

Masterclass on modern statistical approaches to extreme value analysis in metocean engineering

Tuesday 22 September (13:00-18:00 BST)

The Masterclass is open to all IOGP Members and participants are required to have some background understanding of the extreme value analysis topic.

REGISTER

The purpose of this Masterclass is to provide Metocean practitioners, engineers, analysts and decision-makers with a practical understanding of contemporary statistical methods for extreme value analysis (EVA) and their application in offshore and marine engineering.

The Masterclass will focus on the estimation of rare environmental conditions used in design, operations and risk assessments, highlighting recent developments in statistical modelling, uncertainty quantification and multivariate analysis. Particular emphasis will be placed on the practical application of methods, interpretation of results, model diagnostics and engineering judgement.

13:00-14:00	Fundamentals
	- Motivating example - Engineering convention: Weibull model - Statistical motivation for forms of tail functions - Where does GEV come from? - Where does GP come from? - How are GEV and GP linked? - Key basic practical considerations - Threshold stability of GP tail - How to fit a statistical model 101 - Penalised maximum likelihood - Model averaging - Bayesian inference
13:45-14:00	Break / Questions
14:00-15:00	Covariate effects
	- Motivating example / what is a covariate? - What can go wrong if I ignore a covariate? - When should I consider using a covariate model? - How do I incorporate covariates into a statistical model? - Simple outline inference - What are the key 'fiddle' factors? - What can go wrong in a covariate analysis?
14:45-15:00	Break / Questions
15:00-16:00	Multivariate extremes
	- Motivating example (Hs-Tp) - Engineering practice "Associated values" - Weibull-log normal model - Copula models - Statistical motivation for forms of bivariate dependence - Conditional extremes - Simple outline inference - What are the key 'fiddle' factors? - What can go wrong in a conditional extremes analysis? - How do I incorporate covariates?

15:45-16:00	Break / Questions
16:00-17:00	covXtreme Worked Examples
	- What simplifying assumptions does covXtreme make? - Outline of inference procedure - Key practical steps at each stage of the analysis - Walk-through of two published analyses (available on GitHub)
16:45-17:00	Break / Questions
17:00-18:00	Related developments and take-aways
	- Other developments - Fully probabilistic design, incorporating structure in inference - Angular-radial models for multivariate example - High-dimensional inference - Spatial extremes - Spatial conditional extremes - Temporal conditional extremes - Key takeaways from the Masterclass - Available software - covXtreme - entry-level functionality and a good benchmark - evgam, texmex, JEVA, proprietary (Shell, Offshore Consulting, SAM JIP)
17:45-18:00	Questions

Monday 28 September (08:00-10:00 BST) (virtual session only)

This one hour virtual session will summarize the key points from the workshop held on 22 September 2026, followed by a Q&A session.

Participants are encouraged to send their questions to Birgitta Visser at bv@iogp.org ahead of the meeting.