



Koninklijk Nederlands
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Constraining Ocean Dynamic Sea Level along the coast of the Netherlands

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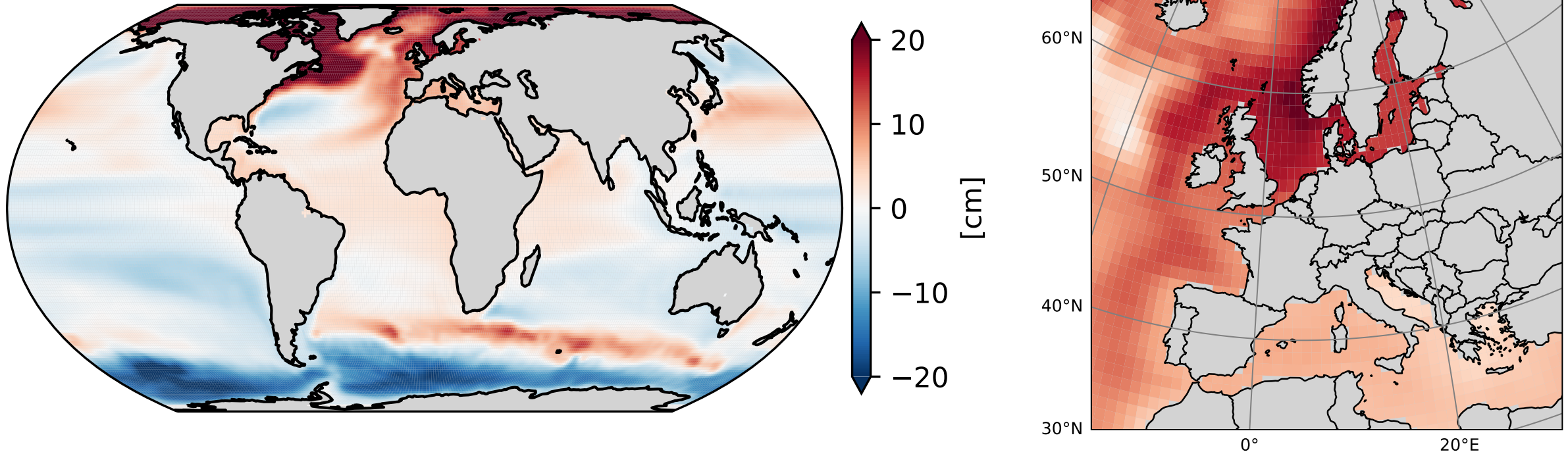
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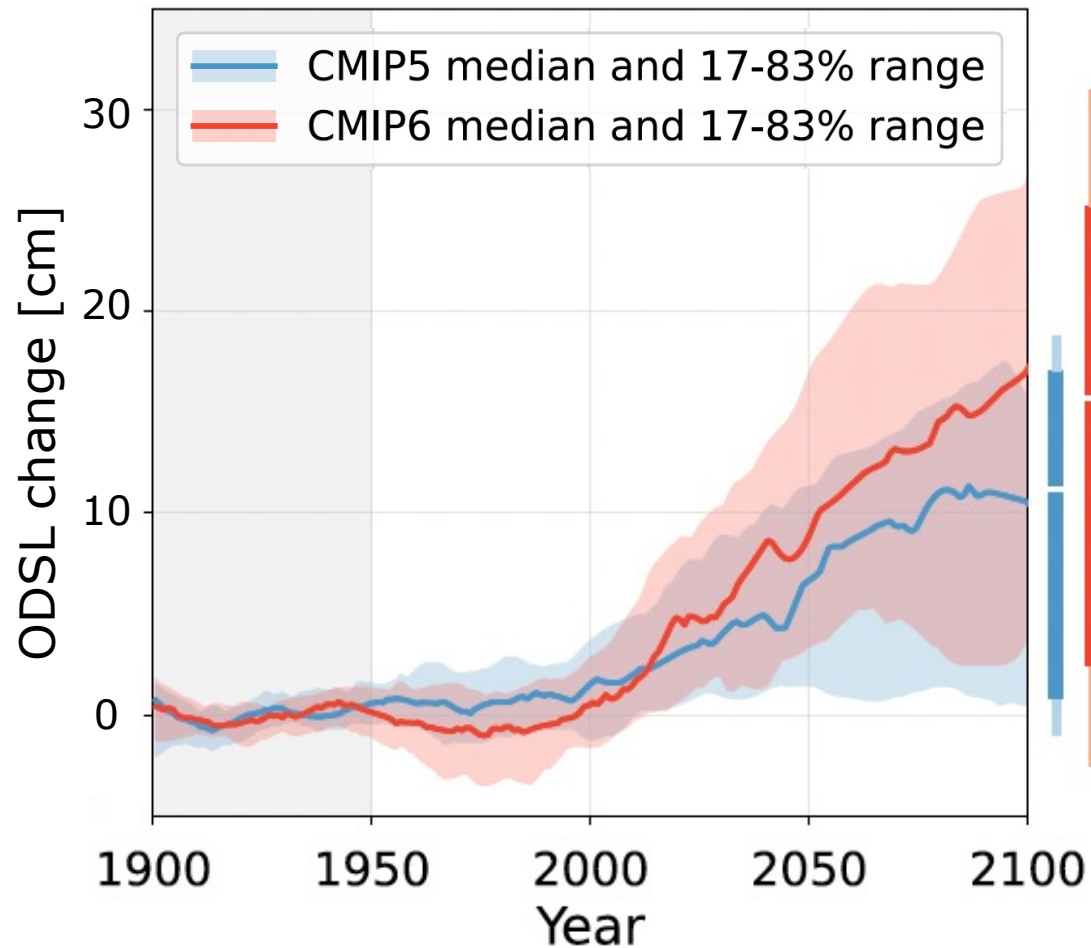
Future ocean-dynamic sea-level (ODSL) change for SSP2-4.5



- 2100 compared to 1986-2005, average of 29 CMIP6 models
- In the North Sea ODSL is about 25% of total sea level rise in 2100



Increased median and divergence in CMIP6 compared to CMIP5



- Time evolution of modelled ODSL in the North Sea for SSP2-4.5 (Jesse et al. in prep)

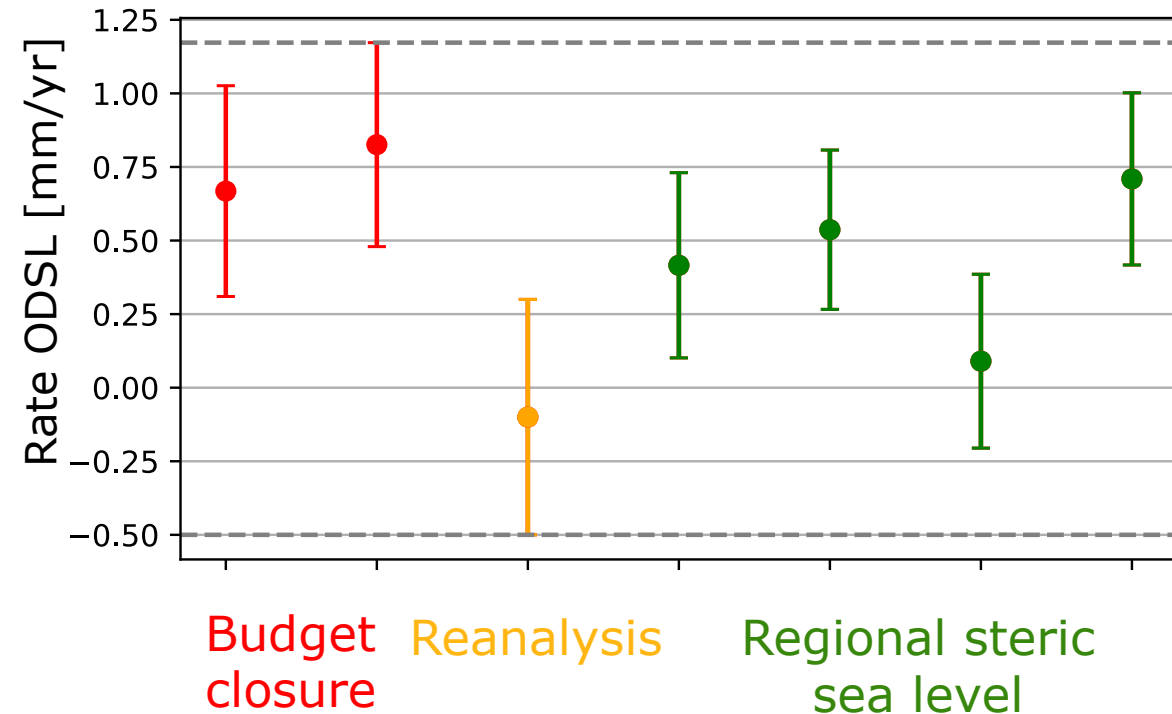
Those model ensembles, at the core of most sea level scenarios, raise a few questions:

- ***Is the fast ODSL increase from the 1990th realistic?***
- ***Can recent observations be used to constrain future projections?***



Observational evidence

Period 1993-2021

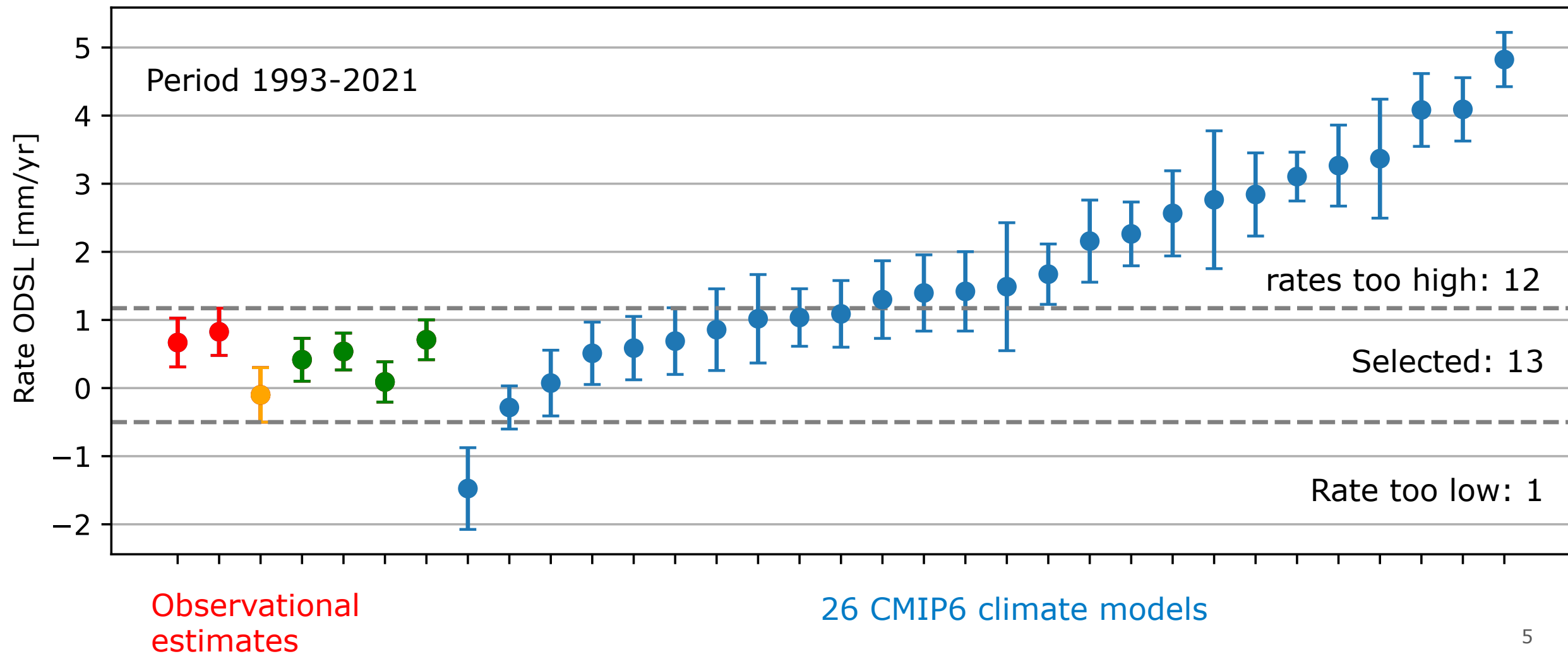


Ocean-Dynamic Sea-Level cannot be observed directly but can be estimated indirectly:

- **Reverse the sea level budget** with ODSL as unknown:
ODSL = observations – sum of other contributors (e.g. Antarctica, glaciers...)
(based on Frederikse et al. 2020)
- **Ocean reanalysis** (Simple Ocean Data Assimilation, SODA)
- Compute the **regional steric sea level** from observed temperature and salinity



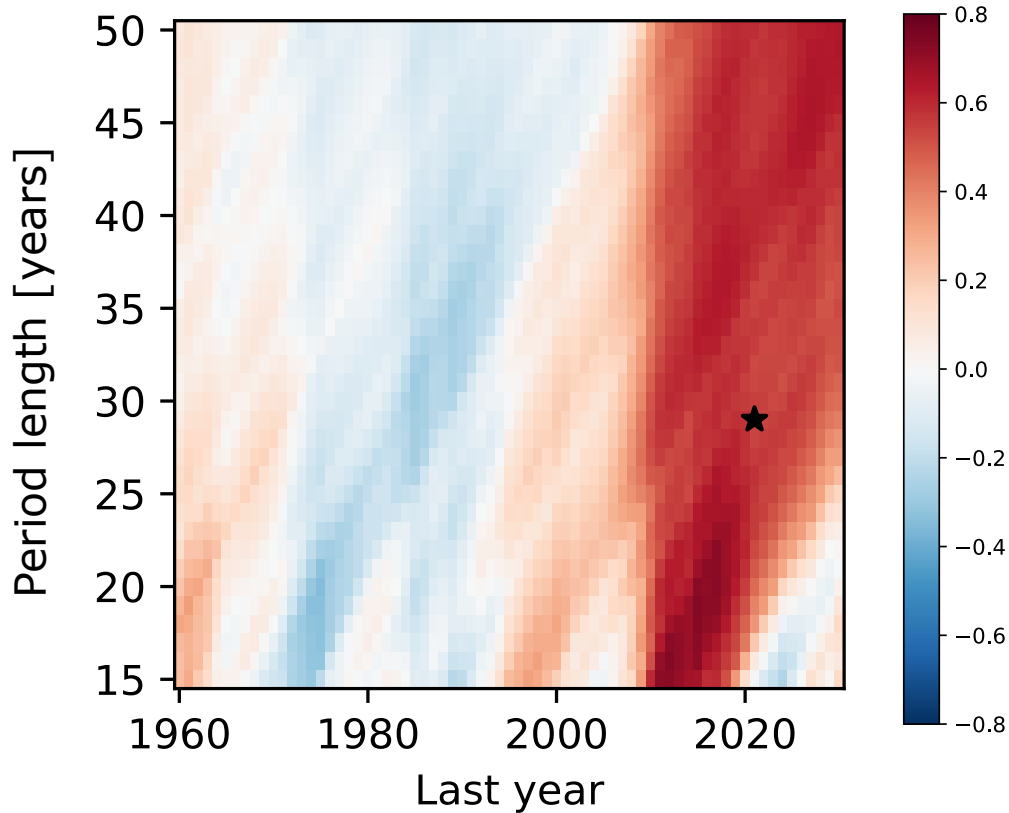
Model selection





Is past ODSL rate related to future height?

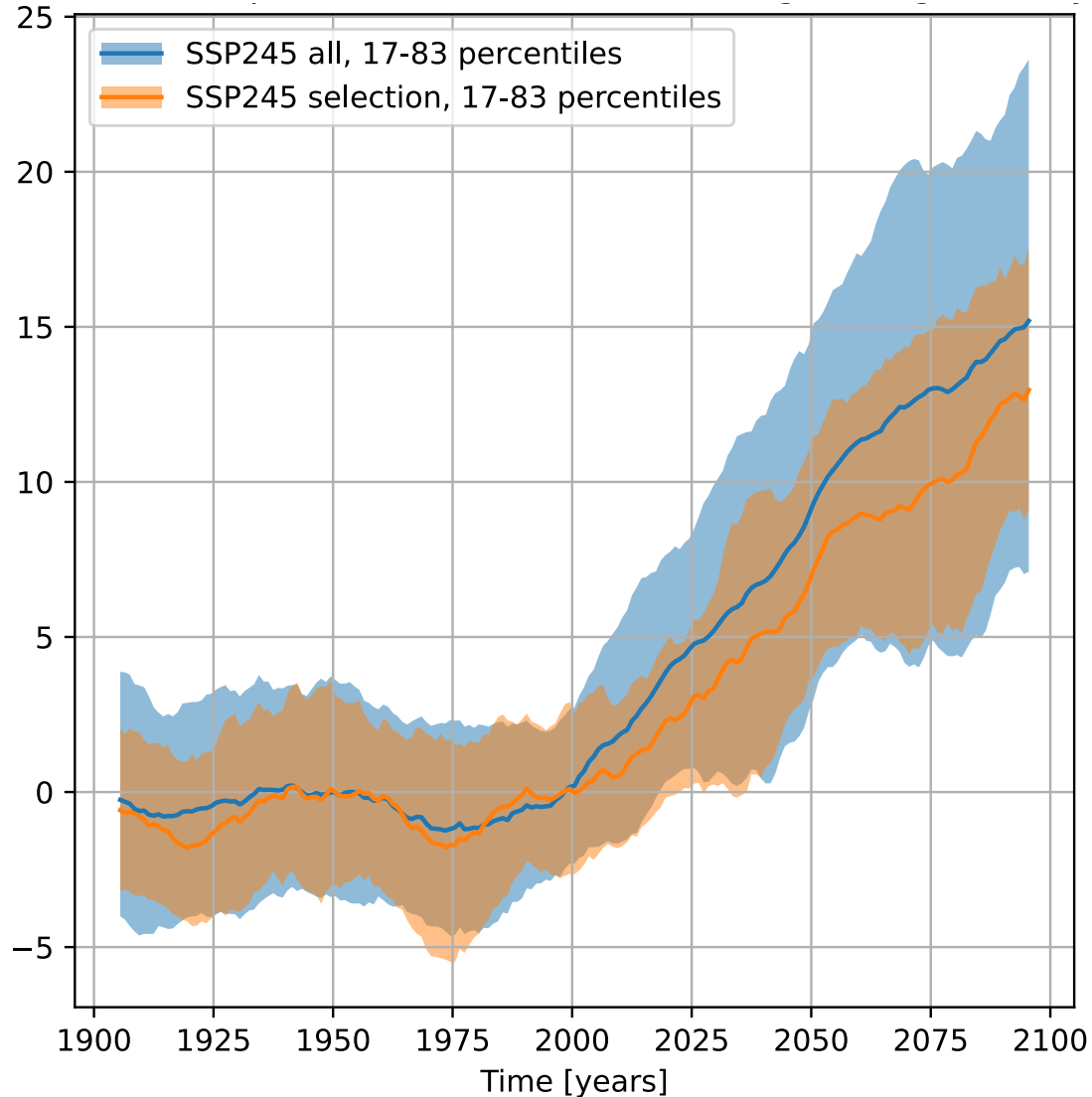
SSP245 no wind



- Correlation between rates of ODSL corrected for wind in the historical period and height in 2100 (based on Li et al. 2022)
- Black star: 1993-2021
- For periods ending after 2010, past rates correlate with height in 2100



Difference in the projections



Selecting models with plausible rate for the period 1993-2021 results in:

- Decreased divergence
- Upper bound of the likely range 6 cm lower
- Median in 2100 2cm lower



Conclusions

- Half of CMIP6 models have ocean-dynamic sea-level (ODSL) rates that are not plausible along the Dutch coast over the observational period
- In CMIP6 past ODSL rates are related to heights in 2100
- Selecting models allows to produce sea level scenarios that closely match the observed sea level for the past



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