Statistical tools for climate impact assessment

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- Statistical methods are useful in the **detection**, **attribution** and **prediction** of environmental trends
- They allow us to make **probabilistic** statements about risk, that reflect the **uncertainties** inherent in the science
- We are currently involved in scientific projects which look at **impacts** of **climate change** on **hydrology** & **ecology**
- Development of new statistical methods is vital in improving the **accuracy** & **precision** of quantitative assessments: e.g. smoothing methods, model averaging, extreme value theory

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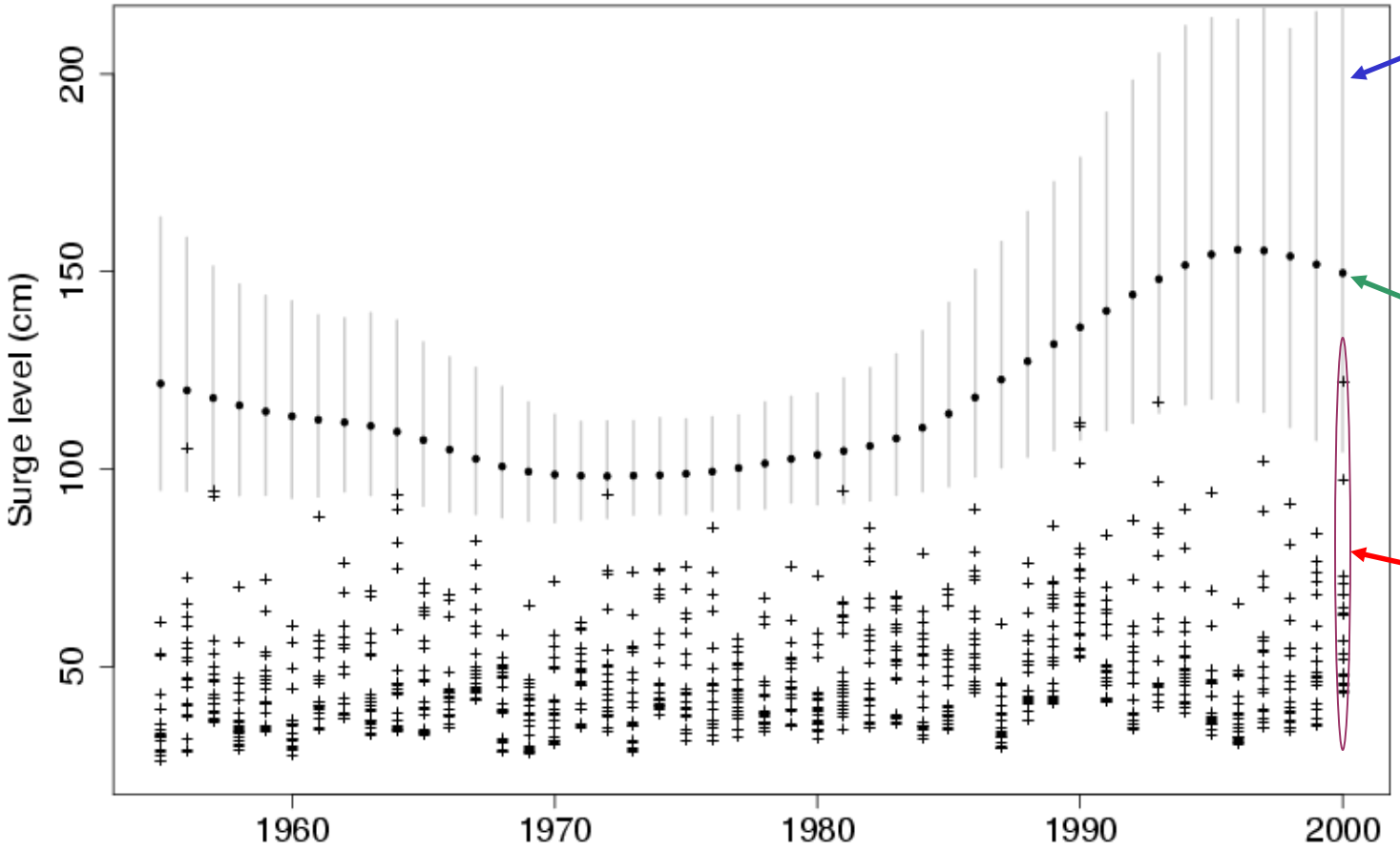
Detecting change:
Extreme events

Trends in storm surge levels at Aberdeen

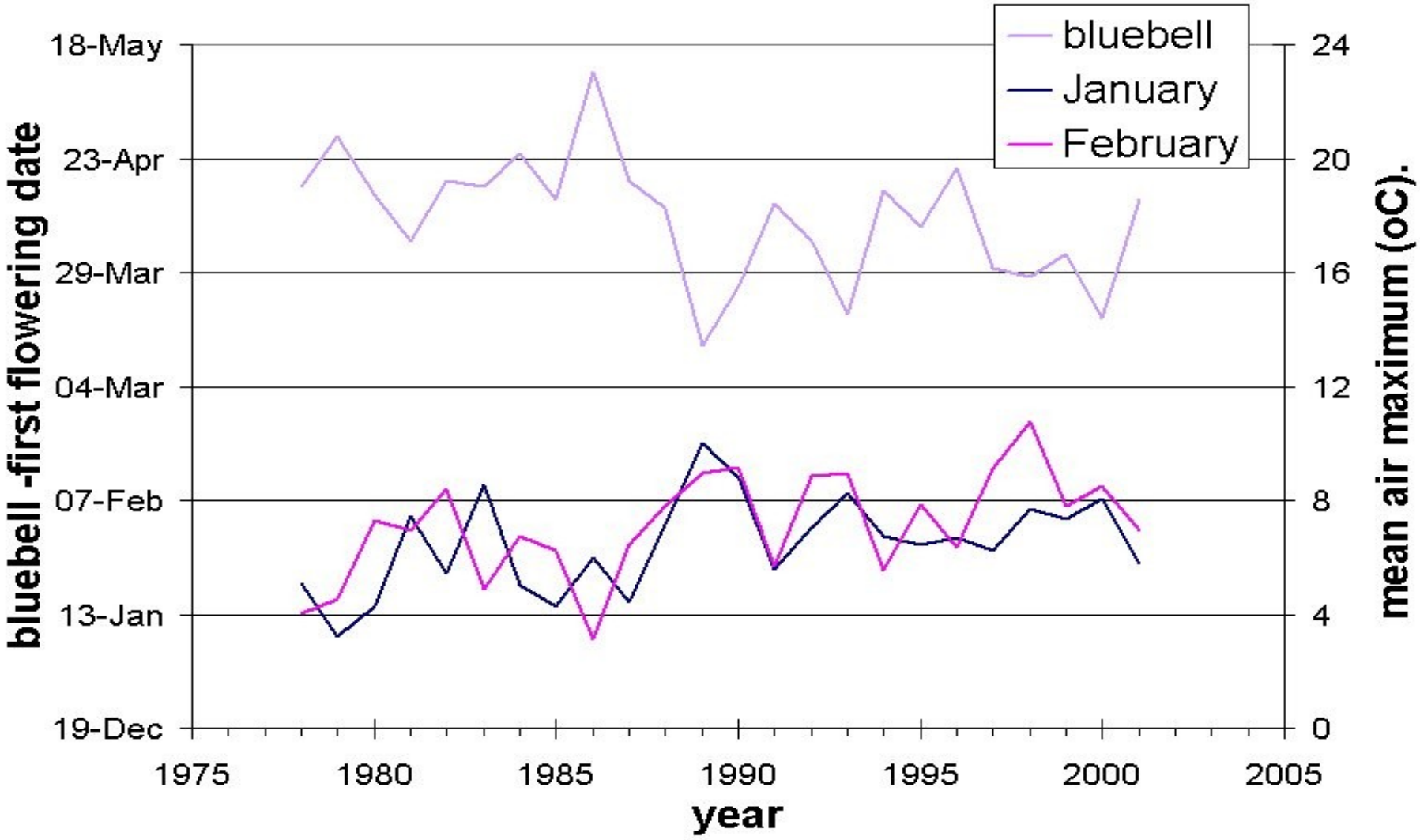


Quantify **uncertainty** involved in this **extrapolation**

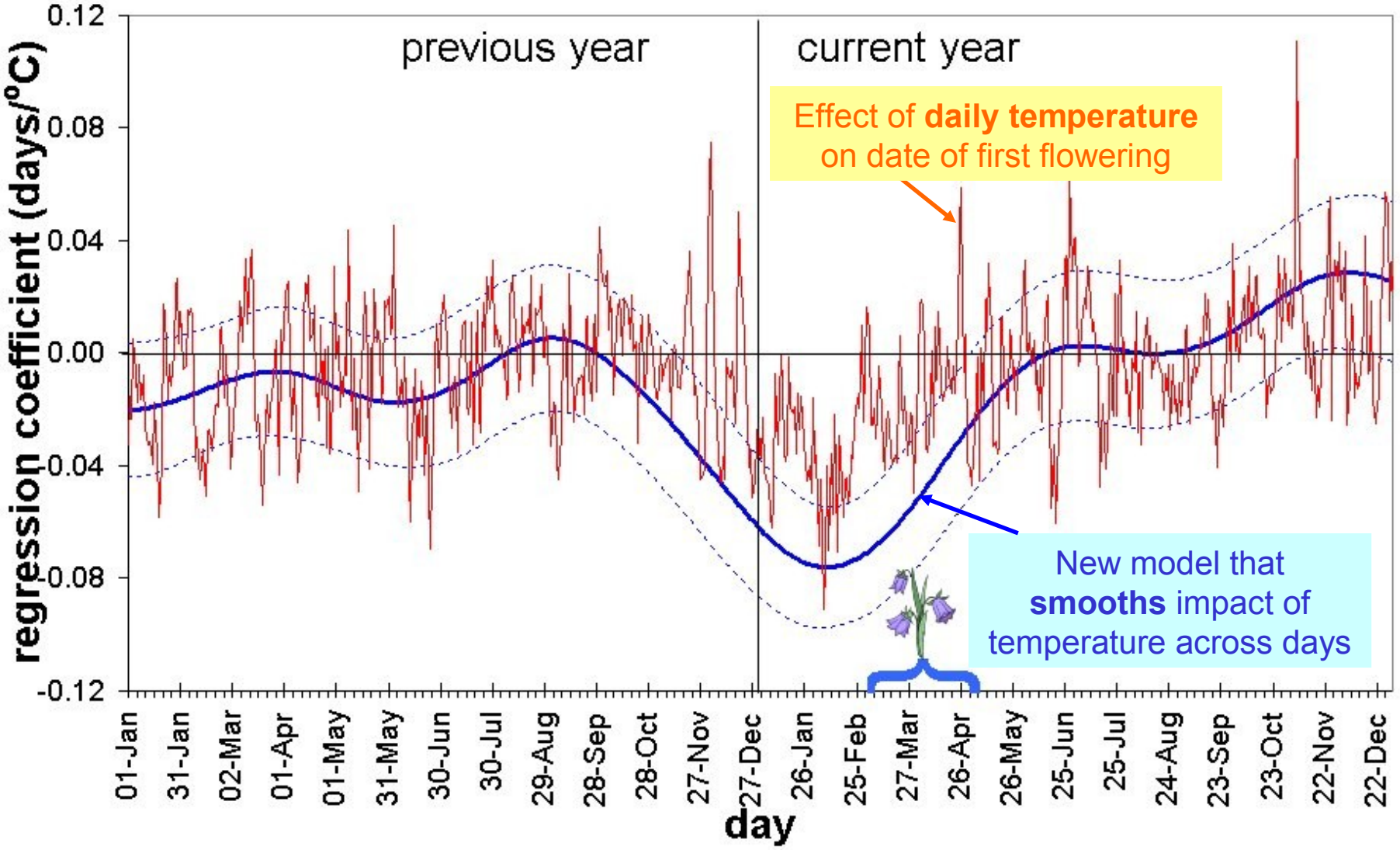
Estimate **50 year return levels** using **extreme value theory**

Analyse data on extreme events only
20 largest surges per year

Detecting & attributing change:
Phenology

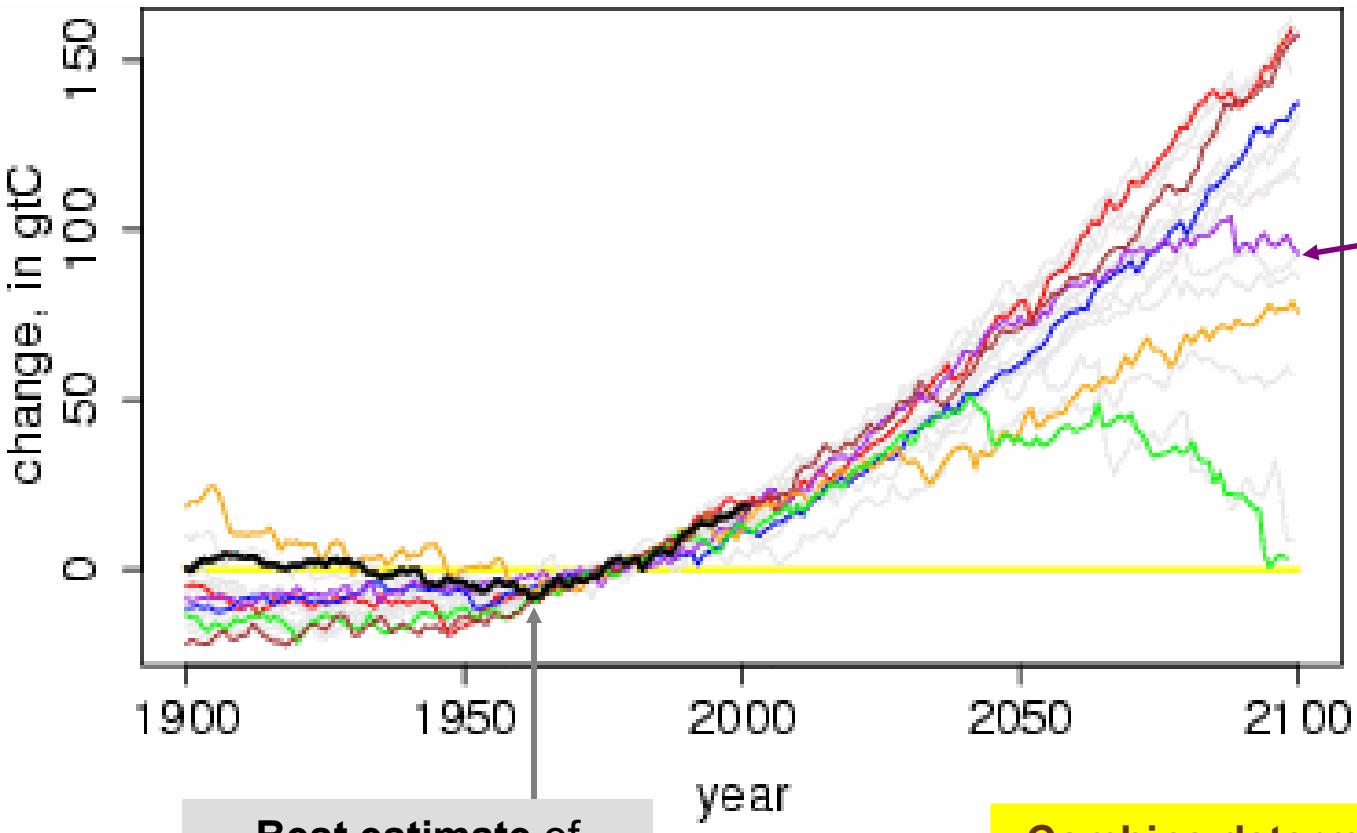


Detecting & attributing change:
Phenology



Predicting change:
Biomass

Predicted trends in global vegetation carbon stocks



Deterministic predictions, each based on a different **climate model**

Best estimate of change over 20th century, using **observed climate**

Combine deterministic predictions using a novel form of statistical **model averaging** – allows us to make **probabilistic predictions** of future change