Severe thunderstorms and associated extreme events such as hail represent a substantial hazard potential for buildings, crops, and critical infrastructure. In the last decades, damage caused by severe hailstorms has increased significantly in Central Europe. In southwest Germany, more than 40% of all damage to buildings by natural hazards is associated with large hail (1986–2008, Kunz 2009). Within the frame of the project HARISS-CC (‘Hail Risk and Climate Change’), it is examined whether an indication is found that extreme events connected to severe thunderstorms have been increasing in the number or intensity over the past decades (Mohr, 2012) and which changes will be expected in the future. Because thunderstorms are not captured uniquely and entirely by observations, the trend analyses rely on several proxies like convective indices and parameters (CPs) quantifying the thunderstorm potential of the atmosphere.

**data base**

High resolution regional climate data of IMK-TRG, KIT, Germany (Berg et al., 2012):
- **COSMO** 4.8 with double nesting:
  - First nesting: 0.44° (~50km), RK 360s
  - Second nesting: 0.2625° (~7km), RXTS
- Driven with reanalysis data ERA40 (CE40) and different global climate models (GCM):
  - ECHAMS (CES) Run-1-3 (R1,R2,R3) & IPCCM3 (CC3)
- **Area**: Germany, period: 1971-2000 (C20), 2001-2050 with A1B scenario (A1B)
- **Summer half year** (Sh), April-September, 12 UTC

**validation**

Can regional climate models (RCM) reproduce the convective potential?

**mixed layer Convective Available Potential Energy (CAPE)**

\[
\text{CAPE} = \frac{R_d}{g} \left( T_e - T_i \right) d\theta_p
\]

\[
\text{SLI} = T_{sl} - T_{sl}^{*}
\]

**climatology**

How does the climatology of extreme CPs looks like in the past?

Grid points representative for larger areas.
- North-to-south gradient, with high values in Southern Germany.
- Hail-relevant thresholds of the CPs according to insurance data (Kunz, 2007, Mohr and Kunz, 2012) are exceeded for the extremes in the south.

**trend analysis 1978-2000**

**climate control runs C20**

**future scenarios A1B**

**conclusions**

- CCLM simulations are able to reproduce the convective potential for extreme events in Germany.
- However, highly instable conditions are underestimated, particularly in the north.
- Reanalysis data shows an increase in the convective potential for extreme events due to the increase in near-surface moisture (low statistical significance). This agrees well with the analyses of sounding data.
- Trends in the future are highly variable and not reliable. Larger ensembles of RCMs are required.