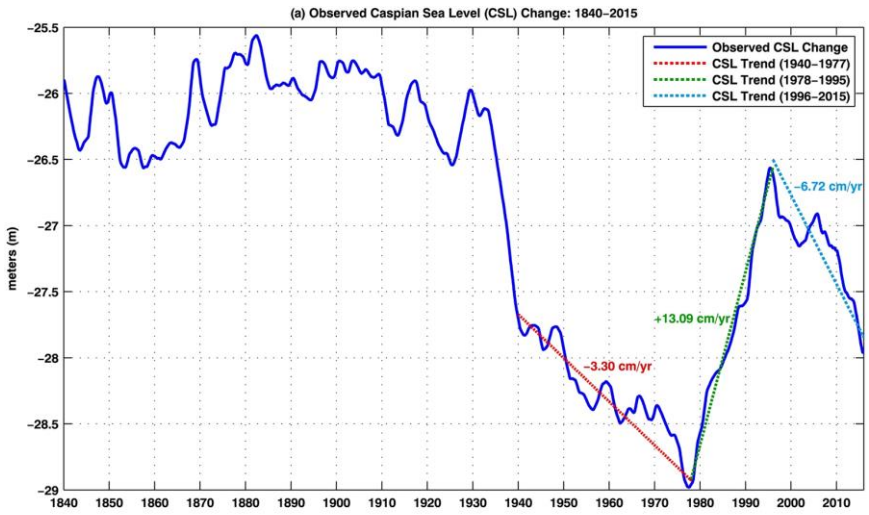
Karlsruhe Institute of Technology

Evaluation of climate model simulations of the Caspian Sea region

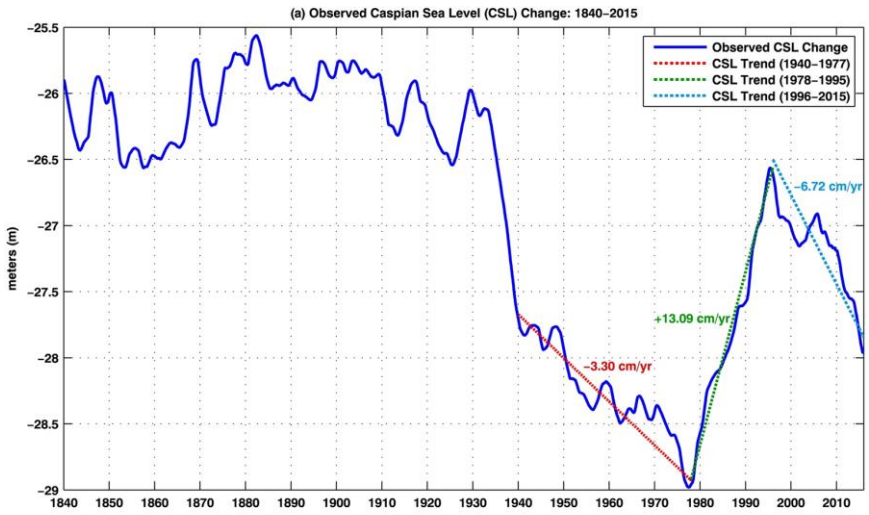
Kim Stadelmaier, Patrick Ludwig, Joaquim Pinto

Water levels of the Caspian Sea



Chen et al., 2017; Fig. 2a

Water levels of the Caspian Sea



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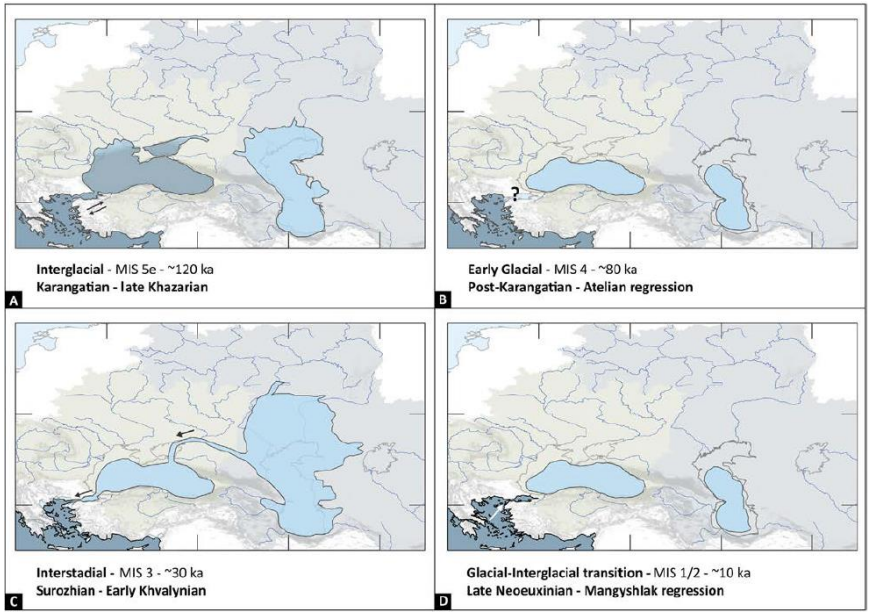

Krijgsman et al., 2021; Fig. 7

How well is the Caspian Sea region represented in global climate model simulations?

Representation of the Caspian Sea region in global climate models

CMIP6 historical simulations

Representation of the Caspian Sea region in global climate models

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MPI-ESM AWI-ESM IPSL-CM

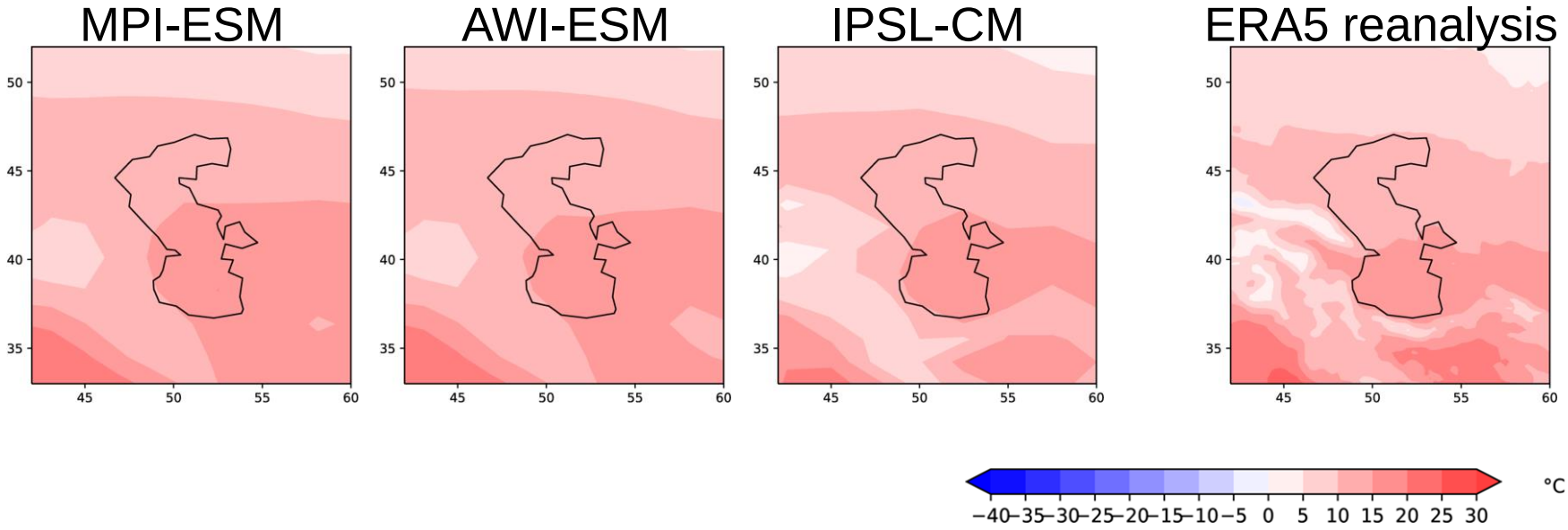
Representation of the Caspian Sea region in global climate models

CMIP6 historical simulations

MPI-ESM AWI-ESM IPSL-CM ERA5 reanalysis

Representation of the Caspian Sea region in global climate models – 2m air temperature

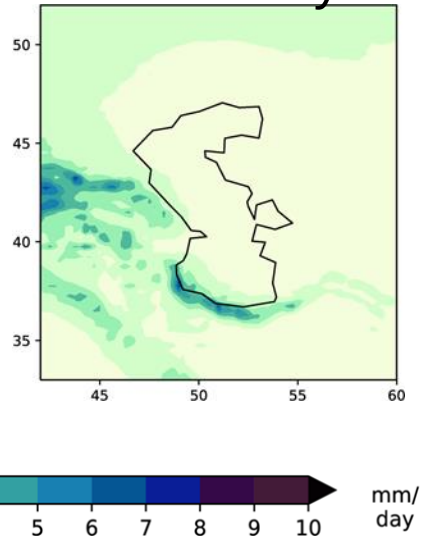
CMIP6 historical simulations



Representation of the Caspian Sea region in global climate models – precipitation

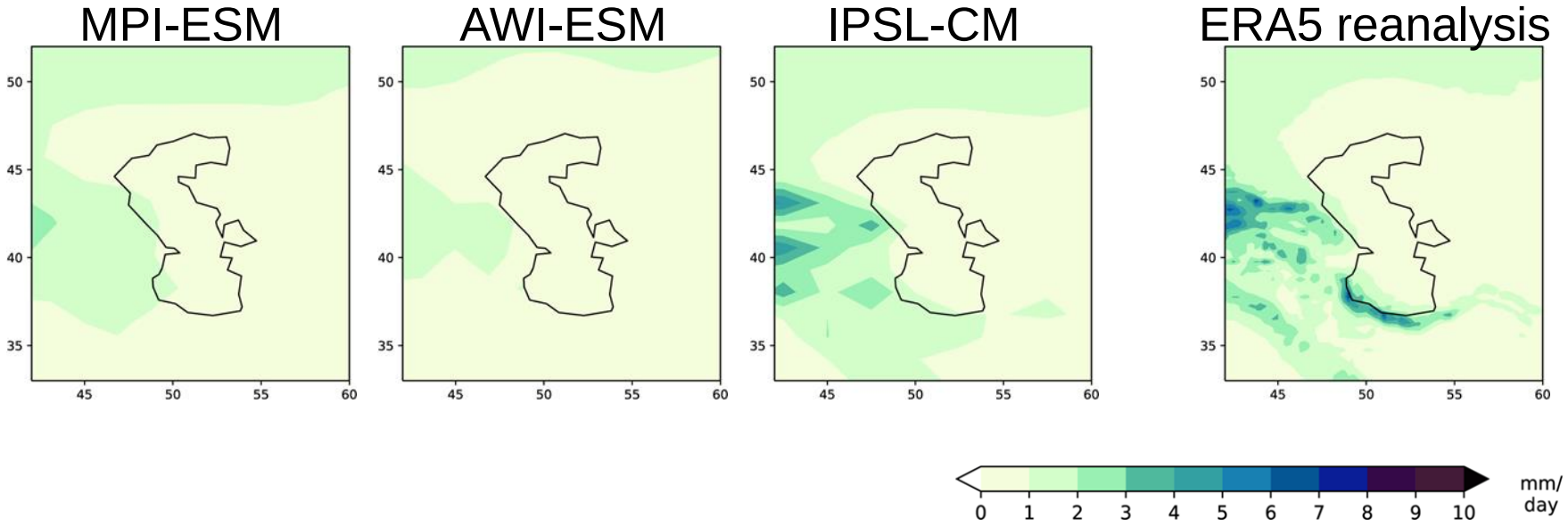
CMIP6 historical simulations

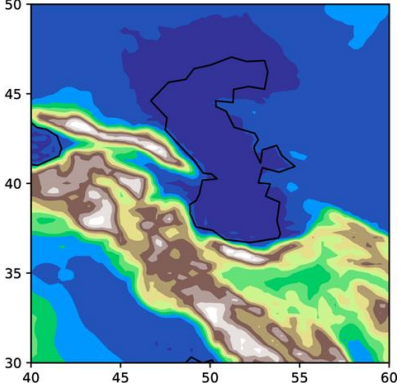
MPI-ESM AWI-ESM IPSL-CM ERA5 reanalysis



Representation of the Caspian Sea region in global climate models – precipitation

CMIP6 historical simulations

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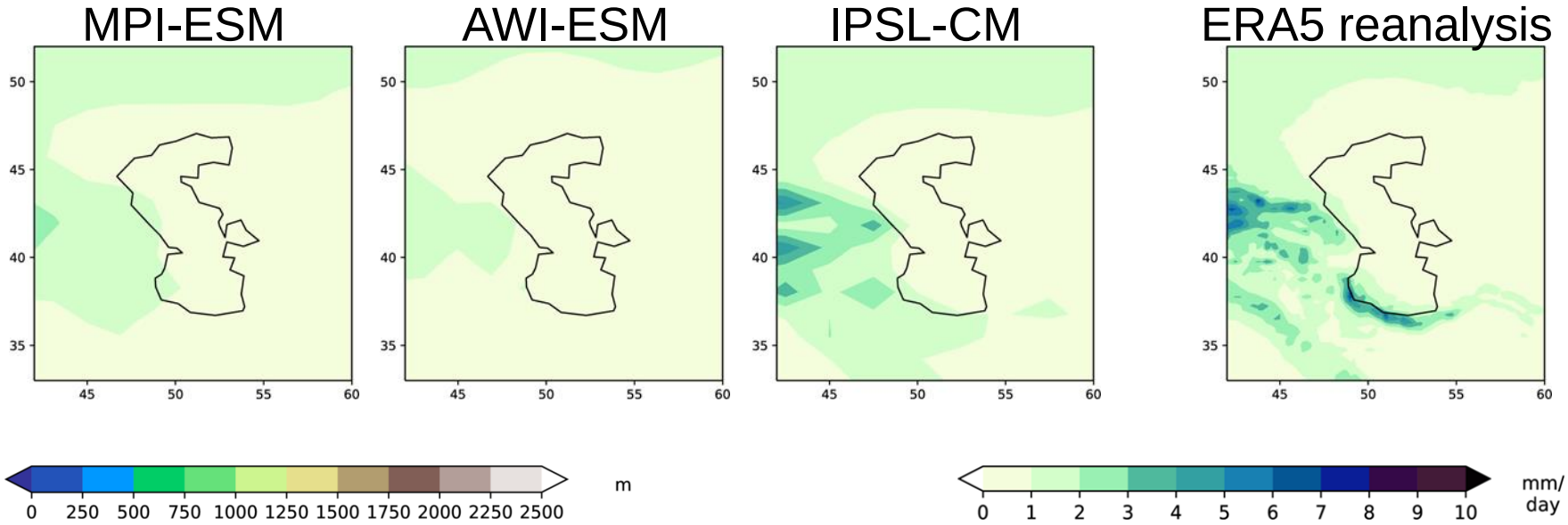
MPI-ESM
AWI-ESM
IPSL-CM
ERA5 reanalysis
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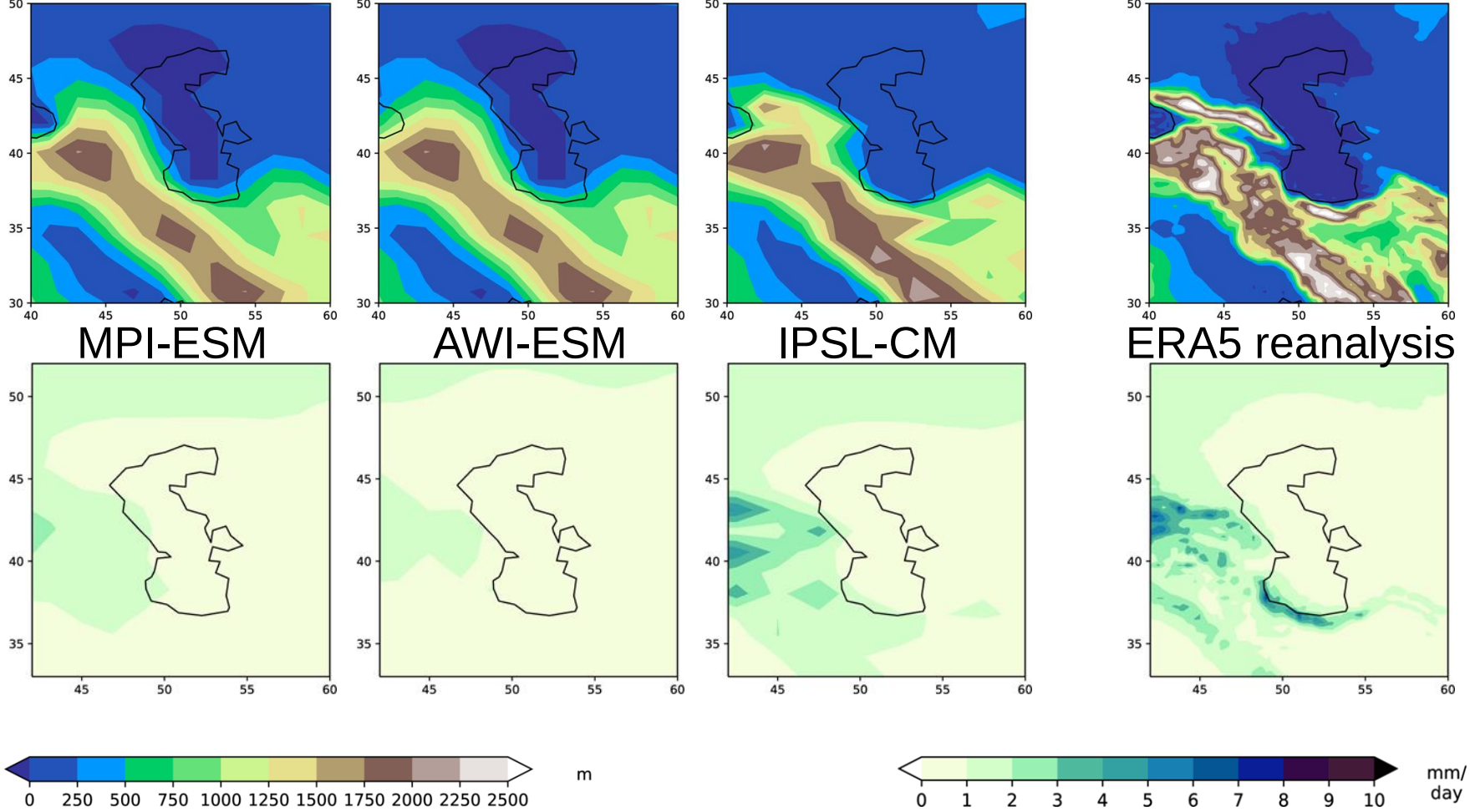
m
0 1 2 3 4 5 6 7 8 9 10
mm/
day


MPI-ESM
AWI-ESM
IPSL-CM
ERA5 reanalysis
0 250 500 750 1000 1250 1500 1750 2000 2250 2500
m
0 1 2 3 4 5 6 7 8 9 10
mm/day

Overcome this gap with regional climate model simulations

Paleo climate modeling of the Caspian Sea region

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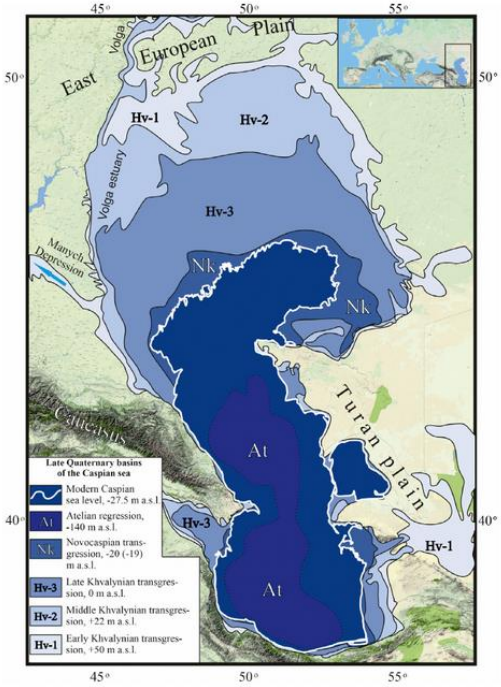
LGM

- 20,000 years before present
- Globally: cold and dry

- ~Khvalynian transgression phase of Caspian Sea



Kurbanov et al., 2021; Fig. 1

Summary

- **Global climate models** have **difficulties in reproducing today's precipitation** - due to their low **horizontal resolution**

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- **Global climate models** have **difficulties in reproducing today's precipitation** - due to their low **horizontal resolution**

- **Regional** climate modeling can **improve the representation** of the local orography

- Regional **paleo** climate modeling will lead to further understanding of the **Caspian Sea level variations** and their **influence on the regional climate**

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