Radar data & noise

Making synthetic noise look like real noise

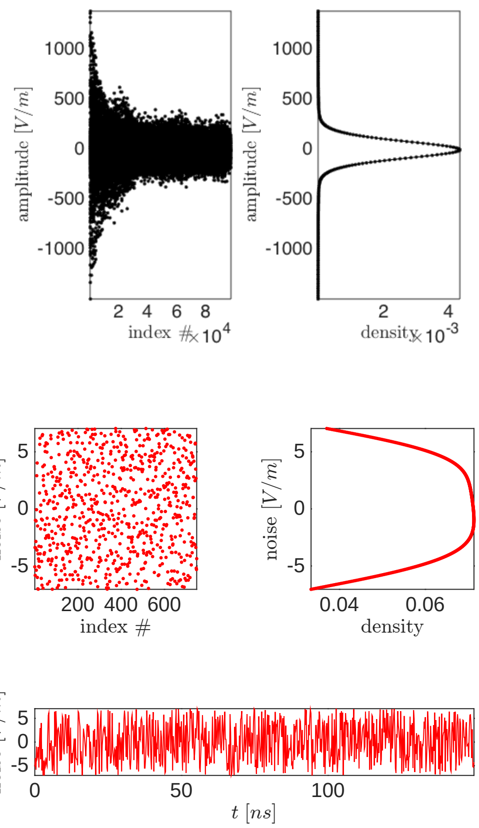

Figure 1: **Top:** probability density of all amplitudes in a field-collected shot gather. **Bottom:** probability density of one trace of the *white gaussian* noise vector.

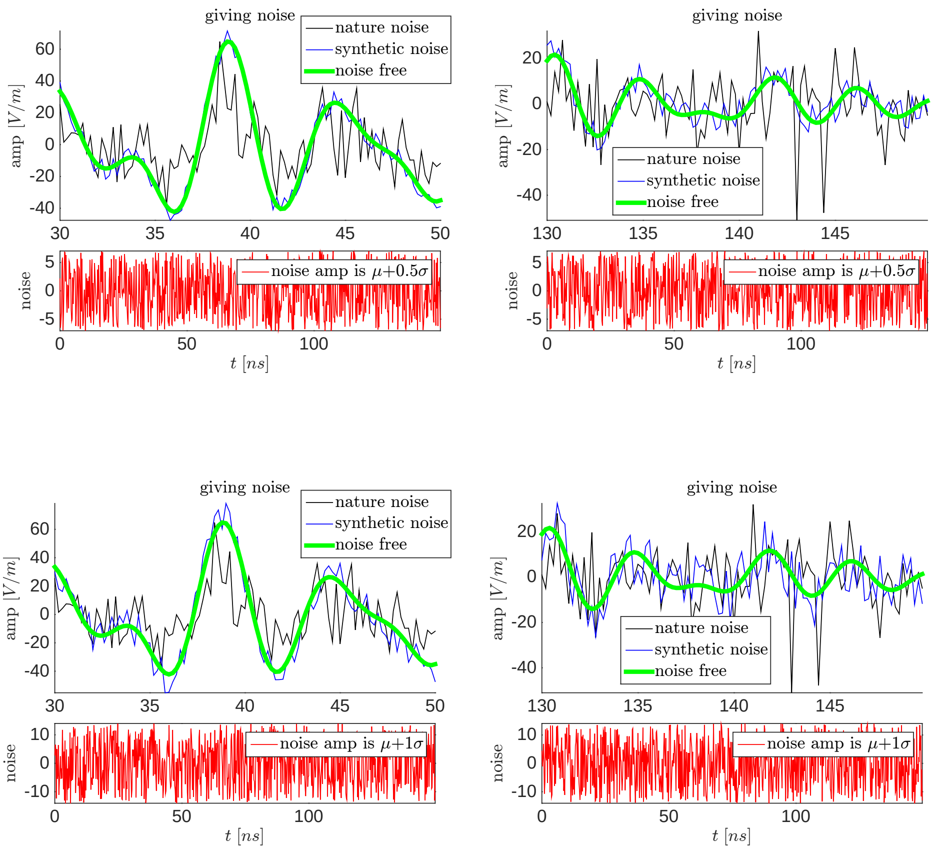

Figure 2: Different noise amplitudes for the same trace zoomed in on early and late times.

Synthetic data with synthetic noise

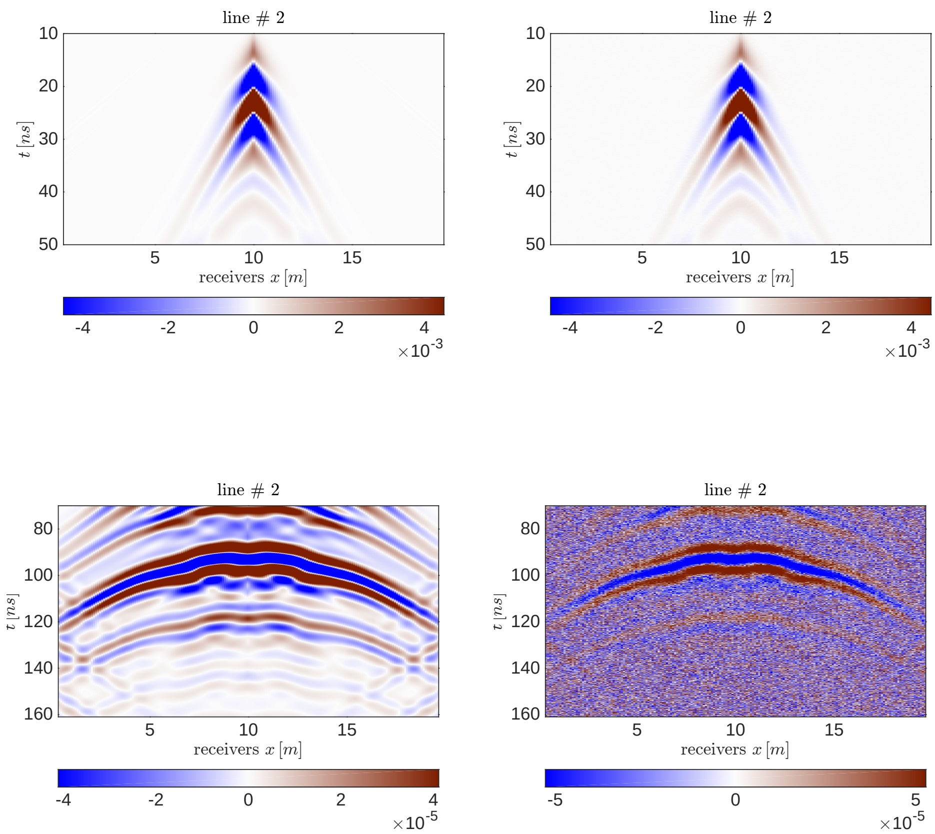

Figure 3: Noise-free (**left**) and noisy data (**left**) with $\pm 10\%$ of the noise-free std for the same shot gather zoomed in on early and late times.

Measuring noise propagation in the inversion

Let $y = f(x)$ be a real function on the vector x. We can measure the error propagation of x on y by

$$\mathsf{std}(y) \approx \sqrt{\left(\sum_i \partial_{x_i} f \cdot \mathsf{std}(x_i)\right)^2}. \tag{1}$$

In order to get uncertainty measurements on the parameters, what about thinking of f as the inversion routine, y as the parameters and x as the observed data?

$$\mathsf{std}(\varepsilon) \approx \sqrt{\left(\sum_i \partial_{d_i^o} \varepsilon \cdot \mathsf{std}(d_i^o)\right)^2} \tag{2}$$

$$\nabla_{d^o} \varepsilon \approx \frac{\varepsilon(d^o + \varsigma d^o) - \varepsilon(d^o)}{\varsigma} \tag{3}$$