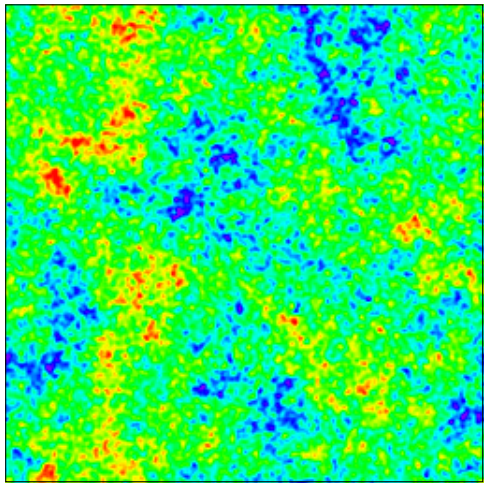
Specifying Initial Stress for Dyanamic Heterogeneous Earthquake Source Models

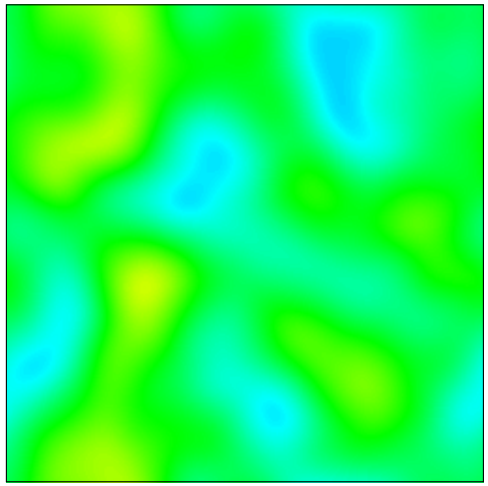
D. J. Andrews and Michael Barall

2D Self-similar random function

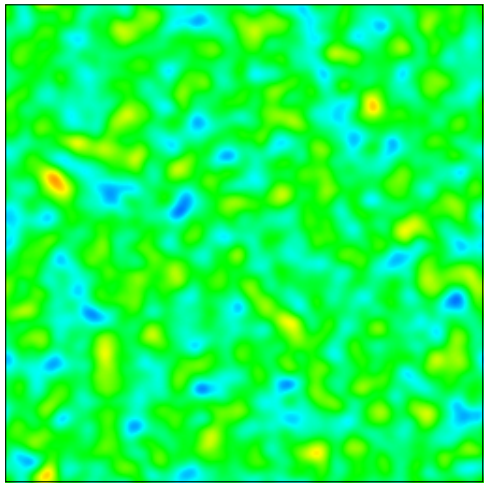


$1 < 1/\lambda < 64$

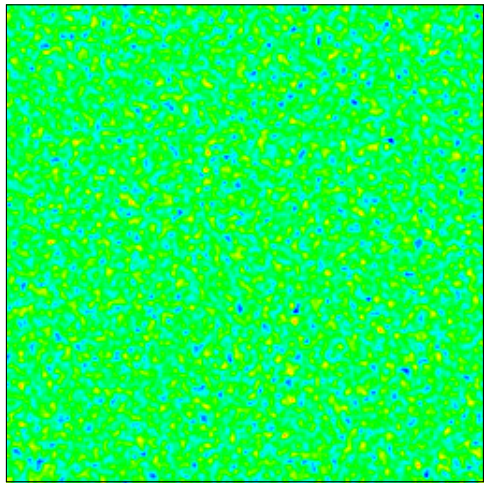
Band-pass filtered functions (all with same color scale)



$1 < 1/\lambda < 4$



$4 < 1/\lambda < 16$



$16 < 1/\lambda < 64$

Self-similar function

$w(x,z)$

Ratio of shear stress to normal stress

$\tau/\sigma = [\, f_d + \alpha\, w(x,z) \,]\, D(z)$

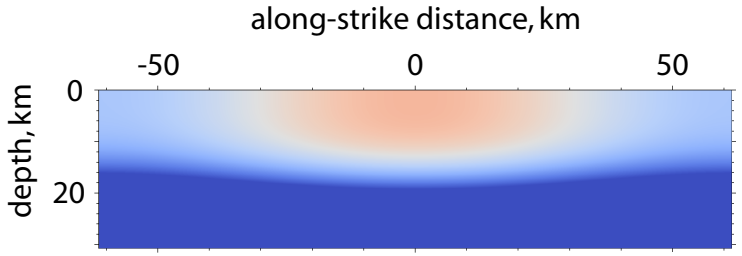
where

f_d dynamic friction coefficient

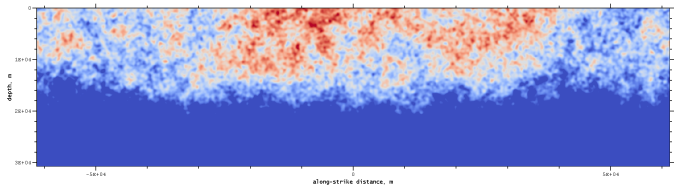
α scale factor

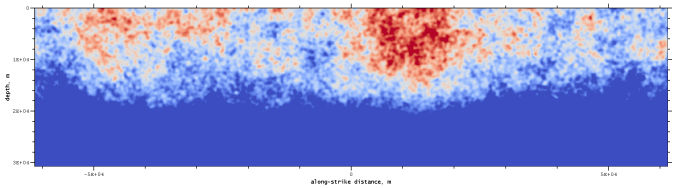
$D(z)$ depth conditioning function

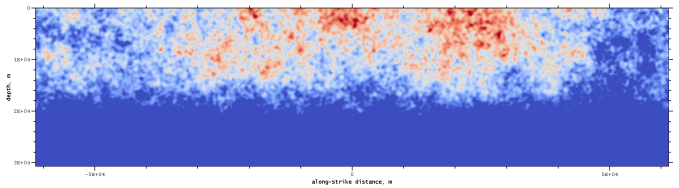
Stress ratio minus dynamic friction

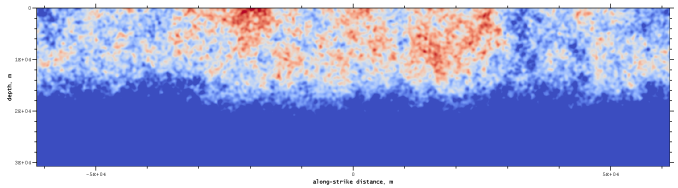


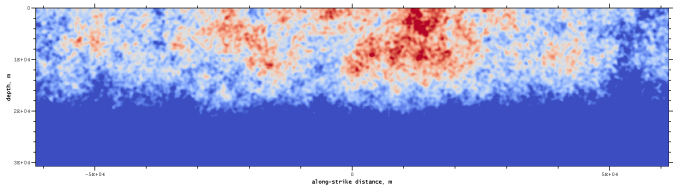
Five random models, Gaussian distribution



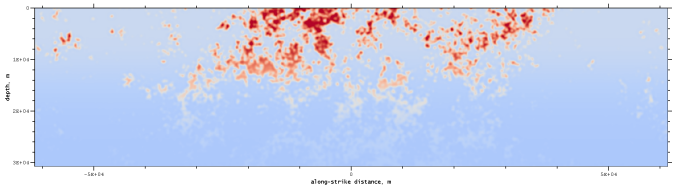


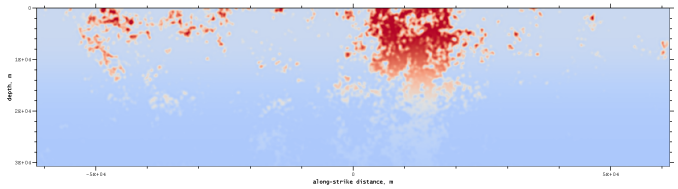


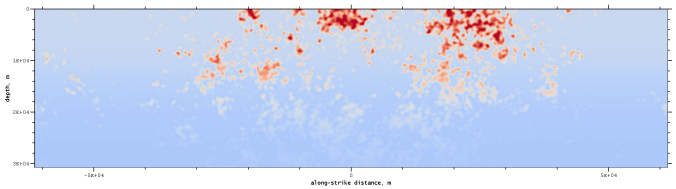


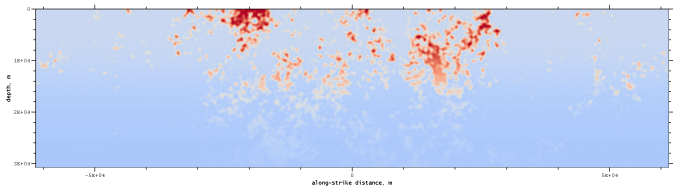


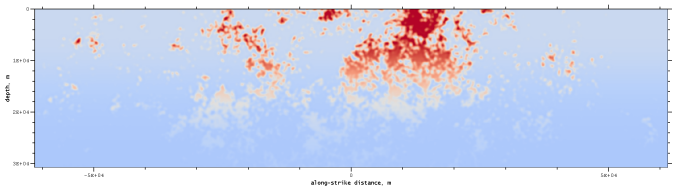
Five random models, Asperity distribution











D_C is **not** constant.

It is a myth that the friction law
determines the physics of faulting.
Off-fault energy loss is more important.

Joe Andrews' choices for dynamic rupture modeling:

1. Time weakening
2. Prescribed initiation
3. Velocity toughening

To model an event with different magnitude,
adjust parameters of this model.

L Rupture length
z_0 Characteristic depth in depth-conditioning function
α Scale factor, determines average stress drop