DATA, MODELS & UNCERTAINTY IN THE NATURAL SCIENCES

Problem Set 4

In the data file
`http://geoweb.princeton.edu/people/simons/CSV/geiger_student.asc`, or else
`http://geoweb.princeton.edu/people/simons/CSV/geiger_student.mat`,
you will find a set of station locations ($\mathbf{x}, \mathbf{y}, \mathbf{z}$) and first arrival times ($\mathbf{t}$), measured at those stations, of an earthquake of unknown location (x, y, z) and origin time t. The homogeneous medium is characterized by a seismic wave speed of 5615 m/s.

I made these data up; they are noisy.

Estimate the location (in space and time) of the earthquake, and the uncertainties surrounding your estimate, as best you can, by *Geiger's method* — the gradient search that we discussed in class.

Do read up on the general methods in book chapters by Aki & Richards or Lay & Wallace, available on the e-Reserves.

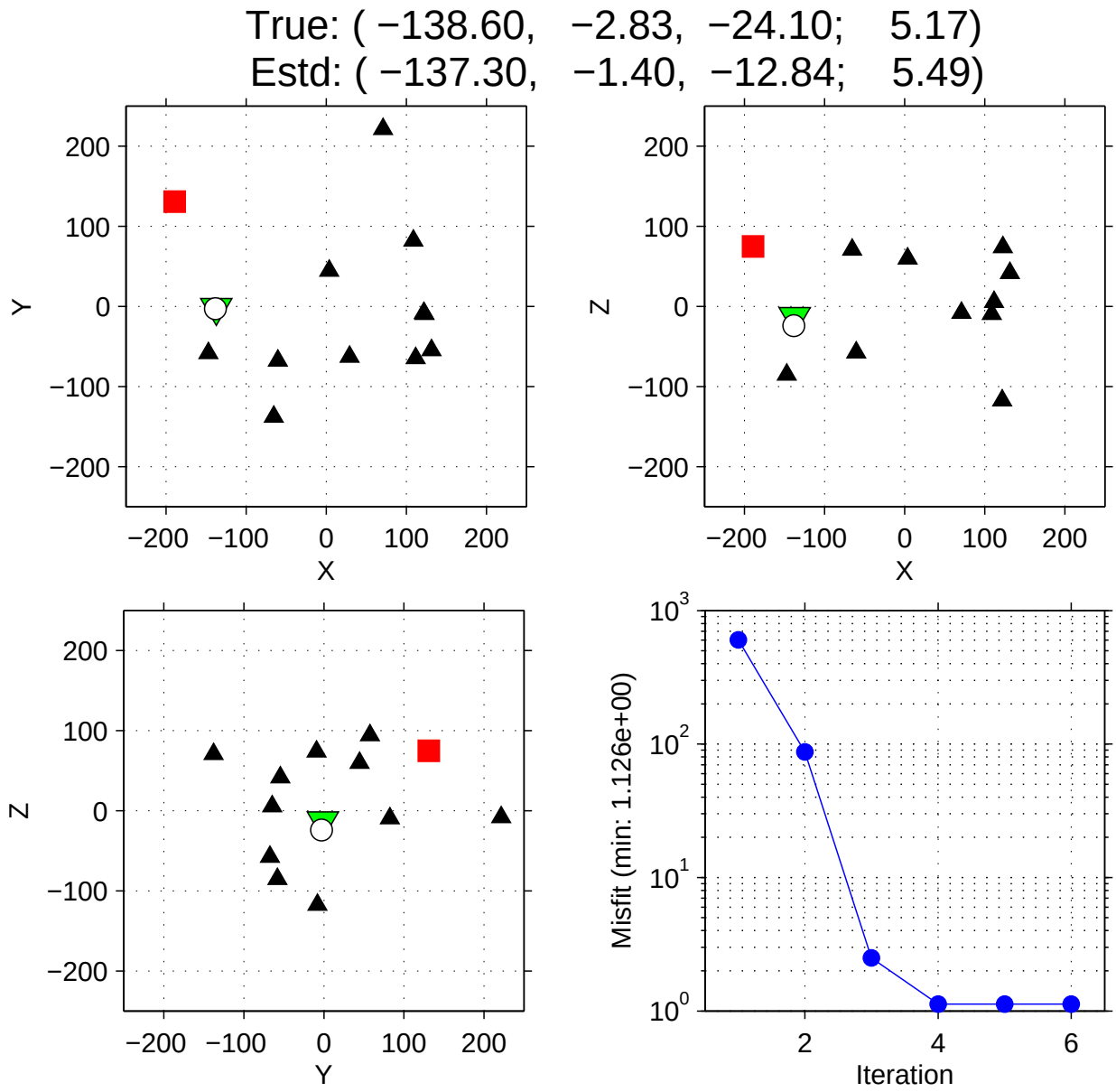

Figure 1: A sample run of my own `geiger`. Dots the true earthquake location, green triangle the estimated location, and the curve linking the blue dots the misfit evolving over the iterations of this nonlinear inversion problem.