Geophysical Research Abstracts
Vol. 13, EGU2011-8405, 2011
EGU General Assembly 2011

Application of a linguistic decision tree model to sea level problems

Samantha Royston (1,2), Jonathan Lawry (2), and Kevin Horsburgh (1)

(1) National Oceanography Centre, Liverpool, UK (samyst@noc.ac.uk), (2) Dept. Engineering Mathematics, University of Bristol, Bristol, UK

Knowledge and understanding of sea level variability on varying spatial and temporal scales remains a key field of research in the earth sciences. Given the complexity of the earth system and its feedbacks, many attempts have been made to produce simplified models of this variability and there remains a potential for probabilistic and transparent data-driven techniques to further our understanding in this field.

Here, a fuzzy rule-based approach (a linguistic decision tree) has been applied to very different problems in sea level science: the short-term forecasting of storm surge in the North Sea, and the replication of annual mean sea level variability on a local scale. The model's merits are proven in the storm surge problem, displaying comparable accuracy to alternative methods, with two benefits. Firstly, the model gives probabilistic estimates of the storm surge. In addition, statistically significant IF-THEN rules produced by the algorithm can be interpreted linguistically and are found to be consistent with our understanding of the physical system.

The same probabilistic and transparent approach is then applied to the mean sea level problem. The algorithm identifies the data fields providing most information about the system and the rules can be interpreted to identify key drivers of sea level variability.

The merits of the data-driven approach will be discussed.