



Does model output uncertainty come from differences between models or differences between model driving data?

In the *earth₂Observe* project we are looking at flood- and drought-related variables calculated from land surface model output, using an ensemble of models and precipitation products. If uncertainty is high in a particular region, it may be composed of:

Model Uncertainty: regional processes are not well enough characterised in these models (e.g. orographic effects, presence of significant aquifers, subgrid processes not well-approximated)

and/or **Product Uncertainty:** there is disagreement between the precipitation data products used to drive the model

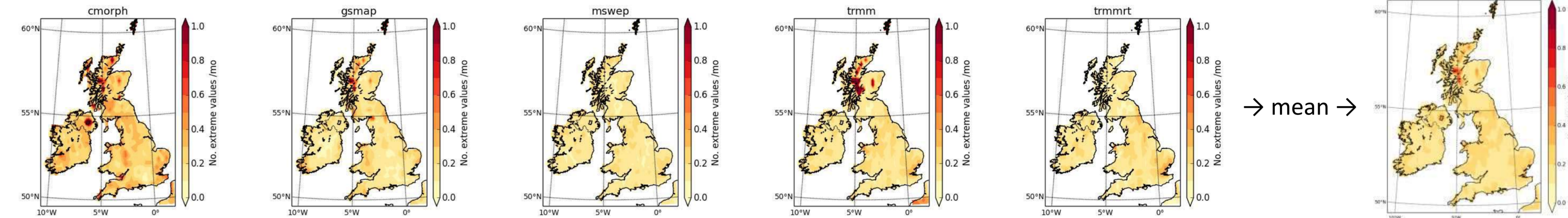
Our results show that total uncertainty can be large (on all plots, red is ≥ 1 extreme event per month) and:

- It appears that uncertainty is generally higher in mountainous areas, but this is mostly a result of inconsistency between precip products rather than model uncertainty (e.g. Scottish highlands, CS 1, Ethiopian highlands, CS 3).
- We find evidence that flood prediction remains a huge challenge in both wet and dry environments (CS 2)
- Predicting dry conditions in dry biomes appears to be generally much more robust than predicting wet conditions in wet biomes (CS 3 vs. CS 2)

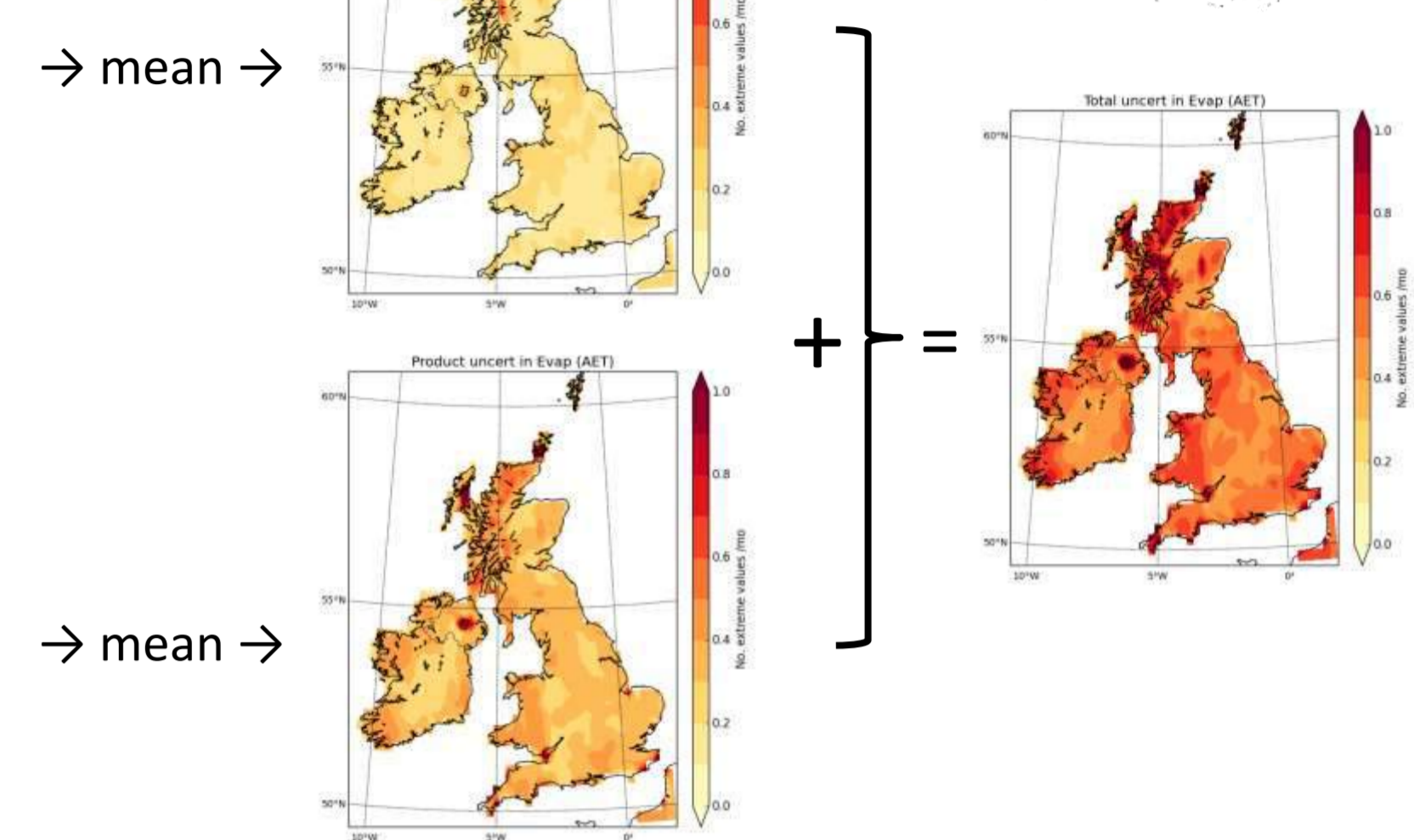
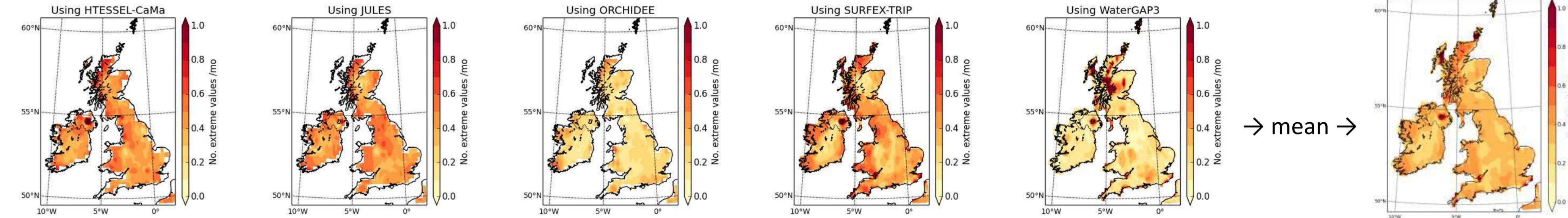
Analysis of more case studies from a greater variety of climatic zones will provide greater clarity on the processes behind these regional patterns.

Case study 1: AET, British Isles. Uncertainty in the occurrence of high extremes.

Model uncertainty:

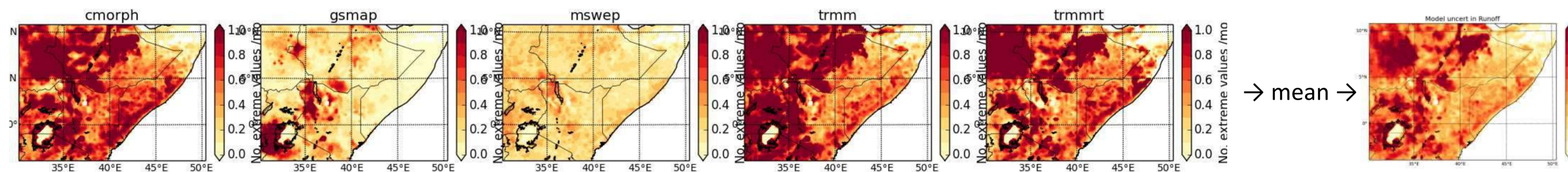


Precip product uncertainty:

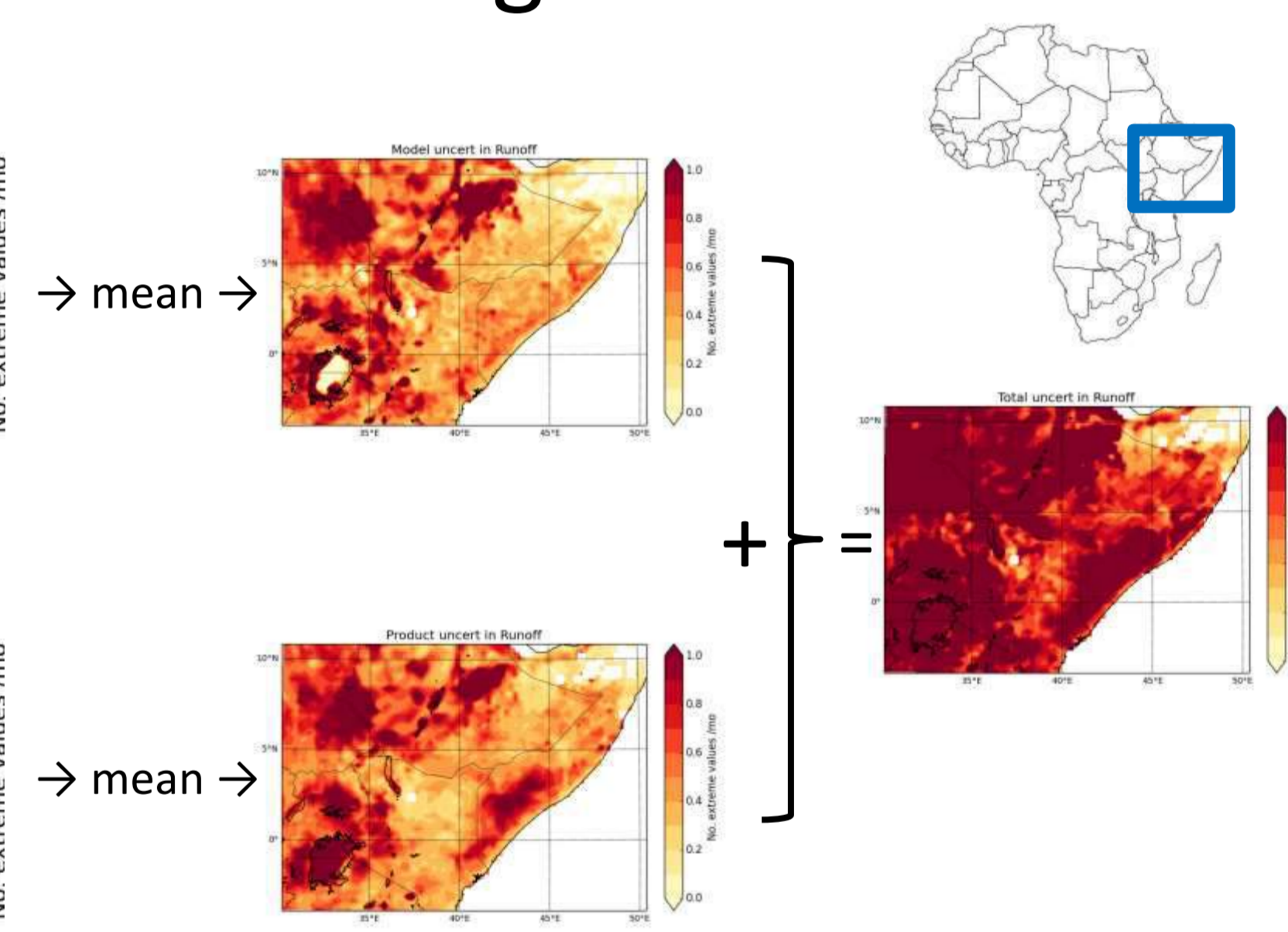
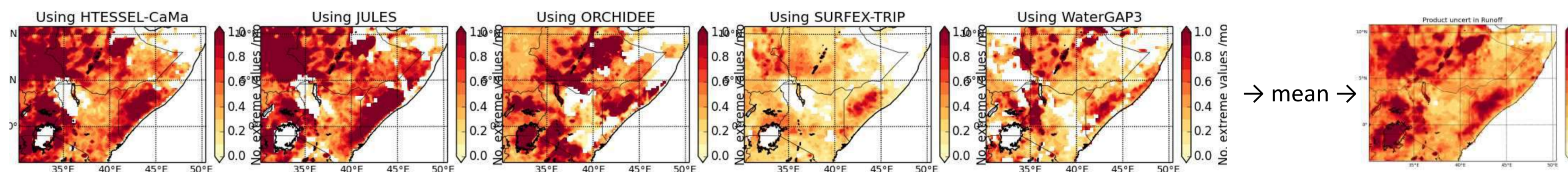


Case study 2: Runoff, Horn of Africa. Uncertainty in the occurrence of high extremes.

Model uncertainty:

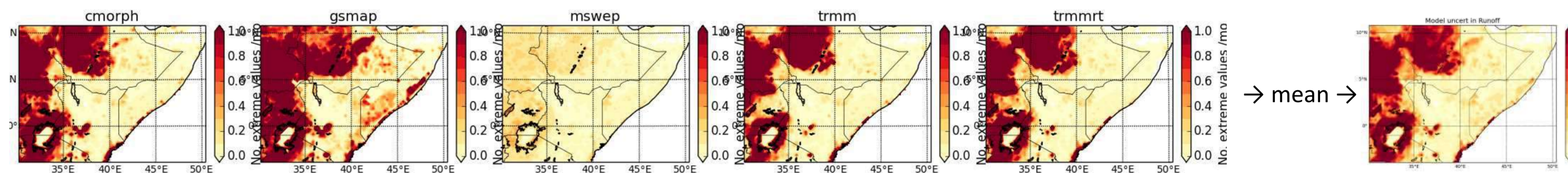


Precip product uncertainty:

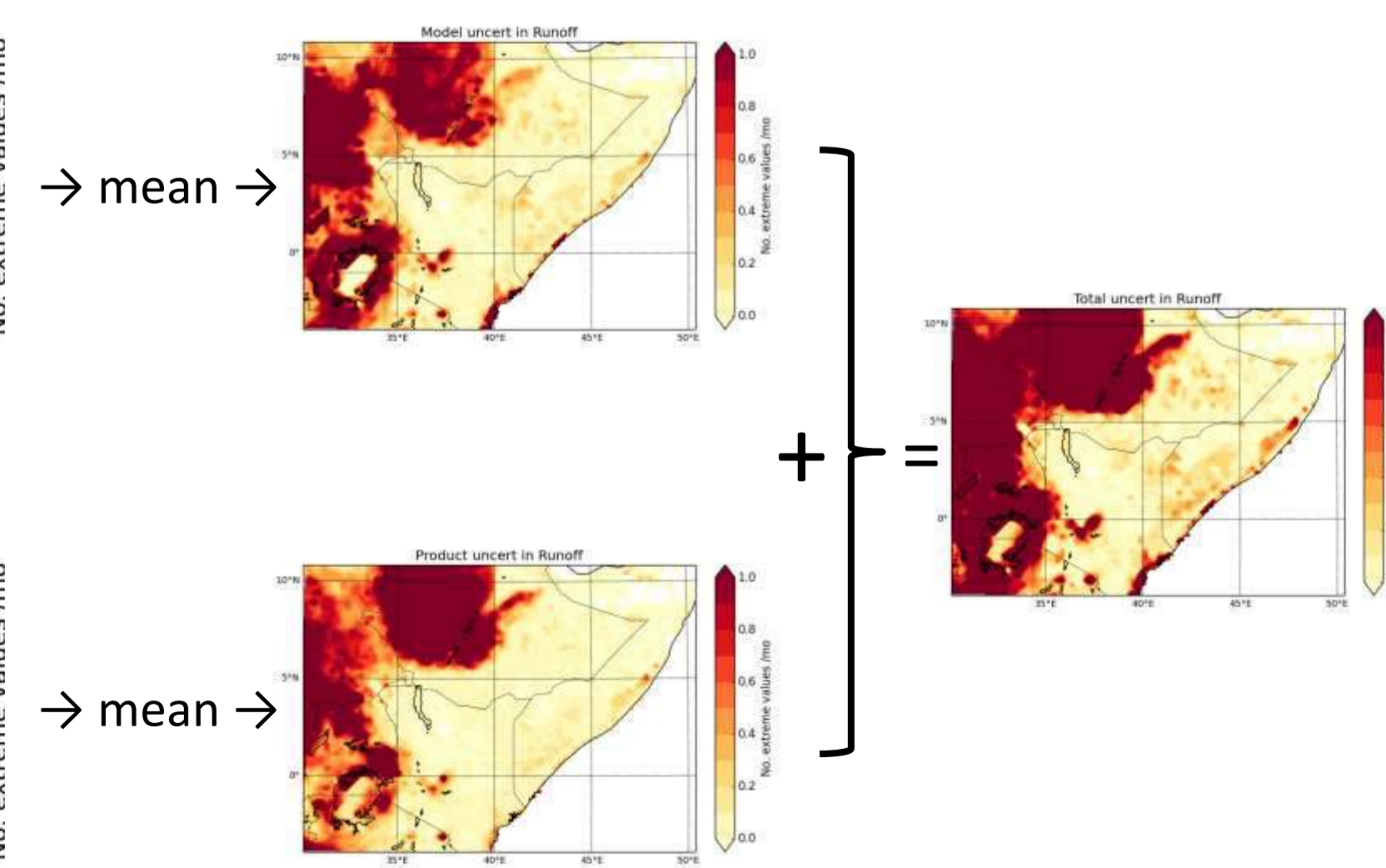
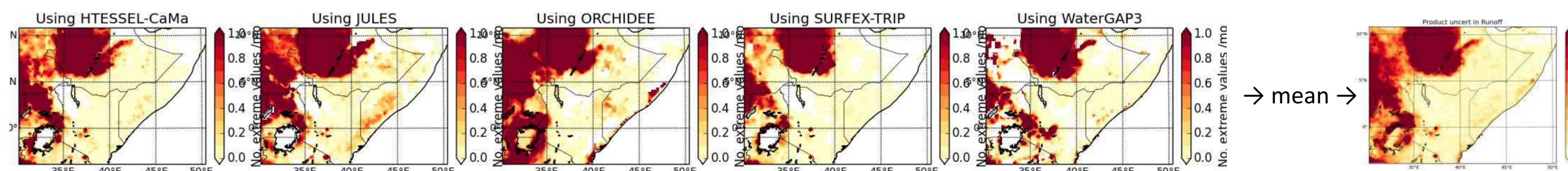


Case study 3: Runoff, Horn of Africa. Uncertainty in the occurrence of low extremes.

Model uncertainty:



Precip product uncertainty:



Earth₂Observe <http://www.earth2observe.eu/> is a collaborative project (27 partners) funded under the EU FP7 programme 2014-17. Overall objective: to contribute to the assessment of global water resources through the use of new Earth Observation datasets and techniques.

WHY do we need to know about model output uncertainty?

BECAUSE knowing about sources of uncertainty allows us to improve our model predictions.