

Stochastic modelling of the tide gauge, altimeter and GPS time series for realistic uncertainties in derived parameters

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Content

- Describe stochastic modelling but not go into detail
- Results from the Monthly Tide Gauge data
- Results from the altimeter data
- Results from the GPS data



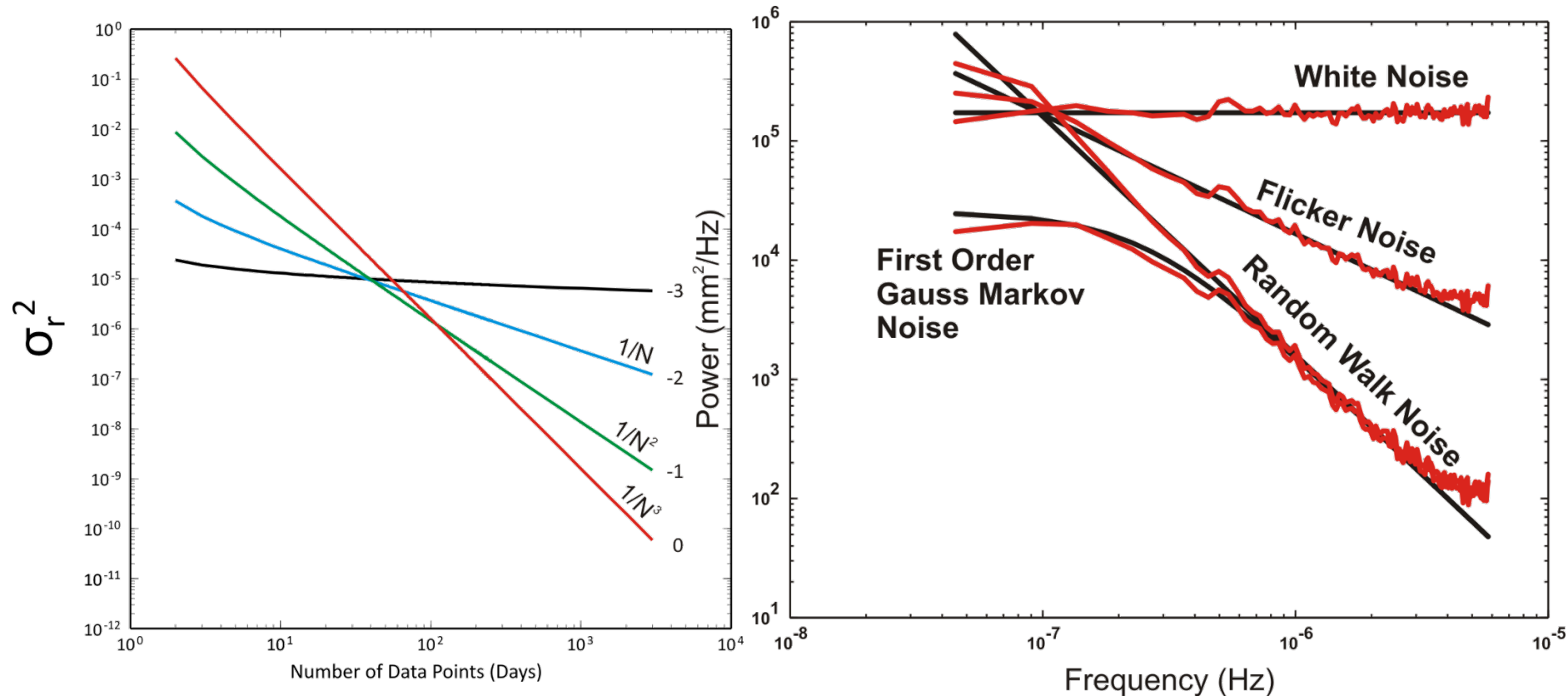
Stochastic modelling concerns the use of probability to model real-world situations in which un-certainty is present.

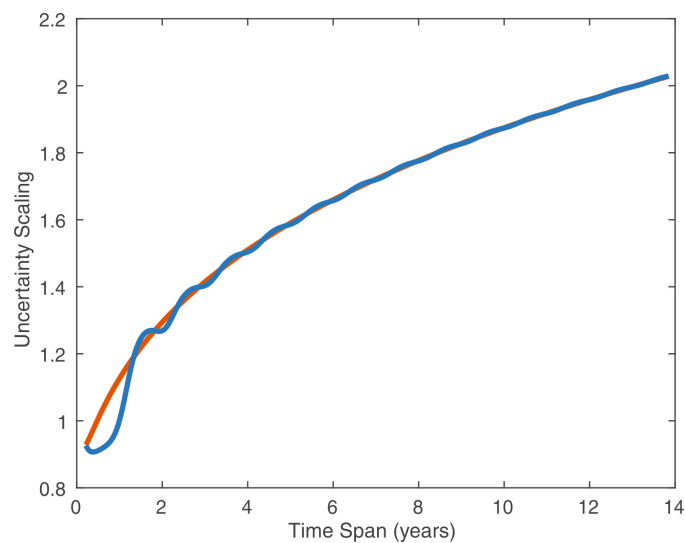
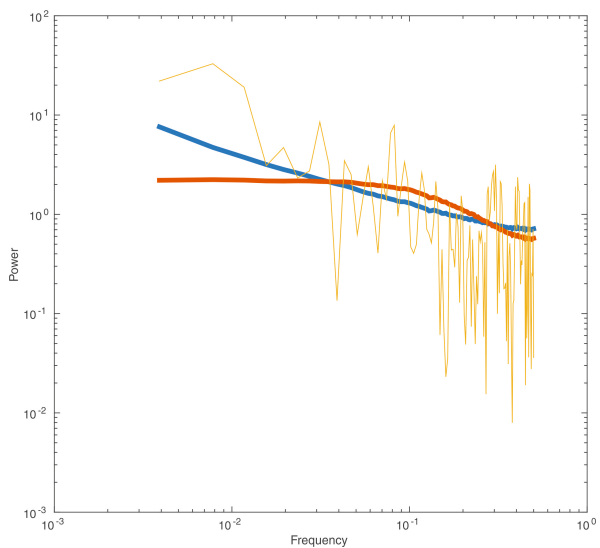
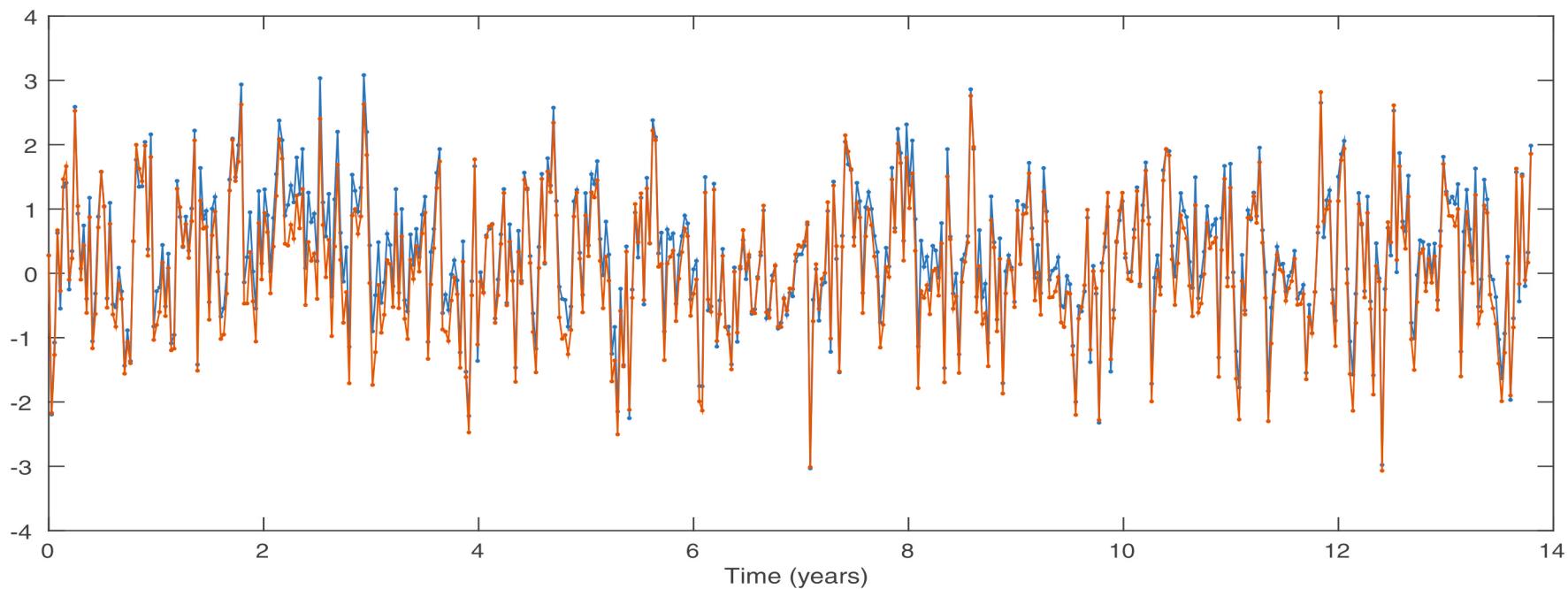
Use of a stochastic model reflects only a pragmatic decision on the part of the modeller that such a model represents the best currently available description of the phenomenon under consideration, given the data that is available and the universe of models known to the modeller.

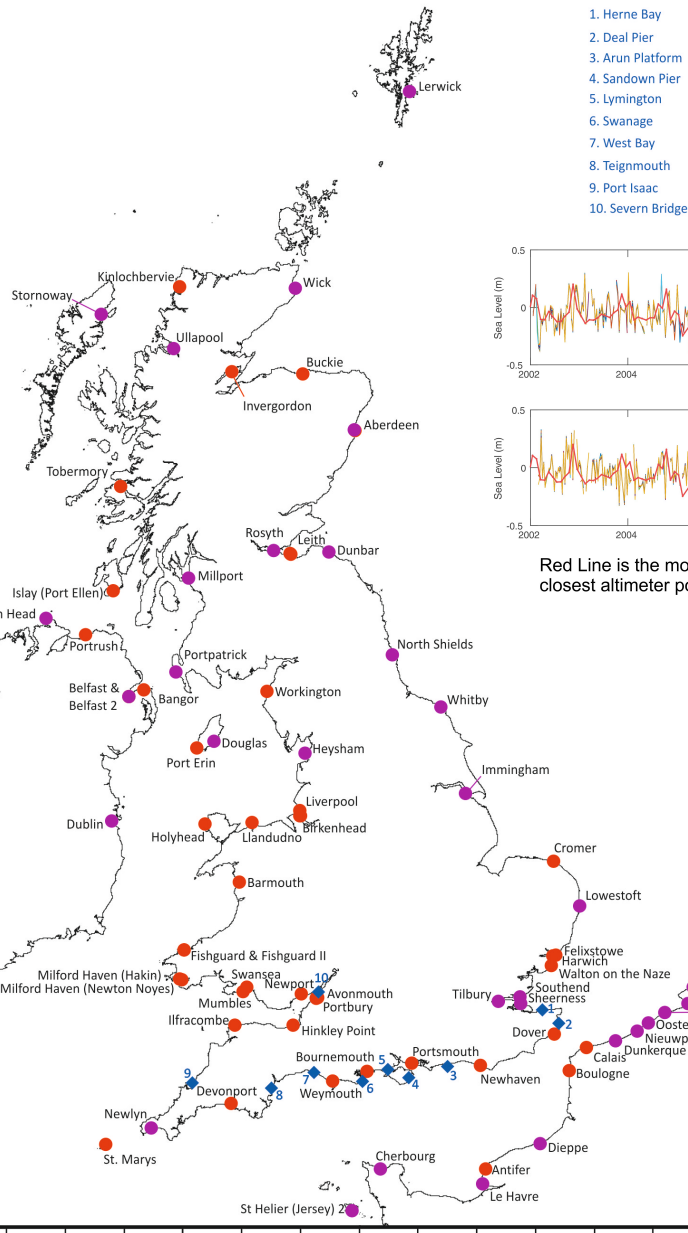
The choice of stochastic model to use does not have a big influence on the estimated parameters, for instance the rate, **BUT** can have a **BIG** influence on the uncertainties we **ASSIGN** to those parameters.

I use **M**aximum **L**ikelihood **E**stimation and **B**ayesian **I**nformation **C**riteria to choose the stochastic models

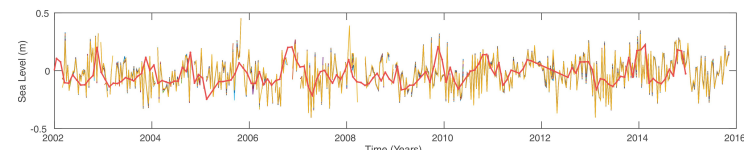
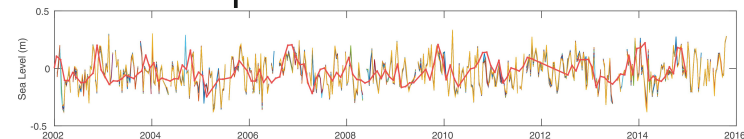
Consequences of time-correlated noise on trend uncertainties



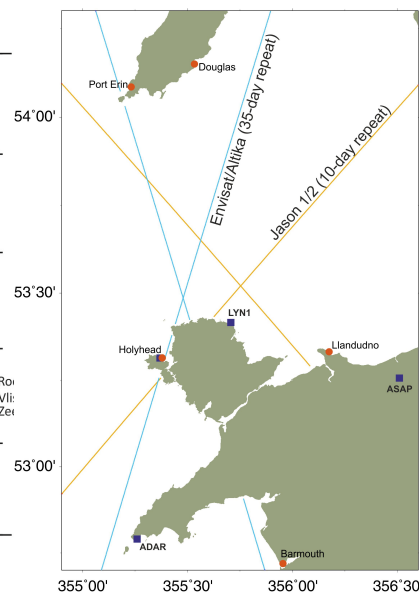
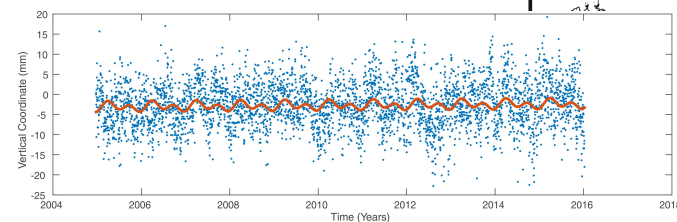
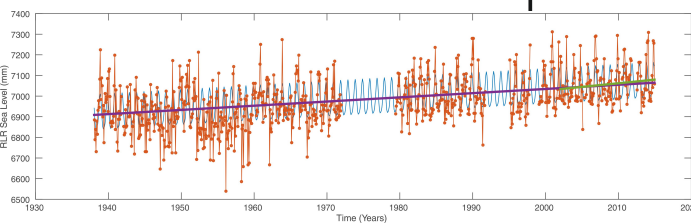




1. Herne Bay
2. Deal Pier
3. Arun Platform
4. Sandown Pier
5. Lymington
6. Swanage
7. West Bay
8. Teignmouth
9. Port Isaac
10. Severn Bridge



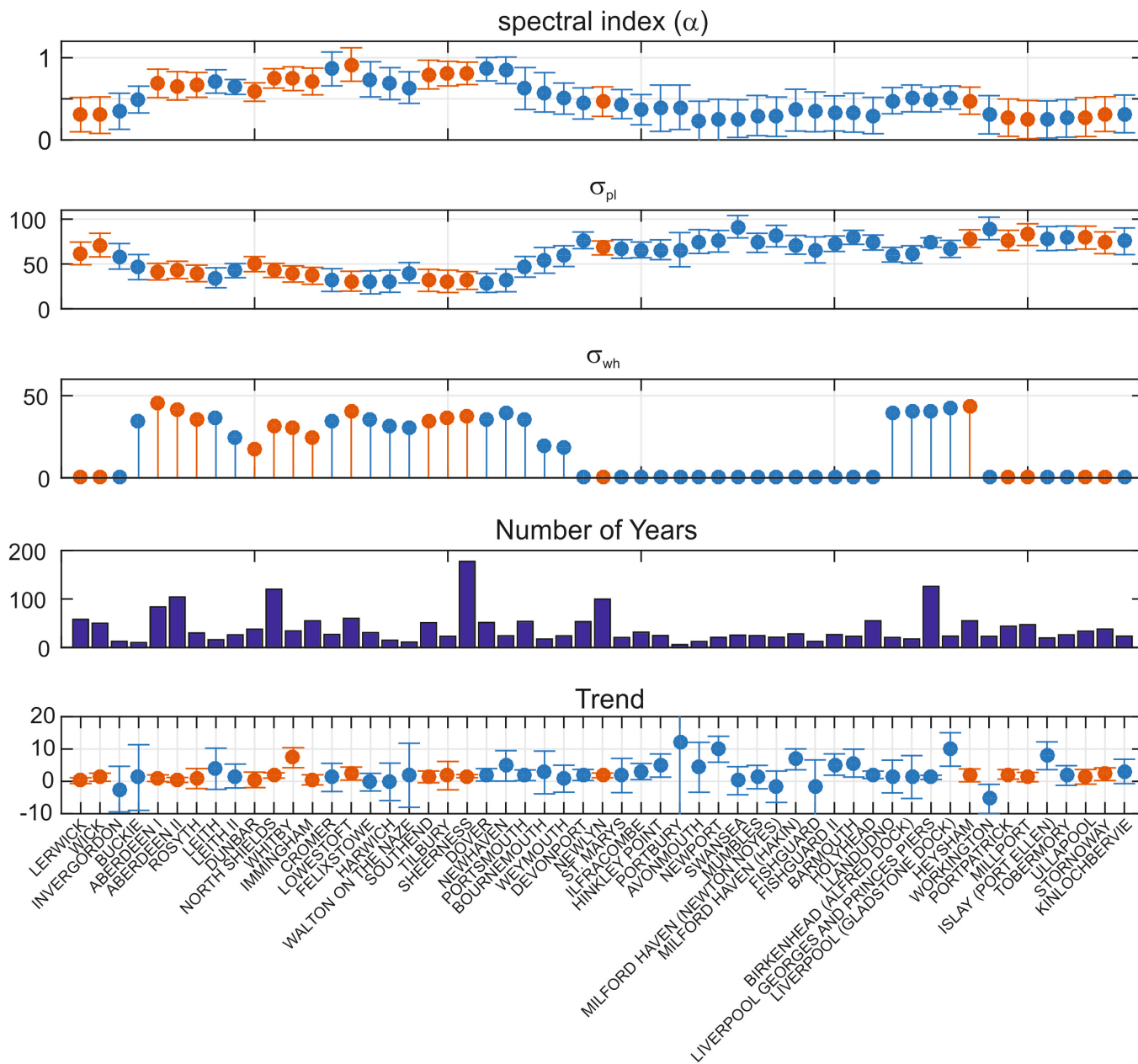
Red Line is the monthly PSMSL record at Holyhead. Coloured Lines are the 10 closest altimeter points on track #163

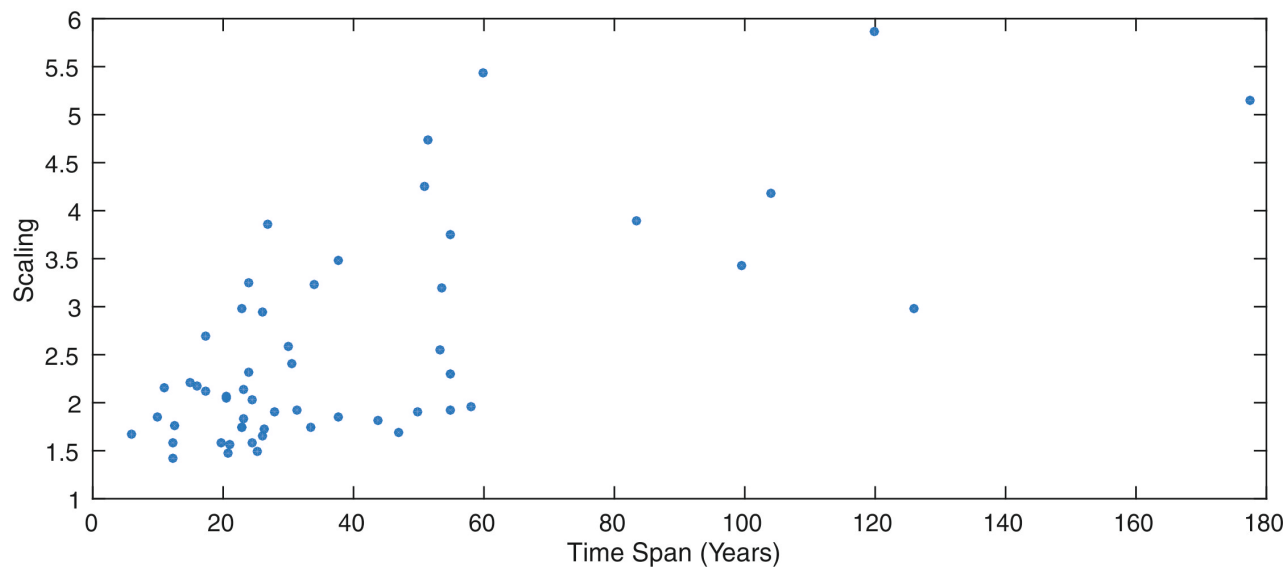
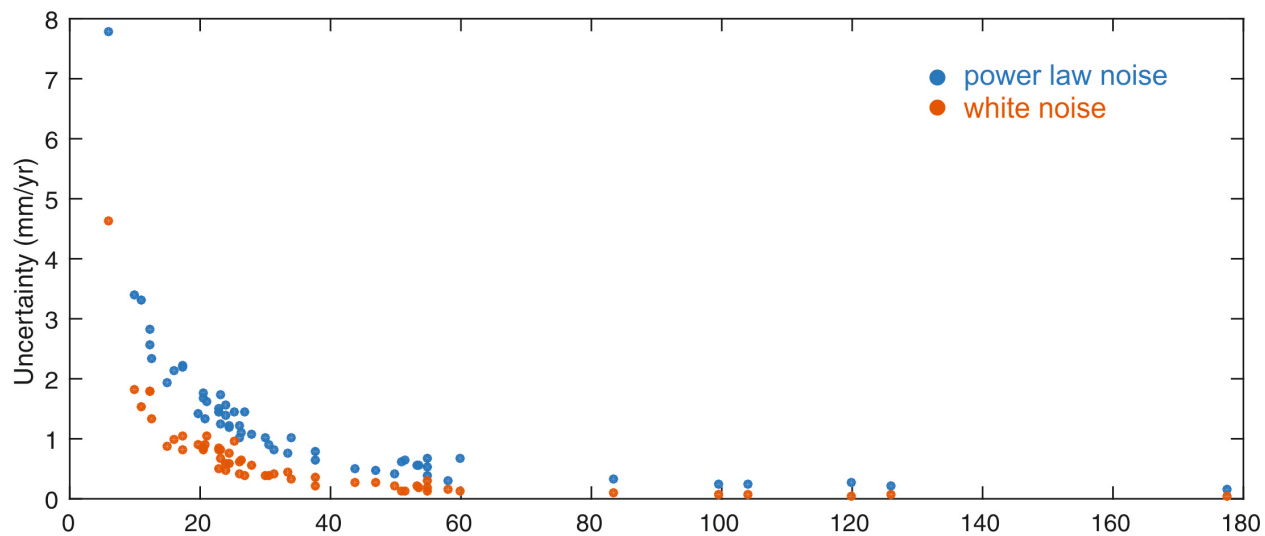


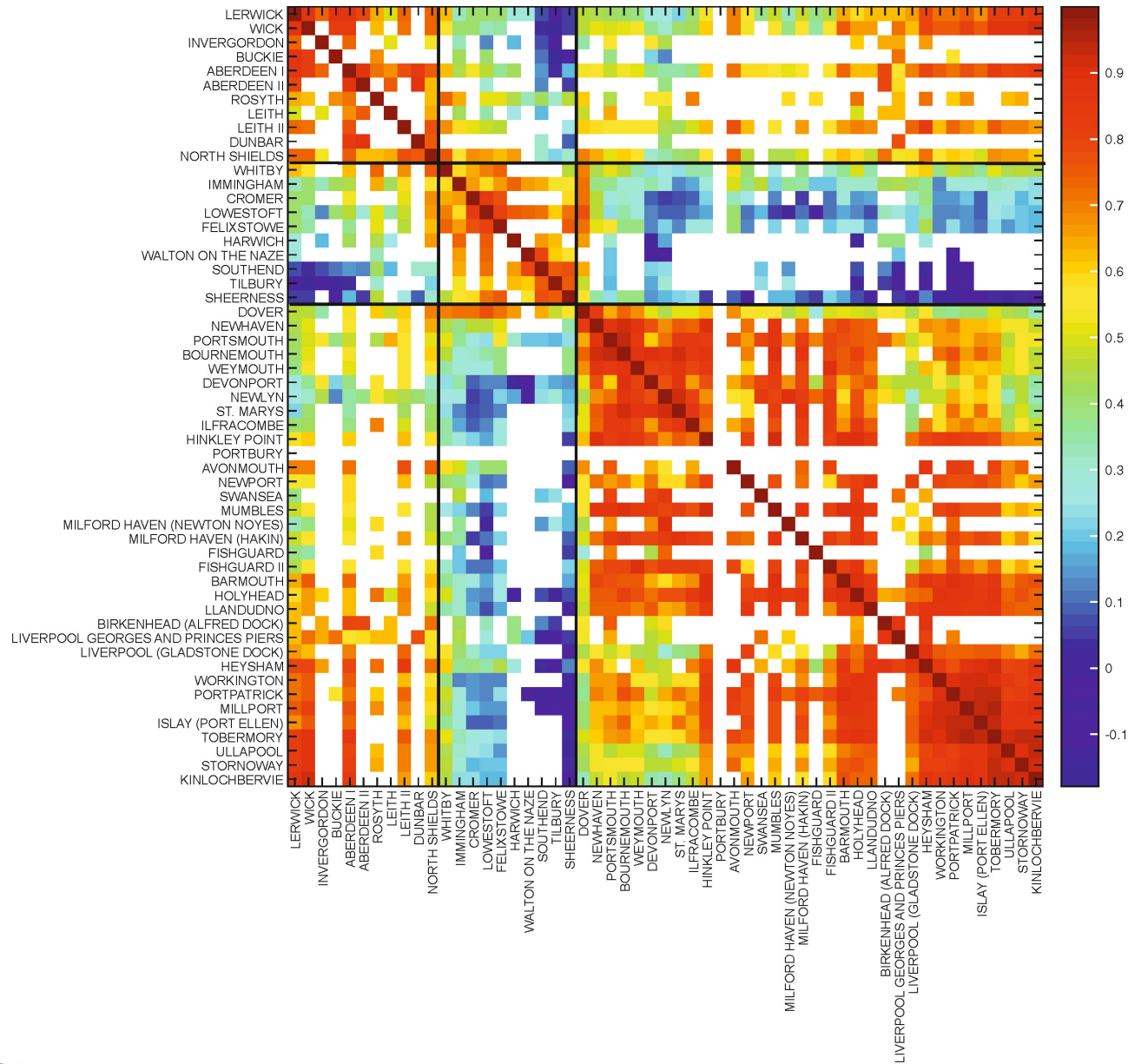
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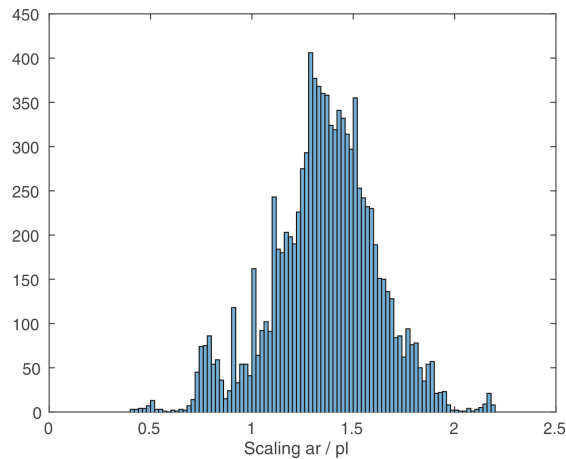
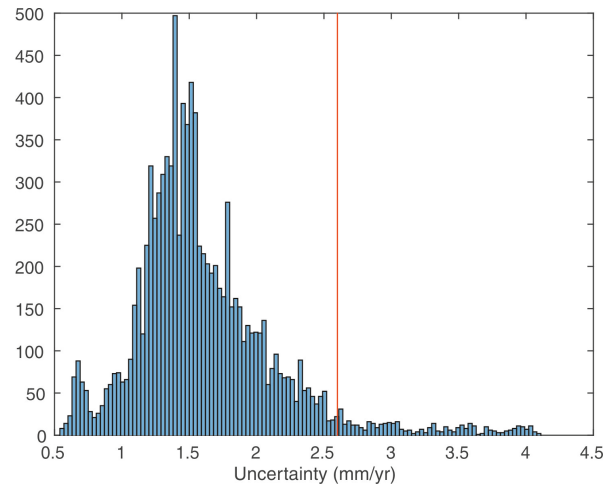
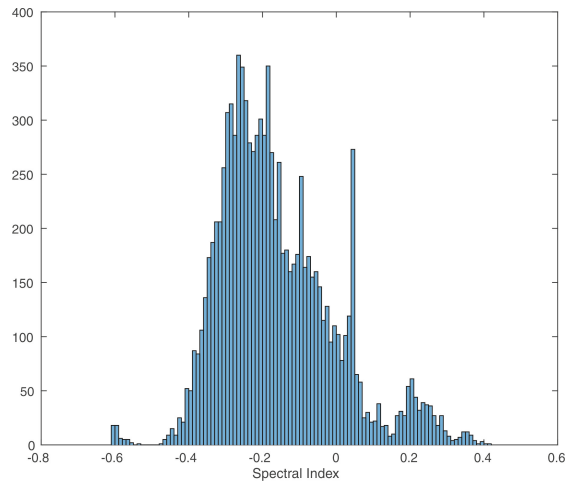
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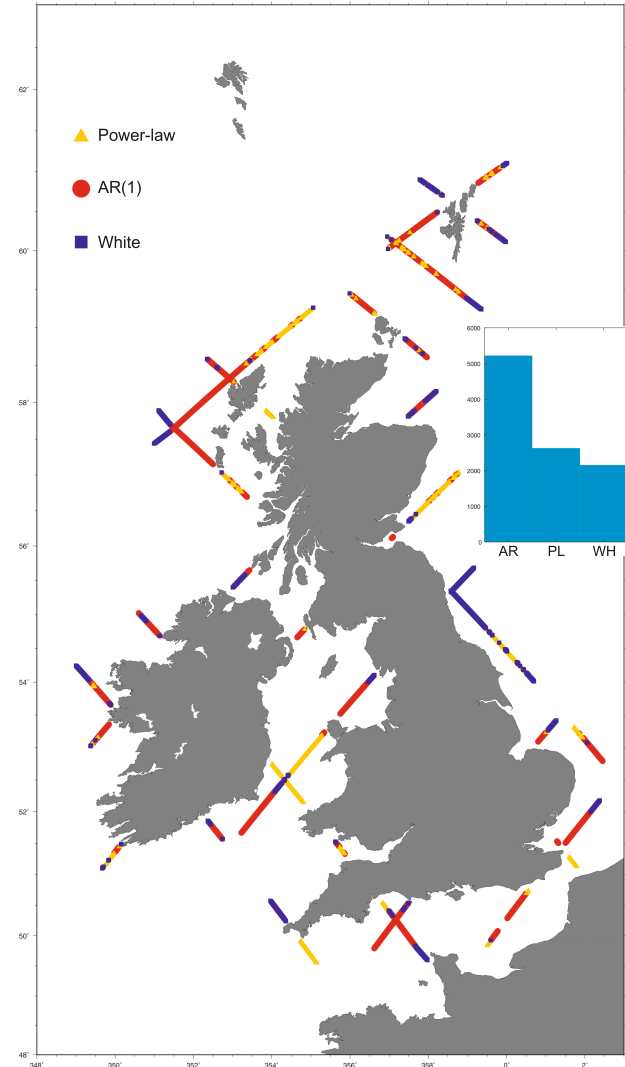


Jason 1/2 altimeter results

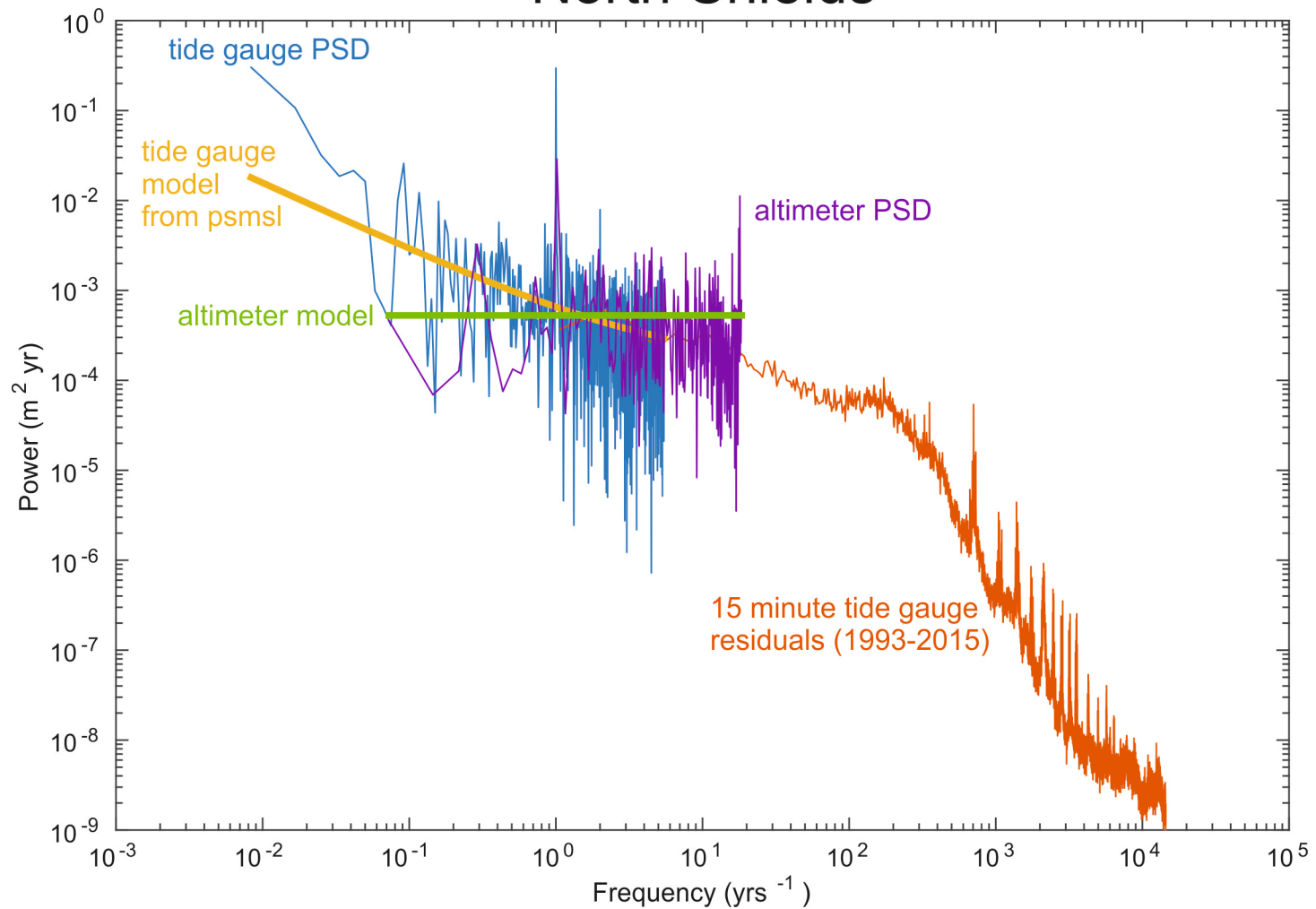


Uncertainty from monthly stochastic model : 3.1 mm/yr

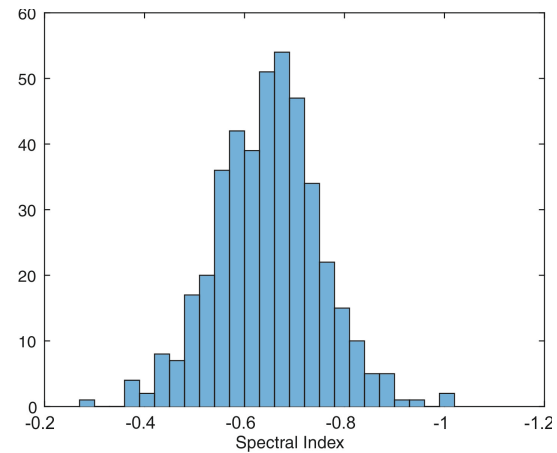
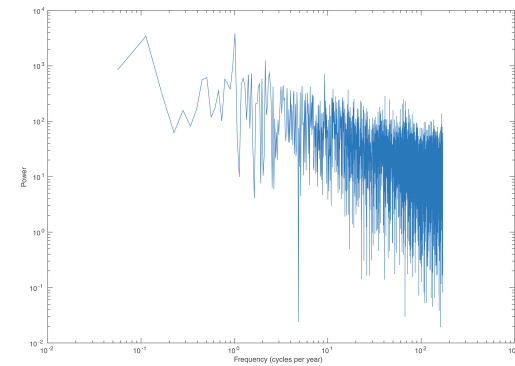
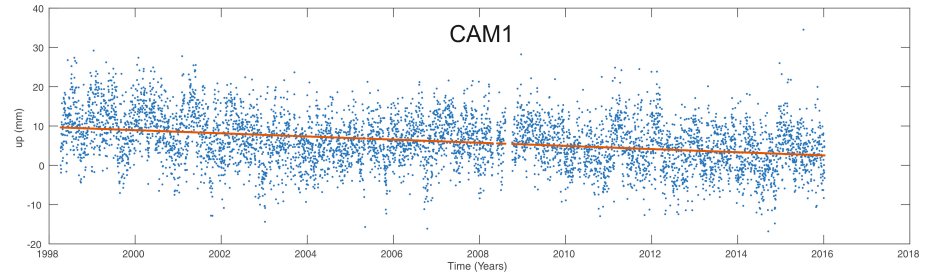
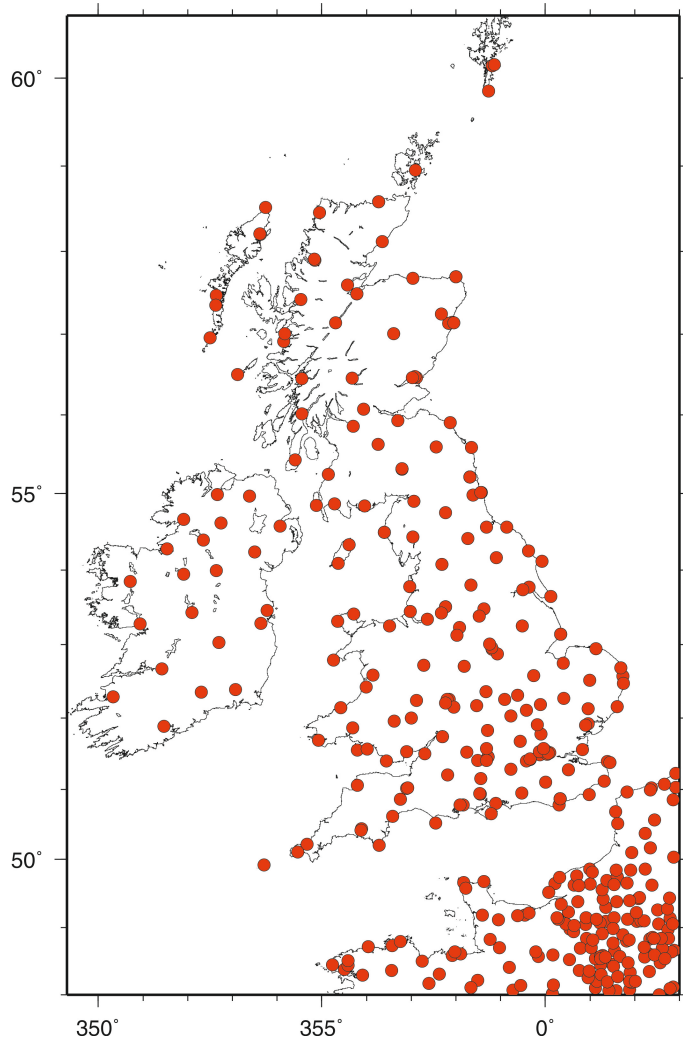
Uncertainty from Monte Carlo Sampling of 15 minute data at 9.91 day intervals : 2.6 mm/yr

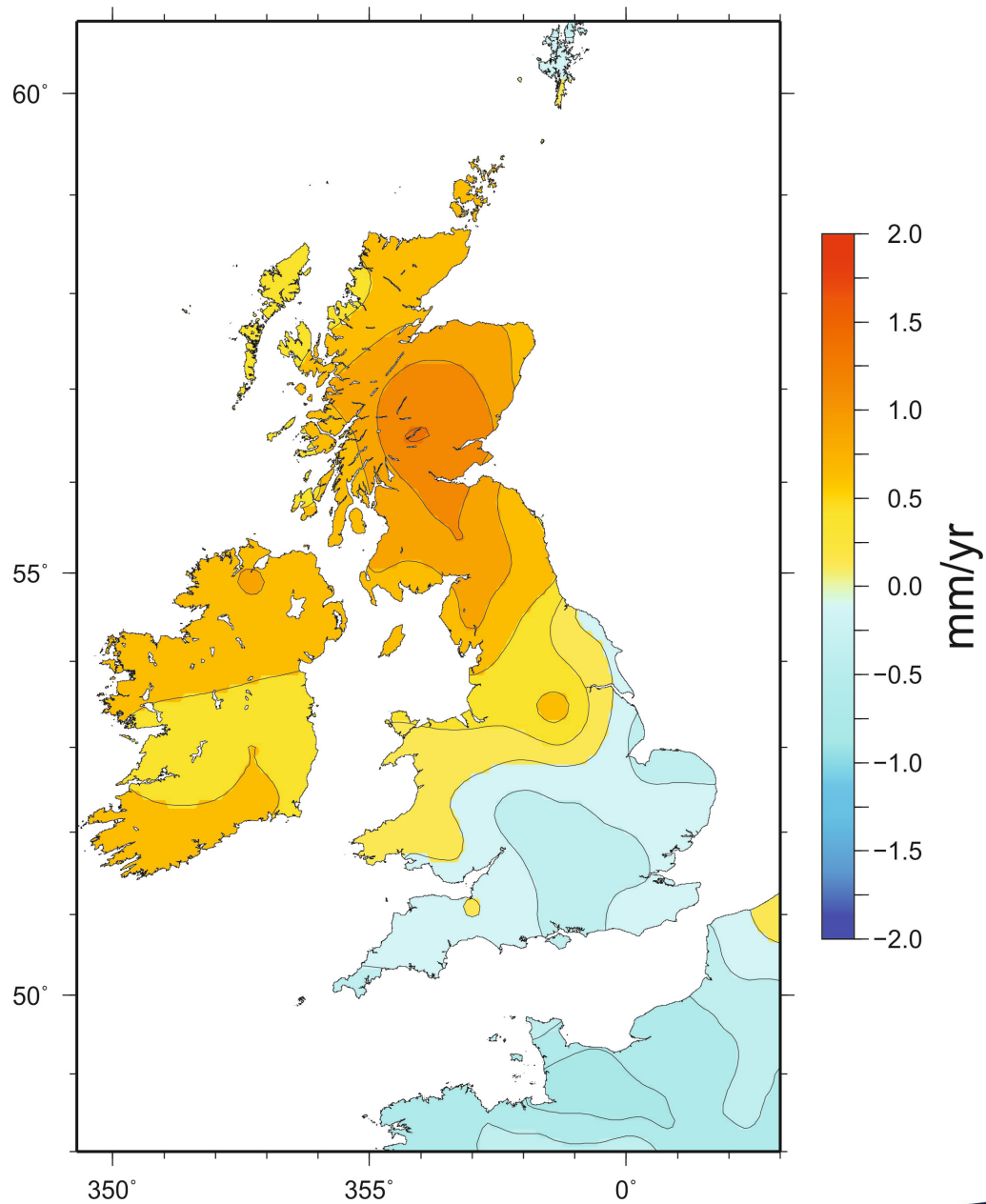


North Shields



GPS : Vertical Land Movement





Summary

- Tide gauge data shows a power law noise power spectrum with a spectral index of approximately -0.5.
- Compared to white noise estimates uncertainties in the trend are from 1-5 times larger
- Altimeter data appears to show smaller spectral indices or AR(1) model
 - Partly because IB effect is removed in the altimeter data
 - Partly length of time series
- GPS data shows a power-law noise with a spectral index of -0.7

