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A numerical toolbox for the homogenization of particle-size data

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Particle-size data are used for a range of applications within both earth science and industry. These data are measured by a range of instrumentation and hence exist in number of different formats. These data are consequently often difficult to integrate. A numerical method is presented for robustly constructing complete particle-size distributions from different data sources, including: visual estimates, sparse particle-size data and incomplete distributions. This approach centres around a constrained cubic-spline interpolation of logit-transformed frequency data and modelling the tails of the distribution. An inverse of the Folk and Ward (1957) graphic method of moments is also presented. Optimization of the number of particle-size classes is demonstrated using a maximum entropy approach. The robustness of these models is assessed using particle-size data from 4885 sediment samples from The Netherlands. Uncertainties in model predictions are assessed by log-ratio analysis. Maximum entropy optimization reveals that the number of particle-size classes can be effectively reduced by a factor of three whilst still retaining 95% of data variability.

Folk, R.L. and Ward, W.C. (1957) Brazos River bar [Texas]; a study in the significance of grain size parameters. Journal of Sedimentary Research, 27(3): 1527-1404.