Chutes and Ladders

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Key Points:

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Abstract

1 Body

Heat escaping the solid Earth's surface indicates a dynamically cooling planet. Surface heat flow databases (Hasterok & Chapman, 2008; Lucazeau, 2019; Pollack et al., 1993) enable investigation *everything is related, but nearer things are more related* (Krige, 1951; Matheron, 1963). The spatial (dis)continuity of surface heat flow represents the areal extent of geodynamic processes and their interactions. For example, patterns of consistently low surface heat flow outline the areal extent of cratons (Figure 1)

1.1 Figures

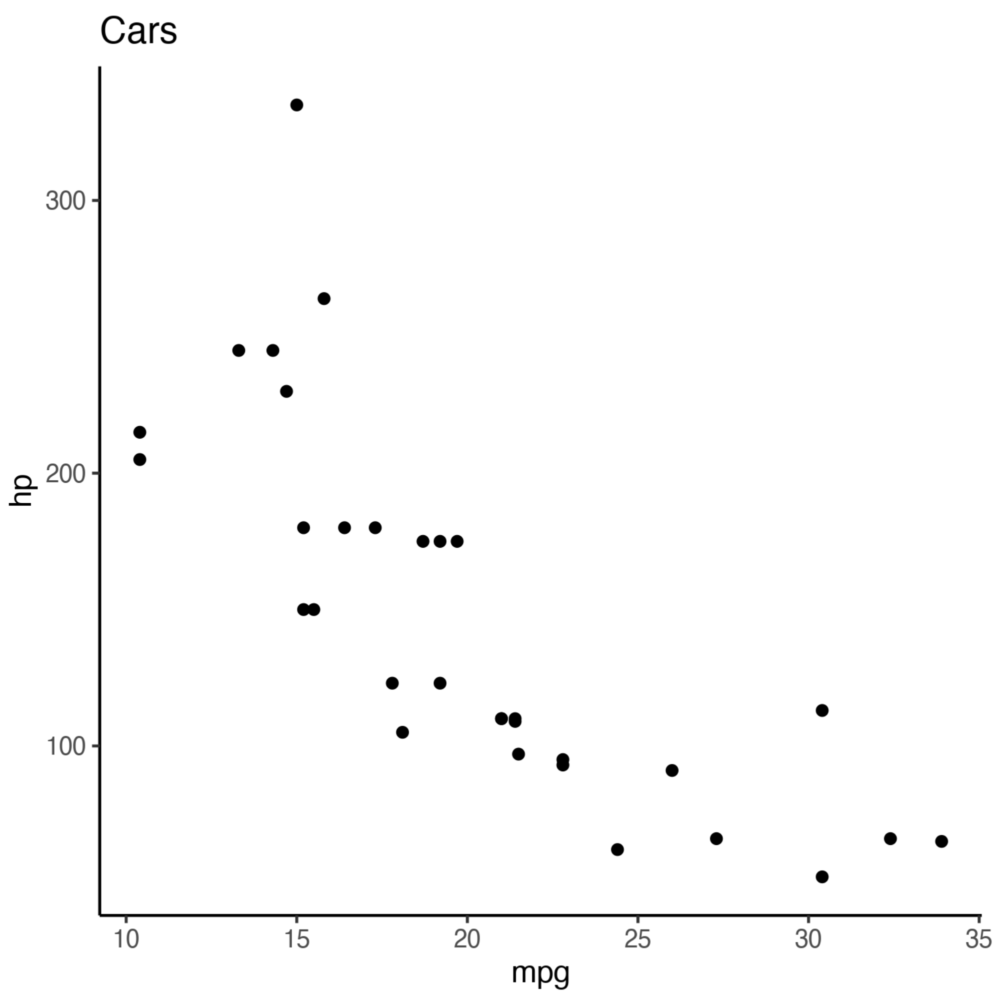

Figure 1: A cars plot

1.2 Equations

Like Lucazeau (2019), we exclude 4790 poor quality observations (Code 6 = D) from our analysis. We further remove 350 data points without heat flow observations and two without geographic information. Multiple observations at the same location are parsed to avoid singular covariance matrices during Kriging:

$$\begin{aligned} & f(X_i^q, Y_i^q) = \\ & X_i^q > Y_i^q \rightarrow z_i = x_i \\ & X_i^q < Y_i^q \rightarrow z_i = y_i \\ & X_i^q = Y_i^q \rightarrow z_i = RAND(x_i, y_i) \end{aligned} \tag{1}$$

where X_i^q and Y_i^q represent the quality of each duplicate observation pair at location i, $RAND$ is a random function that selects either the observation x_i or y_i, and z_i stores the observation selected by $f(X_i^q, Y_i^q)$. The final dataset used for Kriging has $n =$ 55274 observations after parsing $n = 32430$ duplicate observation. We use Equation 1 to

1.3 Code

You can link to code at `https://doi.org/10.17605/OSF.IO/CA6ZU`.

```
+proj=robin +lon_0=-155 +lon_wrap=-155 +x_0=0 +y_0=0
+ellps=WGS84 +datum=WGS84 +units=m +no_defs
```

1.4 Tables

Table 1: Car (mWm^{-2}) observations

n	mean	tot.hp	tot.cyl
32	20.09062	4694	198

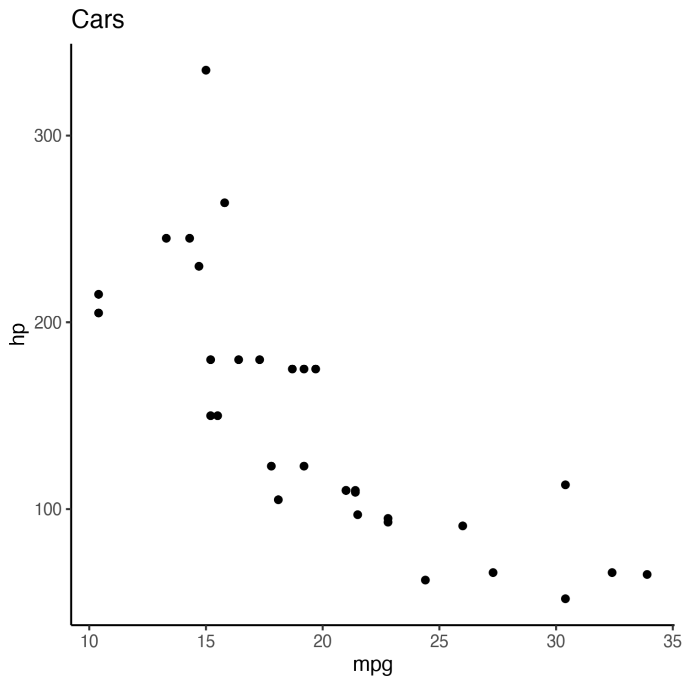

Figure 2: The total number of cylinders is 198 mWm^{-2} and highly skewed right

2 Lists

This study uses

1. Inconsistent patterns
2. Kriging and similarity
3. For testing hypotheses
4. Focused improvements
5. Improving Kriging

3 Open Research

All data, code, and heat flow interpolations can be found at `https://doi.org/10.17605/OSF.IO/CA6ZU`, the official Open Science Framework data repository. All code is MIT Licensed and free for use and distribution (see license details, sec. A.0.1).

Acknowledgments

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4 References

A Appendix

A.0.1 License

No license but a table in Table A.1

Table A.1: Parameters and ranges used in the optimization algorithm

Parameter	Search Domain	Units
Lag Cutoff (c)	[1/3, 1/15]	NA
Lag Window (w)	[1, 5]	NA
Model (m)	[Spherical, Exponential]	NA
Sill (s)	$[1, 1000\sqrt{2}]$	mWm^{-2}
Effective Range (a)	[1, 1000]	km
Nugget (n)	$[1, 1000\sqrt{2}]$	mWm^{-2}
Local Search (S)	[1, 10000]	km

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