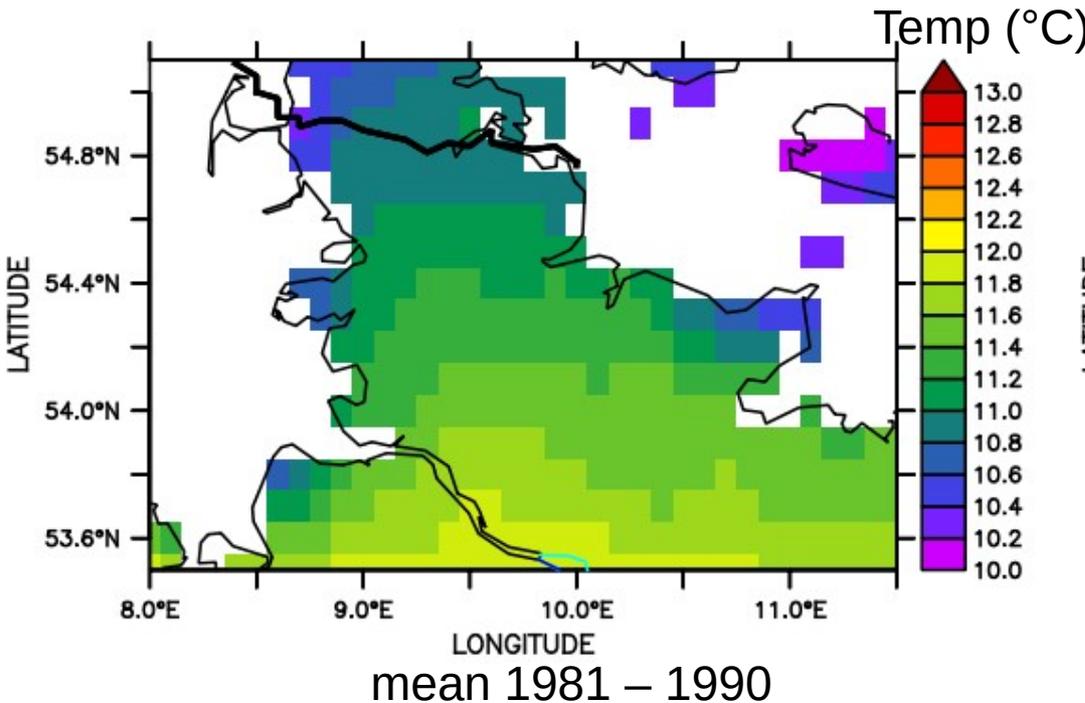
Reference data: ©ESRI



# General context : up to 5°C warmer in 2100



# Regional aspects in SH: temperature increase by 1°C since 1980



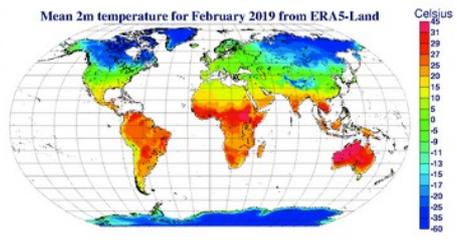
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<https://cds.climate.copernicus.eu>

ERA5-Land hourly data from 1981 to present

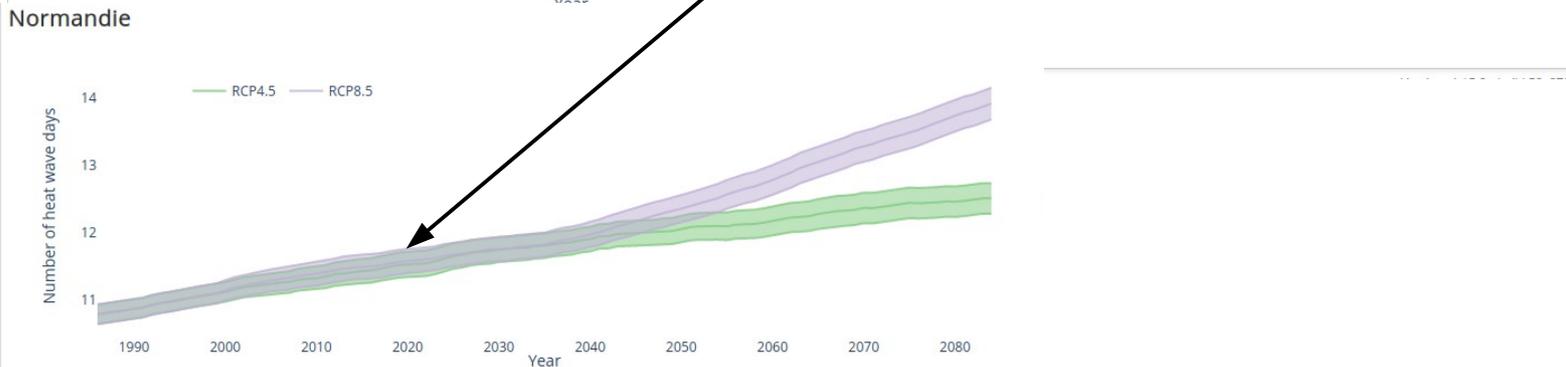
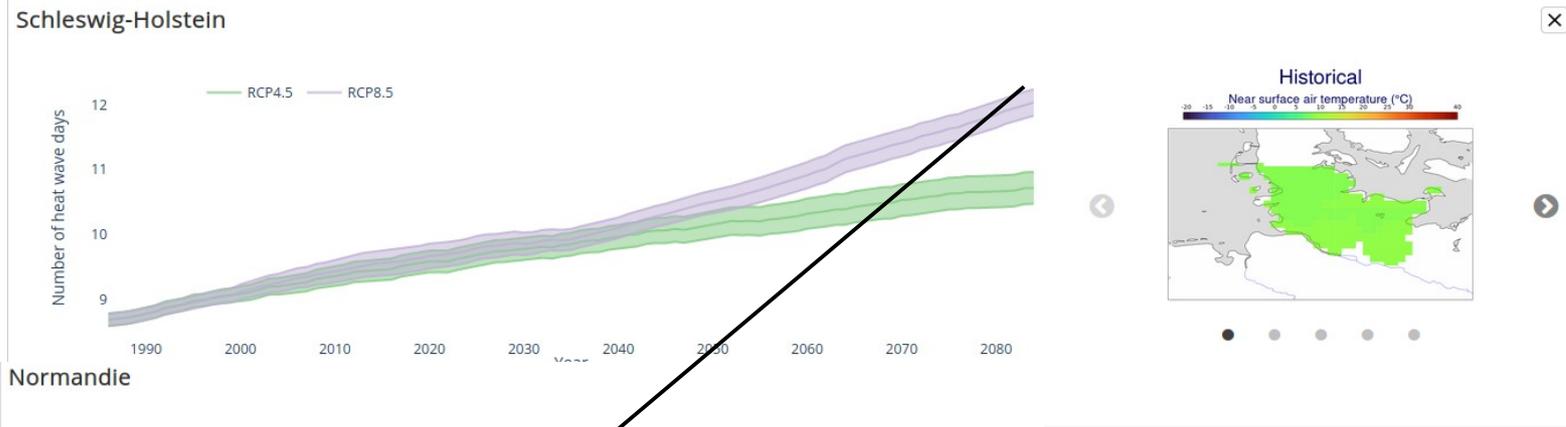
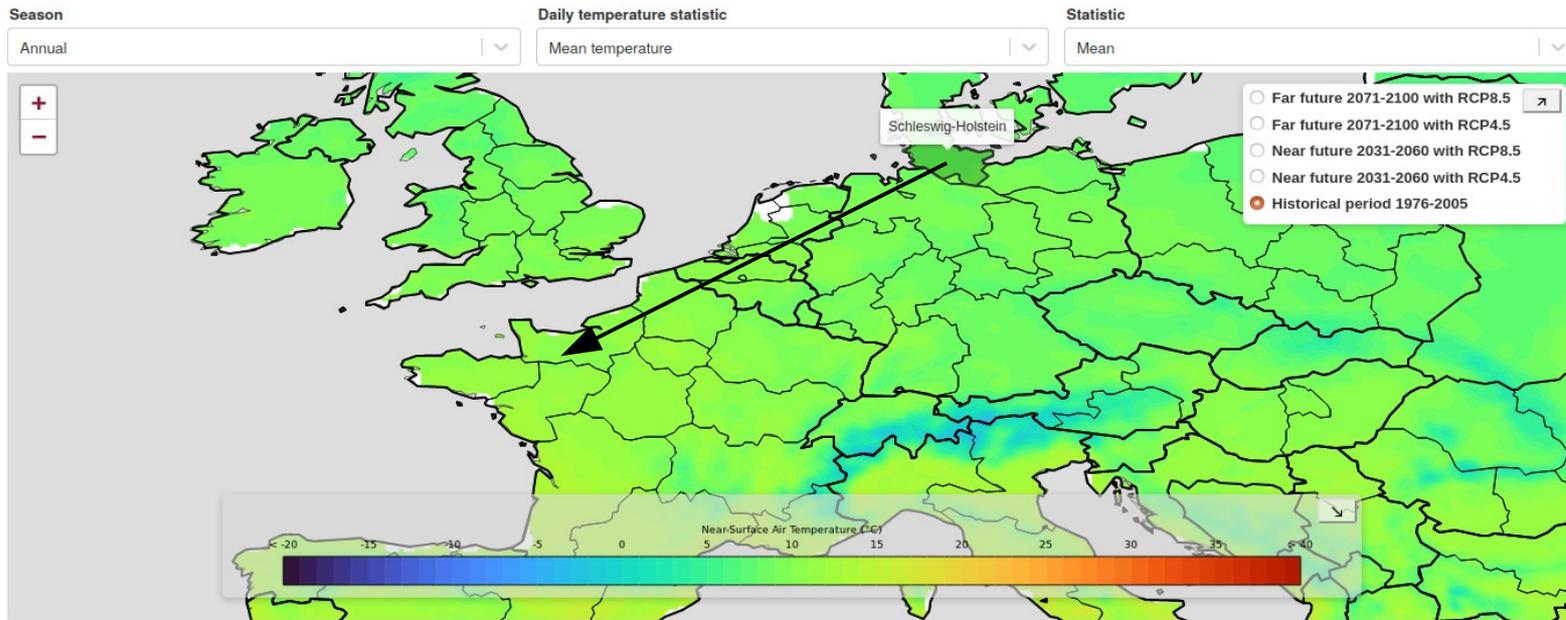
- Overview
- Download data
- Quality assessment
- Documentation

ERA5-Land is a reanalysis dataset providing a consistent view of the evolution of land variables over several decades at an enhanced resolution compared to ERA5. ERA5-Land has been produced by replaying the land component of the ECMWF ERA5 climate reanalysis. Reanalysis combines model data with observations from across the world into a globally complete and consistent dataset using the laws of physics. Reanalysis produces data that goes several decades back in time, providing an accurate description of the climate of the past.

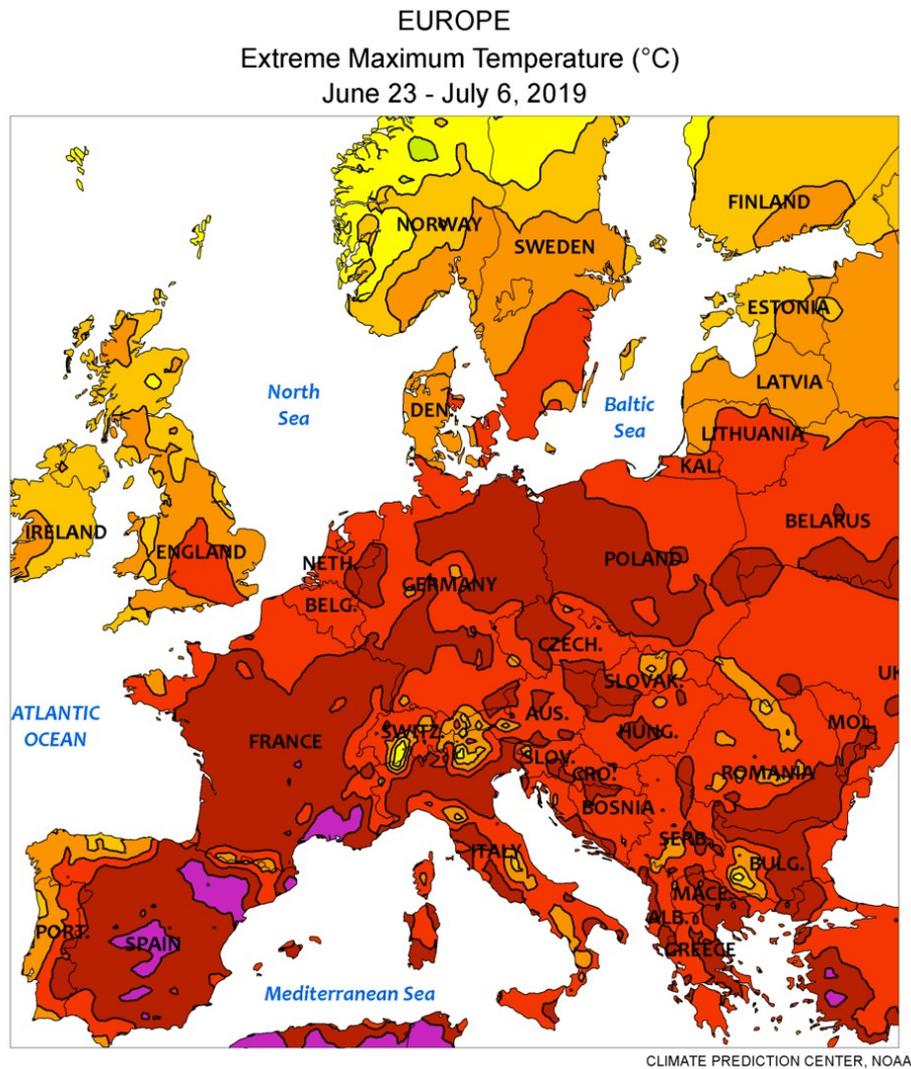


# SH climate in 50 years may feel like Normandie in France now

← → ↻ 🏠 <https://cds.climate.copernicus.eu/cdsapp#!/software/app-health-temperature-exposure-projections?tab=app>



# General context : heat waves occur more often and longer

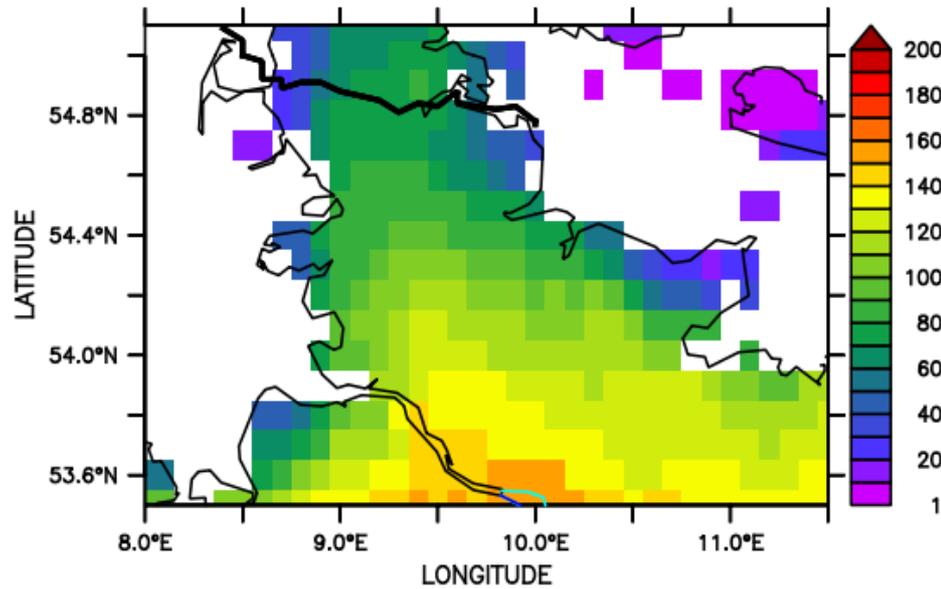


## Steigende Hitzebelastung für über 80-Jährige

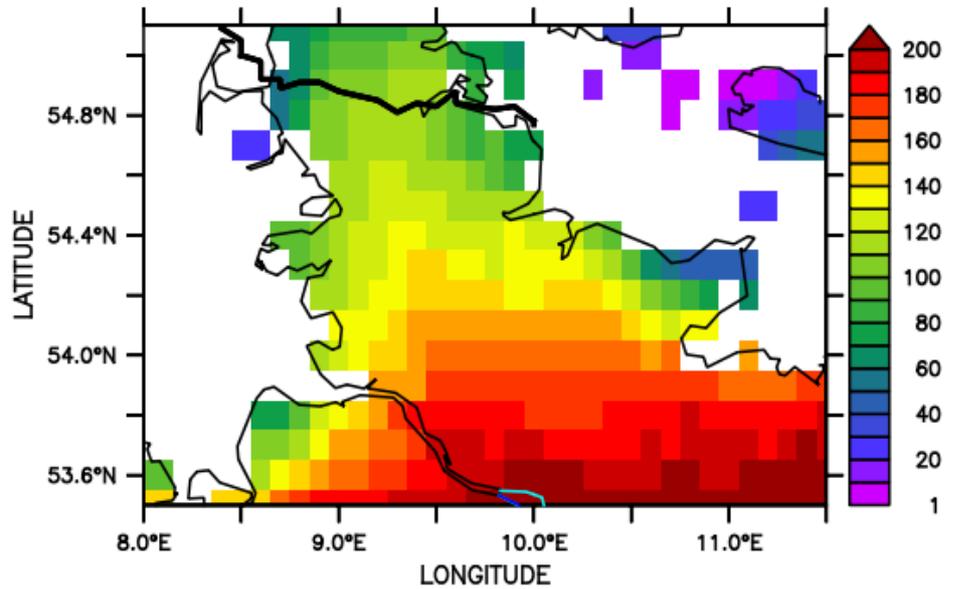


Die Grafik zeigt die Entwicklung der Anzahl der Heißen Tage mit einer Höchsttemperatur von mindestens 30°C pro Jahr gemäß den Beobachtungen im Zeitraum 1951-2016 (schwarz) sowie auf Basis zweier unterschiedlicher Zukunftsszenarien. Die rote Kurve beruht dabei auf den Auswertungen von insgesamt 14 Klimaprojektionen unter der Annahme eines ungebremsen Treibhausgasausstoßes bis zum Ende des 21. Jahrhunderts (RCP-Szenario 8.5 „Weiter so wie bisher“). Die orange Kurve basiert dagegen auf dem Ergebnis einer Klimaprojektion unter der Annahme des Inkrafttretens intensiver Klimaschutzmaßnahmen gemäß dem Pariser Abkommen (RCP-Szenario 2.6 „2°C-Ziel“). Zusätzlich ist die Entwicklung des Anteils der über 80-jährigen an der Gesamtbevölkerung für die Jahre 2015 und 2060 dargestellt.

# Regional aspects in SH : maximal temperature



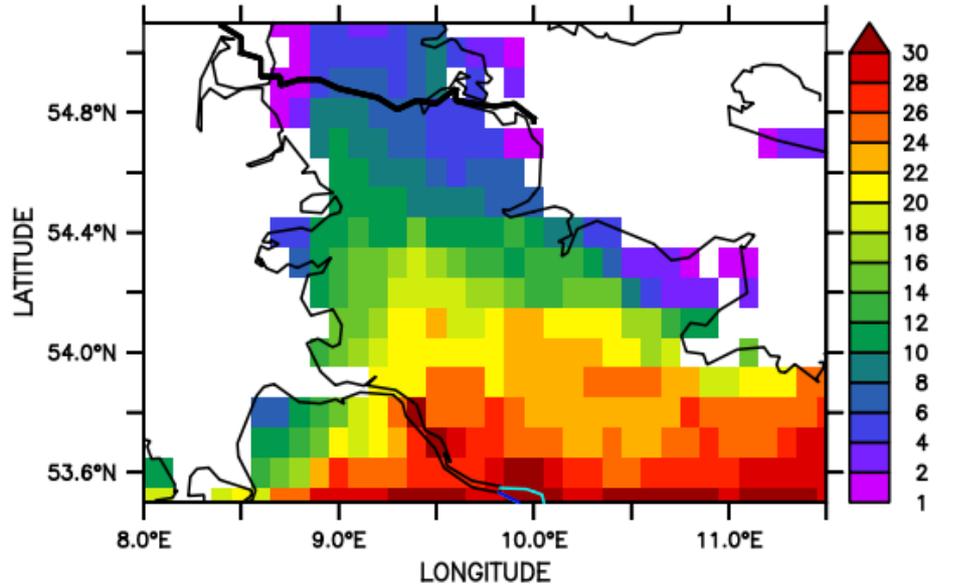
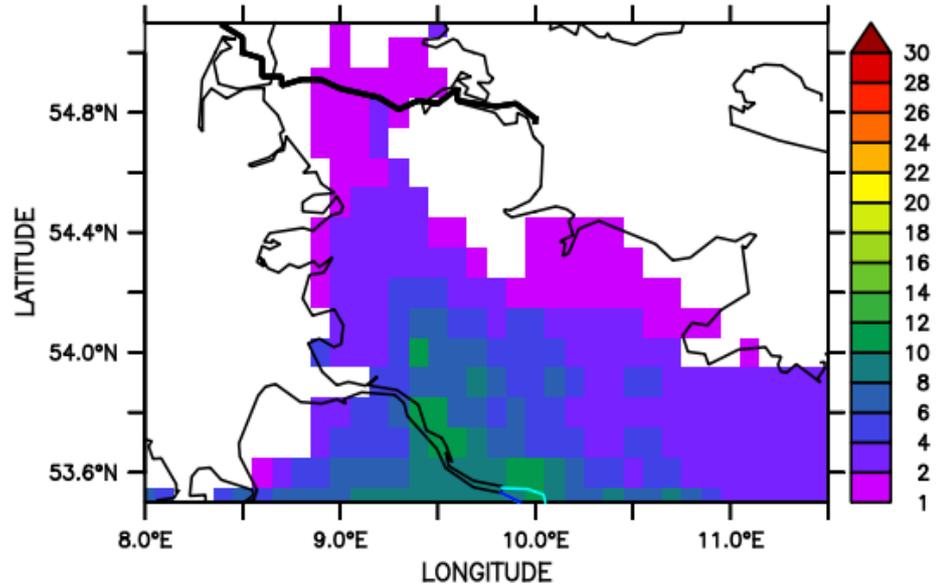
1980 – 1990



2009 – 2019

Number of day where temperature > 25°C

Number of day where temperature > 30 °C  
1980 – 1990



2009 – 2019



## Hitzewelle rollt auf uns zu: DRK gibt Tipps zu Schutz und Hilfe

Jun 26, 2019 | Erste Hilfe, News



HANNOVER. In den kommenden Tagen werden in Deutschland Hitze-Rekorde erwartet. „Die hohen Temperaturen bergen erhebliche gesundheitliche Risiken. Ein Hitzschlag kann sogar lebensbedrohlich werden“, warnt der Landesarzt des DRK-Landesverbandes Niedersachsen e. V., Prof. Dr. med. Wolfgang Koppert. Der Notfallmediziner gibt Tipps, wie man in einer solchen Situation richtig hilft:

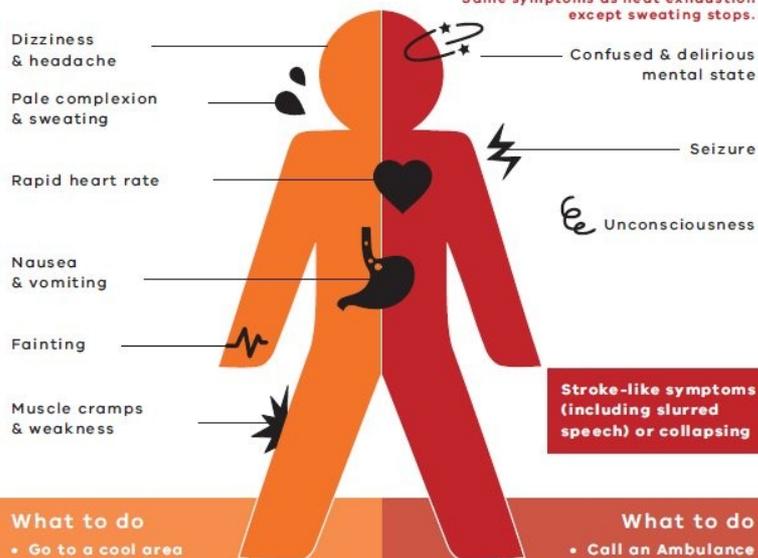
# “Extreme heat” strongly impacts health

## Extreme heat can affect anybody

### Heat exhaustion

### Heat stroke

A life threatening emergency. Call 000.  
Same symptoms as heat exhaustion except sweating stops.



#### What to do

- Go to a cool area and lie down
- Fan if possible
- Drink cool water if not vomiting
- Remove outer clothing
- Wet skin with cool water or wet cloths
- See a doctor

#### What to do

- Call an Ambulance phone 000
- Get the person to a cool area and lay them down
- Remove outer clothing
- Wet skin with water fanning continuously
- Position an unconscious person on their side and clear their airway

For more information visit: [betterhealth.vic.gov.au/heat](http://betterhealth.vic.gov.au/heat)  
Call NURSE-ON-CALL on 1300 60 60 24 for 24-hour health advice, or see your doctor if you are unwell. In an emergency, call 000.

Authorised and published by the Victorian Government, 1 Treasury Place, Melbourne.  
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### Indirect Impacts

### Direct Impacts

#### Impact on health services

- Increased ambulance call-outs and slower response times
- Heat cramps
- Response times
- Increased number of hospital admissions
- Storage of medicines

#### Increased risk of accidents

- Drowning
- Work-related accidents
- Injuries and poisonings

#### Increased transmission of

- Food and waterborne diseases
- Marine algal blooms

#### Potential disruption of infrastructure:

- Power
- Water
- Transport
- Productivity

Health Impacts of Exposure to Extreme heat

#### Heat illness

- Dehydration
- Heat cramps
- Heat stroke

#### Accelerated death from:

- Respiratory disease
- Cardiovascular disease
- Other chronic disease (mental health, renal disease)

#### Hospitalization

- Respiratory disease
- Diabetes mellitus
- Renal disease
- Stroke
- Mental health conditions



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#### Climate change

- News
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- Policy

#### Activities

- Country work
- Data and statistics
- Publications

## Heat threatens health: key figures for Europe

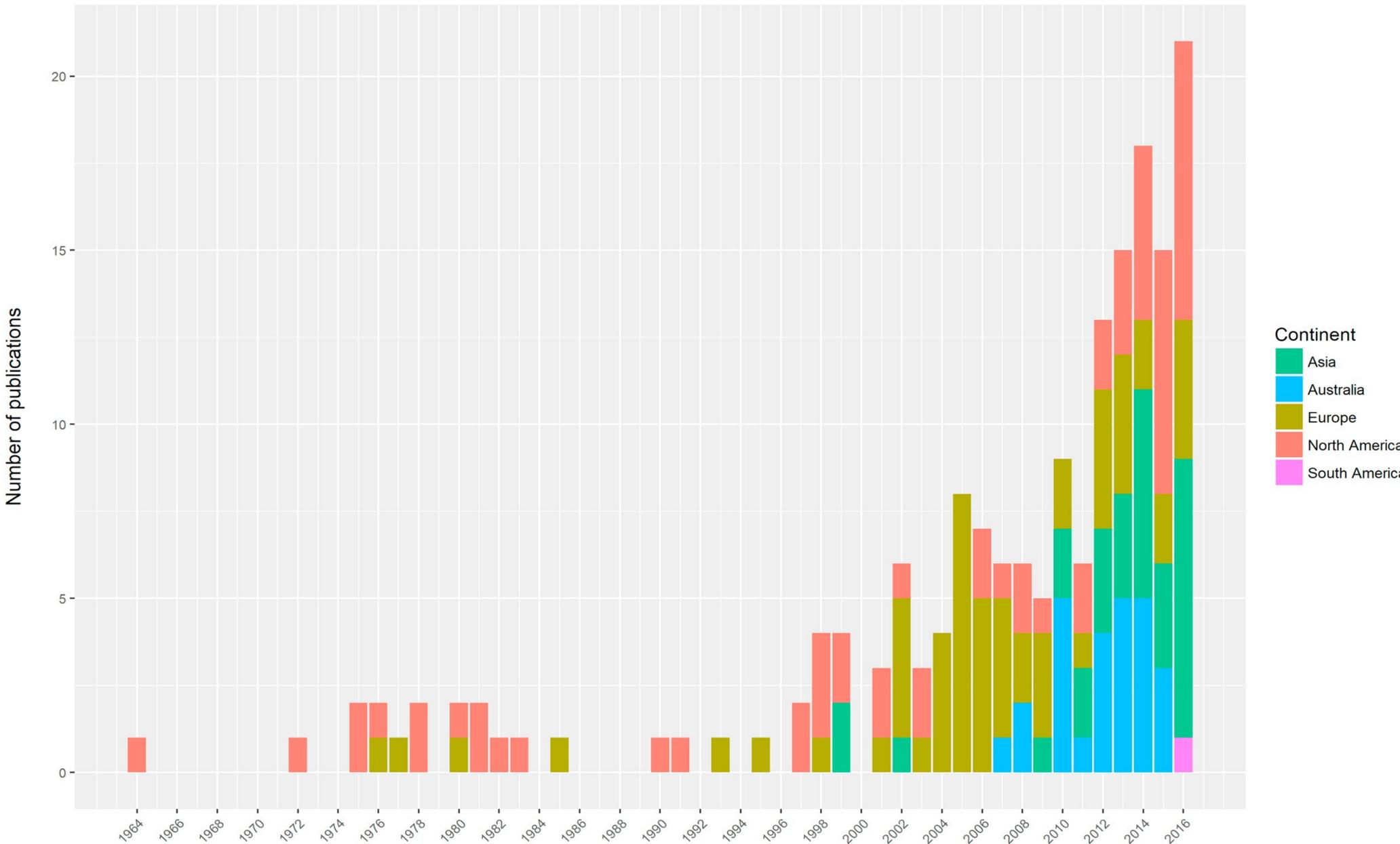


#### Effects: disease and death

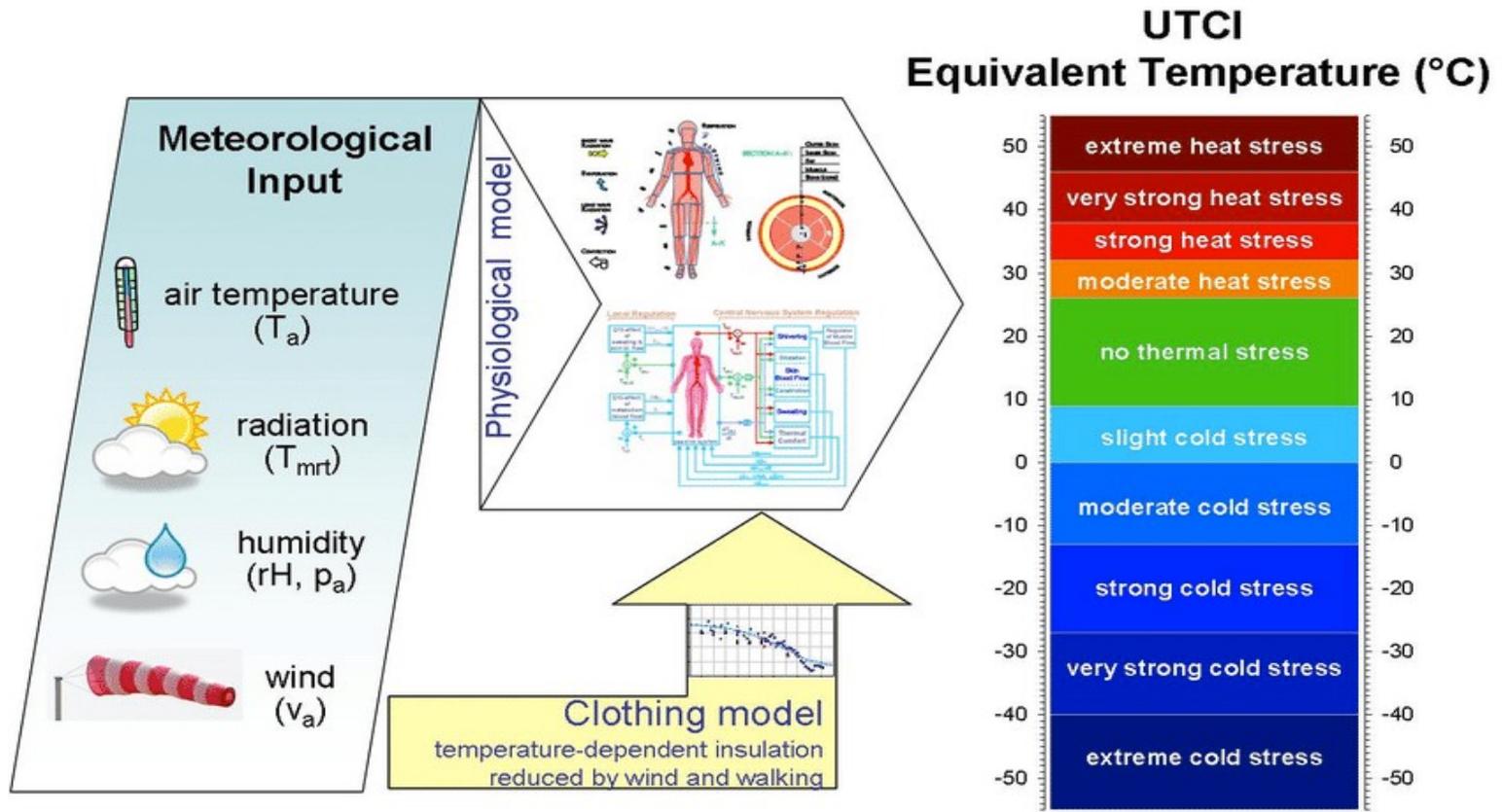
Over 70 000 additional deaths were recorded in the summer of 2003 in 12 European countries. A ten-year analysis in 15 European cities, carried out by the PHEWE (Assessment and Prevention of acute Health Effects of Weather conditions in Europe) project, estimated a 2% increase in mortality in northern cities and a 3% in southern cities for every 1-degree C increase in apparent temperature above the city threshold level.

# ... and it is a growing concern

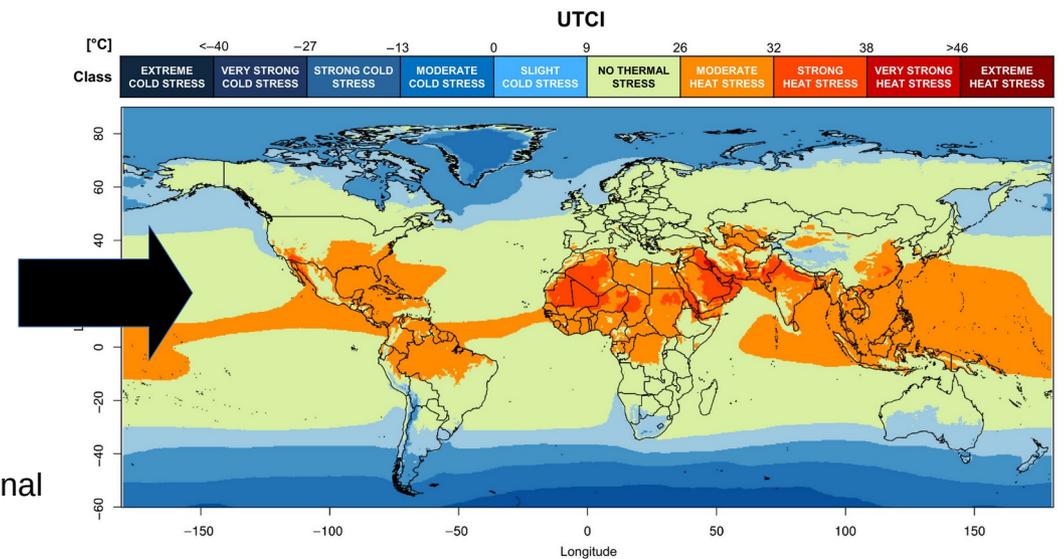
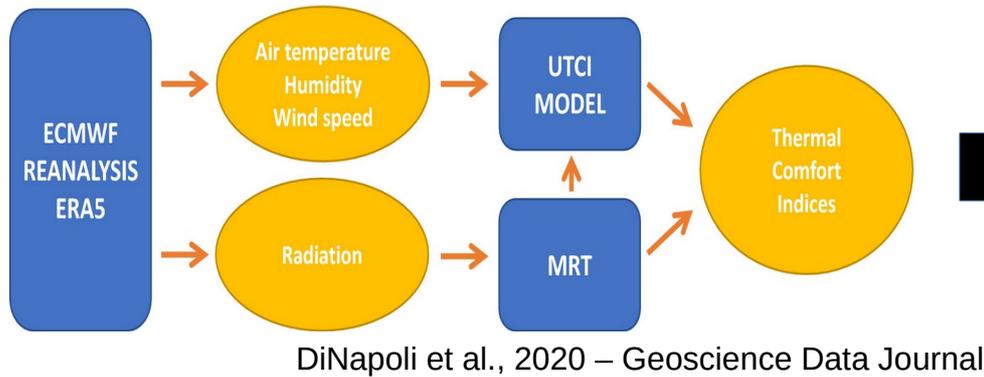
Heatwave and health impact publications by continent, 1964-2016

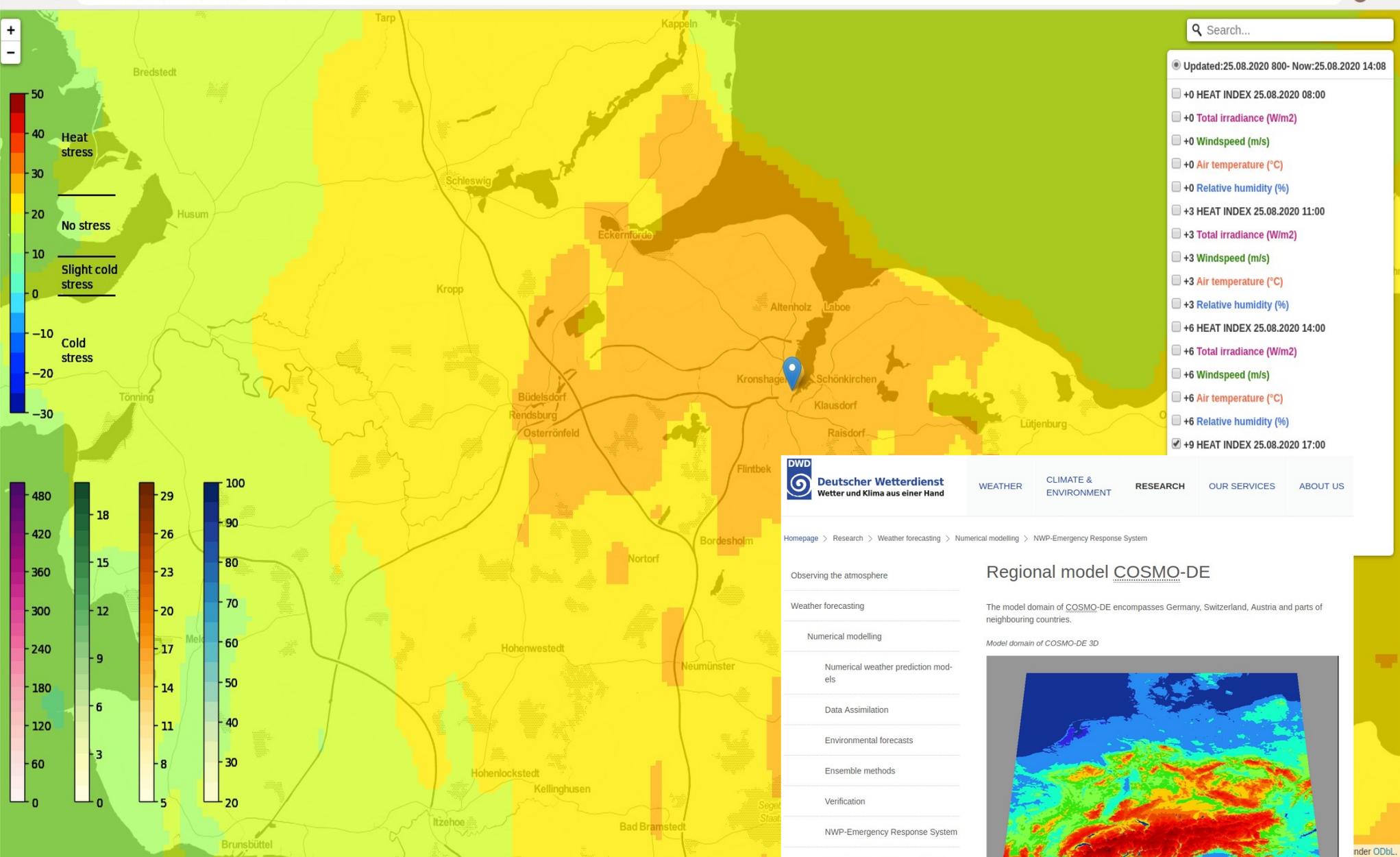


# A quantification tool : the Universal Thermal Comfort Index



Bröde et al., 2011 – conference paper



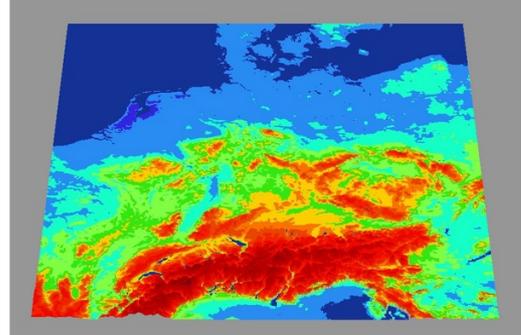


- Observing the atmosphere
- Weather forecasting
- Numerical modelling
- Numerical weather prediction models
- Data Assimilation
- Environmental forecasts
- Ensemble methods
- Verification
- NWP-Emergency Response System
- Weather Forecasts for renewable energy
- Meteorological algorithms and applications
- Climate and environment
- How Our Services for Weather Research

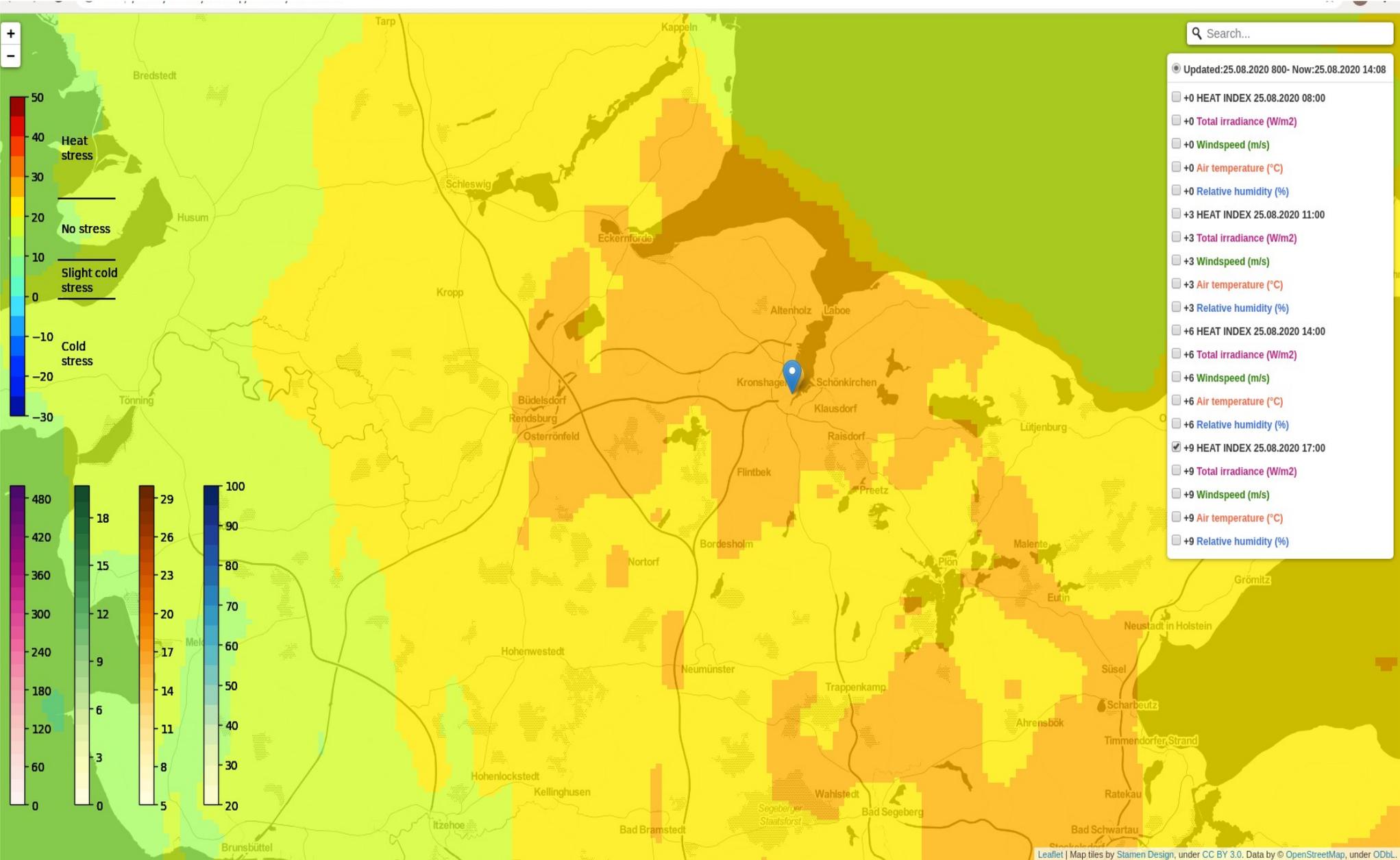
### Regional model COSMO-DE

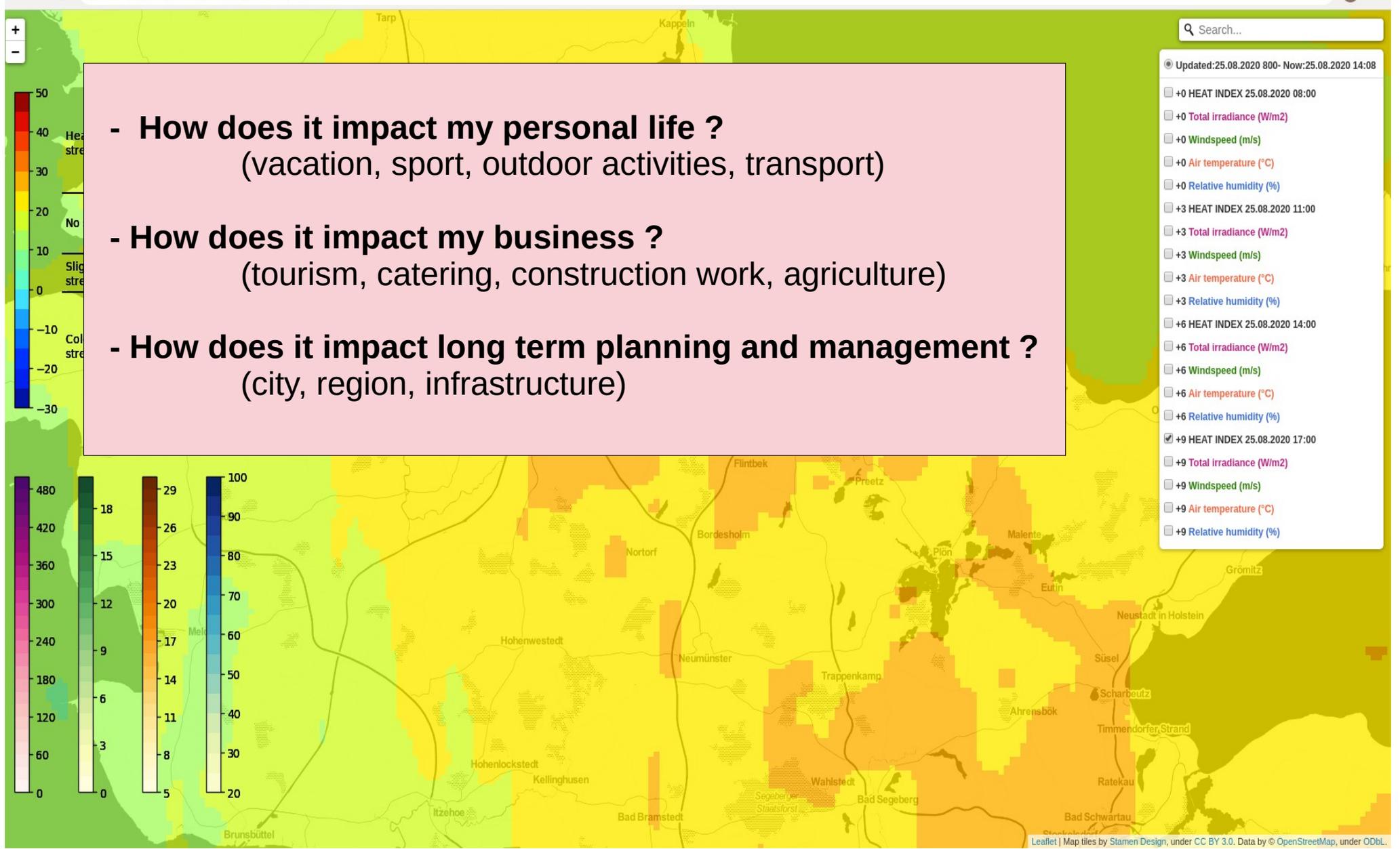
The model domain of COSMO-DE encompasses Germany, Switzerland, Austria and parts of neighbouring countries.

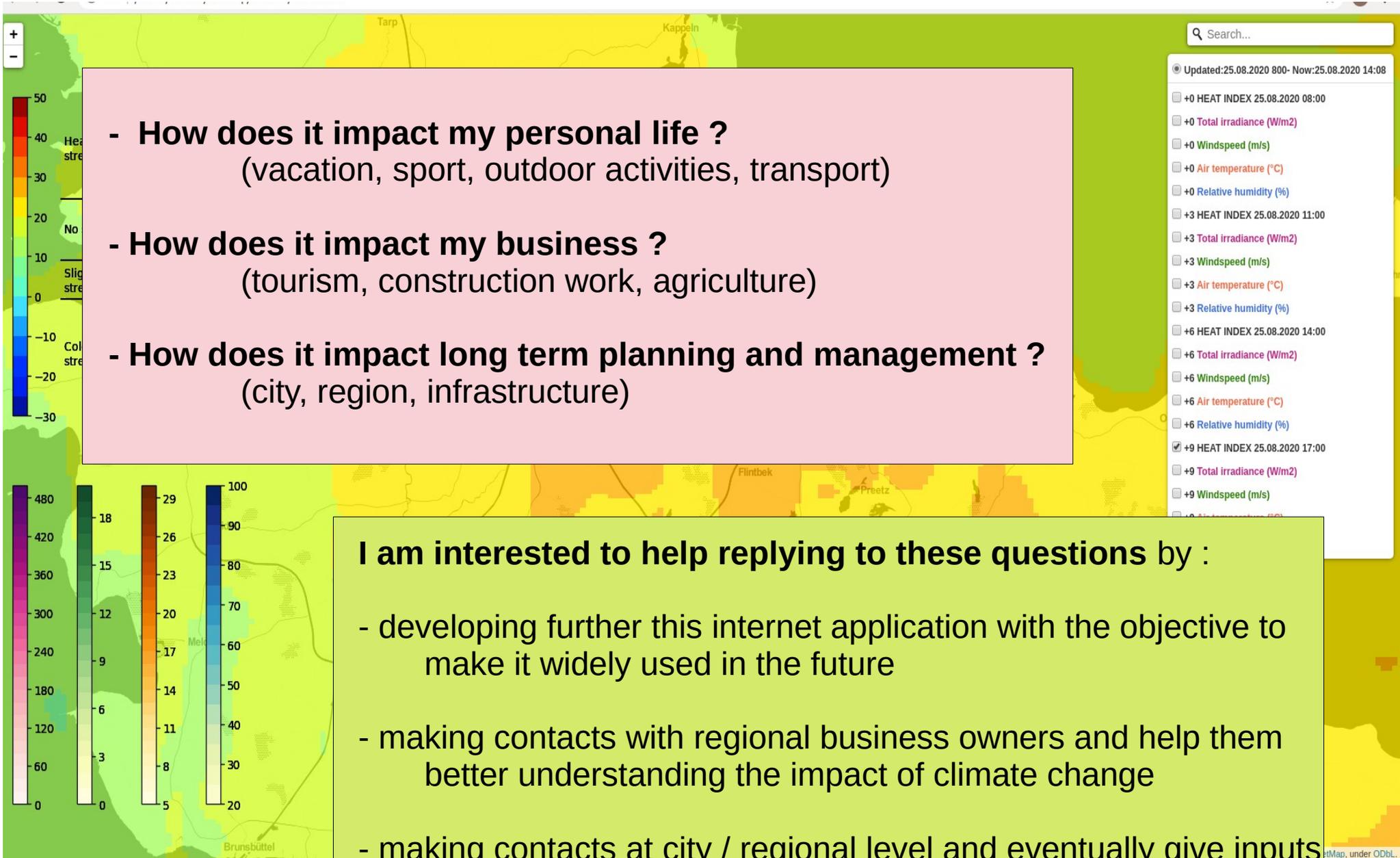
Model domain of COSMO-DE 3D



The domain is covered by a numerical grid consisting of 421 \* 461 grid points and 50 layers in the vertical, i.e. a total of 9.7 million grid points. The set of model equations is solved on this grid. The horizontal grid spacing of COSMO-DE, i.e. the distance between neighbouring grid points, is 2.8 km.







- **How does it impact my personal life ?**  
(vacation, sport, outdoor activities, transport)
- **How does it impact my business ?**  
(tourism, construction work, agriculture)
- **How does it impact long term planning and management ?**  
(city, region, infrastructure)

**I am interested to help replying to these questions by :**

- developing further this internet application with the objective to make it widely used in the future
- making contacts with regional business owners and help them better understanding the impact of climate change
- making contacts at city / regional level and eventually give inputs based on my expertise in climate science

# Take-home messages

- Temperature are increasing in Europe and in Germany
- Heat waves (HW) will occur more often and be longer
- During an HW, temperature can reach more than 35°C during several days
- Very warm temperatures have negative impacts on health and can create a physiological “**heat stress**” (especially if associated with high humidity and low wind speeds)
- The risk of suffering from a “heat stress” **forces us to adapt** our daily activities :
  - privately
  - professional

Thanks to my strong background in climate sciences and data analysis, I am looking forward to **help optimizing these adaptations**