



Journal of Environmental Statistics

February 2010, Volume 1, Book Review 1.

<http://www.jenvstat.org>

Reviewer: Dave Zes
University of California, Los Angeles

Practical Geostatistics Case Studies 2009

Isobel Clark and William V. Harper
Ecosse North America, Columbus, Ohio, 2008.
ISBN 0-9703317-4-6. 382 pp. Paperback Spiral-bound.

The authors intend *Practical Geostatistics Case Studies 2009* (called PGCS here out) as a companion to their earlier works, *Practical Geostatistics 2000* (2) and its partner *Practical Geostatistics Answers to Exercises*. The authors are currently working on what will be the fourth volume in the collection designed to guide readers through more advanced topics in geostatistics.

PGCS contains 10 software-independent case studies from 10 unique datasets aimed at reinforcing essential concepts and techniques through doing-and-seeing. Kriging, inference (such as confidence bounds), and variogram study are staples throughout. Chapter 1 precludes the studies, offering for each data description and topic itemization. Chapter 2 commences with gridded "Coal" data, carrying out univariate description and inverse distance weighting (a nice starting point to ground intuition). Chapter 3 examines "GASA" gold mine data, discussing Sichel's general log transform and parameter estimators. Chapter 4 works with "Geevor" tin mine data. The authors offer a nice practical background of field measurement and assaying, and tin recovery, and provide a solid discussion of the nugget effect and the importance of cross validation. Chapter 5 looks at "Organics" soil data. Treatment of outlier(s), the variogram cloud, and severe anisotropy (the unwieldy power variogram in E-W observations) are highlighted. Chapter 6 works with "Scallops" data. Included is an exploration of the consequence of violating the normality assumption. Chapter 7 explores "Sunshine Mine" gold and silver mine data, introducing the indicator (Bernoulli) variogram. Chapter 8, "Velvetleaf" weeds data, deals with heavy skewed data, and reemploys the indicator variogram. Chapter 9 works with "Wolfcamp" water wells data, and discusses polynomial surface fitting and area kriging. Chapter 10, "Brooms Barn" soil data, offers a treatment of outliers, and reexamines the consequences of challenging the normality assumption. Chapter 11, "Brenda Mine" copper mine data, introduces 3-D kriging (borehole depth), and performs surface trend analysis.

PGCS places a premium on holding the reader's interest. Clark and Harper accomplish this by offering considerable computational detail including intermediate results, lots of tables, a wide variety of graphs and plenty of them, and, perhaps most notably, a compelling spectrum of applications ranging from seafood harvesting (Scallops data), to weed growth (Velvetleaf) to

precious metals (Sunshine Mine & GASA). The authors embellish all of this with a smattering of well-placed, light-hearted wit. While ostensibly a case workbook, the reader will get the sense that results are very much a product of decisions — in varying shades of subjectivity — made by the researcher along the way. The authors at several turns encourage the reader to modify their analyses, e.g., altering a response transform, and note how the change affects a result benchmark, like cross-validation. One upshot is to provide the student structure without crushing creativity.

The text is admittedly a bit unorthodox in presentation and, to a degree, notation. In many ways PGCS follows in the spirit of *Practical Geostatistics 2000*, which received varied acclaim, most notably on the low end, Myers (3), who objected without euphemism to, among other things, the authors' meticulous attention to computation, and also their use of inference.

As a point of commentary, there has always been lurking in academic authorship the tacit sentiment that there is something unmanly about anything short of the densest exposition. This collection is not written for highbrow accolades. Clark and Harper write solely for the benefit of the reader — and the art of geostatistics, a discipline in which both have earned substantial credential, and for which their enthusiasm is clearly revealed in PGCS. The expansive attention to detail in computation, tables and graphs that the authors provide might seem superfluous to someone with pre-knowledge of how things play out, but will be warmly welcomed by, and certainly in some cases will outright prove necessary for, a student just recently coming into contact with spacial data. On the matter of inference, recently there has been a movement towards more conservative use of inference, propelled by the understanding that in real-world applications, usual model assumptions range from unlikely to absurd, e.g., Berk (1). Such studies make the matter of model applicability central. Data-driven case studies are not really the place to labor over theory. PGCS maneuvers through model selection advocating sufficient use of rigorous diagnostics familiar to anyone experienced in regression or experimentation (e.g., cross validation residual analysis).

PGCS, along with its companions, has value in at least two very broad settings. Firstly, as a course textbook for anything from honors high schoolers to graduate students. Career statisticians, secondly, should find it valuable as a source of methodical templates.

References

- [1] Richard Berk, *Regression Analysis: A Constructive Critique*. Sage, Thousand Oaks, CA, 2004.
- [2] Isobel Clark and William V. Harper, *Practical Geostatistics 2000*. Ecosse North America, Columbus, OH, 2000.
- [3] Donald E. Myers, “Mathematical Geology,” Vol. 34, No. 6, August 2002.

Reviewer:

Dave Zes
UCLA Department of Statistics
8125 Math Sciences Bldg
Box 951554
Los Angeles, CA
90095-1554