Rayleigh wave parameters

Tanner Prestegard

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Rayleigh wave parameterization

$$u = r_1\left(z, k, \omega\right)\sin\left(kx - \omega t\right)$$

$$w = r_2\left(z, k, \omega\right)\cos\left(kx - \omega t\right)$$

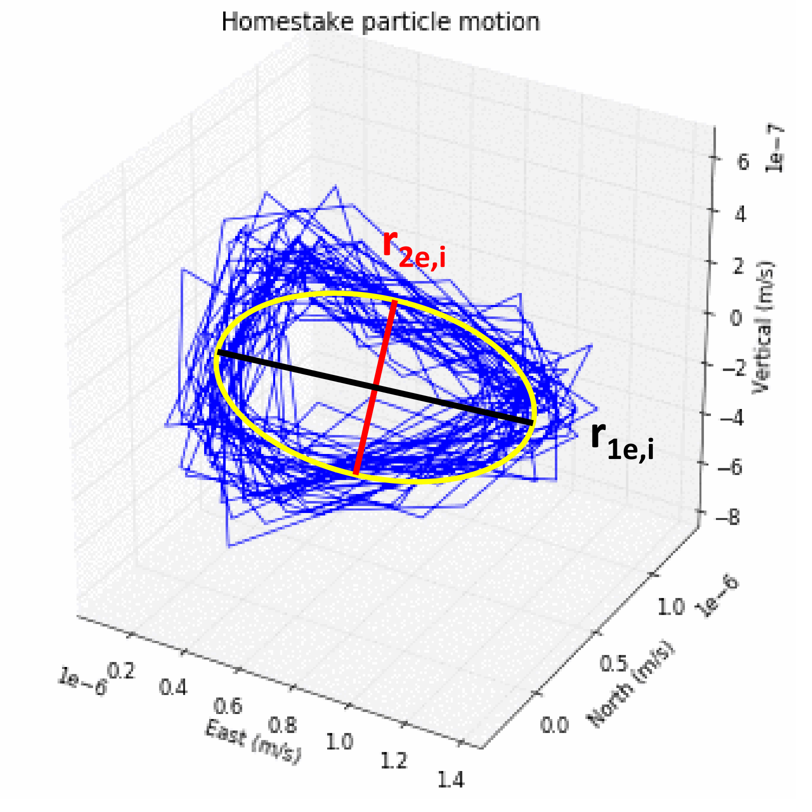
Eigenfunctions are given by:

$$r_1 = C_{11}e^{-a_{11}kz} + C_{12}e^{-a_{12}kz}$$

$$r_2 = C_{21}e^{-a_{21}kz} + C_{22}e^{-a_{22}kz}$$

Particle motion

- Using observations of Rayleigh waves from station *i*, we can estimate the eigenfunction parameters.
- Example gif: [link]



Likelihood function

- Pick some set of *C* and *a* parameters and generate $r_1(C,a)$ and $r_2(C,a)$.
- The likelihood can be estimated as

$$\mathscr{L} \propto e^{-(r_1(C,a)-r_{1e,i})^2} e^{-(r_2(C,a)-r_{2e,i})^2}$$

- For multiple stations (*i*) and multiple observations of Rayleigh waves (*j*):

$$\mathscr{L} \propto \prod_i \prod_j e^{-(r_{1,j}(C,a)-r_{1e,ij})^2} e^{-(r_{2,j}(C,a)-r_{2e,ij})^2}$$

How to deal with *k*?

- $k = 2\pi f/v$
- Can probably estimate *f* from particle motion.
- Could parameterize *v* as a power law and include its index as another parameter to estimate.