NEW DEM APPROACHES

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Remove the Data Outside of the Disc

$$X = 1 : 256$$
$$Y = [129 - [\sqrt{128.5^2 - (128.5 - X)^2}] : 128 + [\sqrt{128.5^2 - (128.5 - X)^2}]]$$

$256^2 = 65536$ pixels changed to 51608.

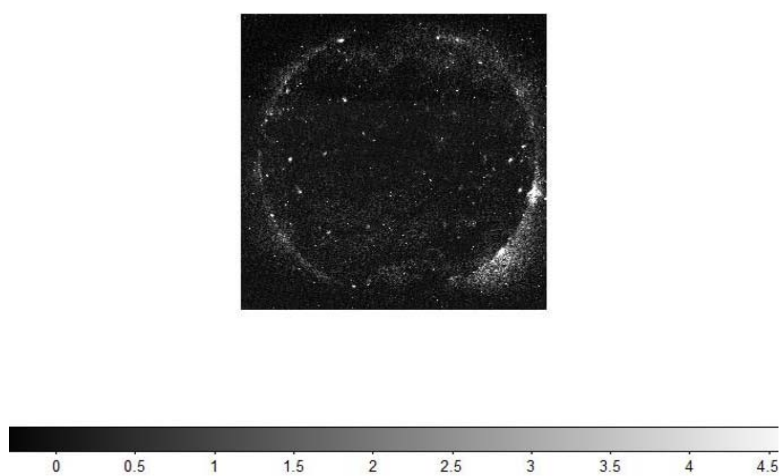

Figure 1: Original Figure

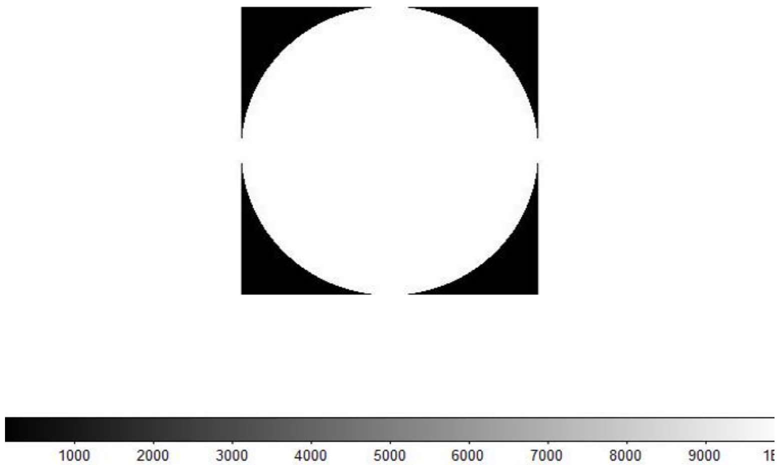

Figure 2: Disk of The Sun

Negative values issue

Name	Positive values(Original)	Positive(Disk)
xrt_331_Be_med_Open.fits	0.6711	0.6876
xrt_332_Al_poly_Open.fits	0.9700	0.9974
xrt_333_C_poly_Open.fits	0.9862	0.9982
xrt_334_Al_poly_Ti_poly.fits	0.9596	0.9939
xrt_335_Be_thin_Open.fits	0.8974	0.9334
xrt_336_Al_med_Open.fits	0.6720	0.6928
xrt_338_Open_Al_thick.fits	0.4534	0.4511
xrt_339_Open_Be_thick.fits	0.5489	0.5542

The most interesting figure is xrt_338_Open_Al_thick.fits, the percentage of pixels with positive value is less than 0.5.

New DEM Model

Without consideration of Guassian Random Field

$$I_b * time = (\sum_{t=1}^{T} \beta_t M_{bt}) * time + e_{ijb}$$

$$sd(e_{ijb}) \propto (I_b * time + \sigma_b)$$

Where σ_b is computed from the magnitude of the negative values of I_b in the data. (Fit a half normal with mode zero to the negative values in I_b, and use the fitted σ_b.)

$\Longrightarrow$

$$\frac{I_b * time}{I_b * time + \sigma_b} = (\sum_{t=1}^{T} \beta_t M_{bt}) \frac{time}{I_b * time + \sigma_b} + \hat{e}_{ijb}$$

$$\hat{e}_{ijb} \sim iid$$

Estimate of σ

1. Find out all the negative values in the disk of Image b, form a vector V_n
2. Get a new vector, V=c(V_n , -V_n)
3. $\hat{\sigma}_b$= sd(V)

Name	$\hat{\sigma}_b$
xrt_331_Be_med_Open.fits	0.12
xrt_332_Al_poly_Open.fits	10.2
xrt_333_C_poly_Open.fits	4.887
xrt_334_Al_poly_Ti_poly.fits	2.42
xrt_335_Be_thin_Open.fits	0.274
xrt_336_Al_med_Open.fits	0.063
xrt_338_Open_Al_thick.fits	0.0602
xrt_339_Open_Be_thick.fits	0.0537

Fit of New Model

Here, the range of Temperature is from 5.5 to 7.5, and the knots of splines are 6, 6.5 and 7.5

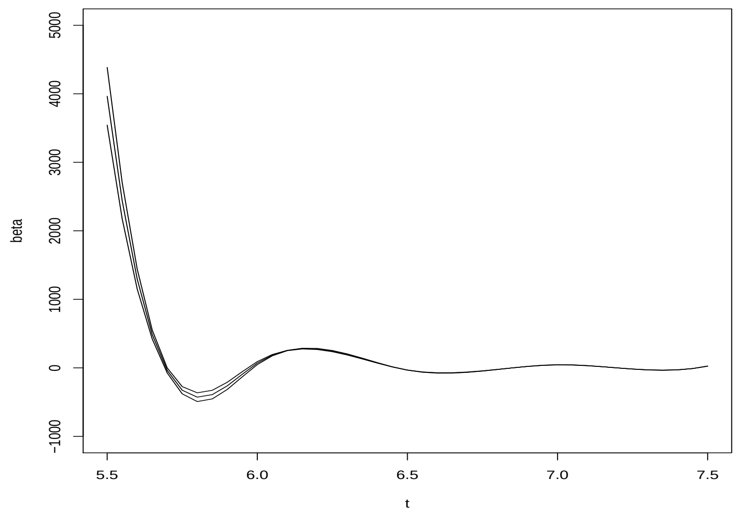

Figure 3: Interesting:The trend changed little as I did before, while the scale of Beta changed a lot, about 10 times less.

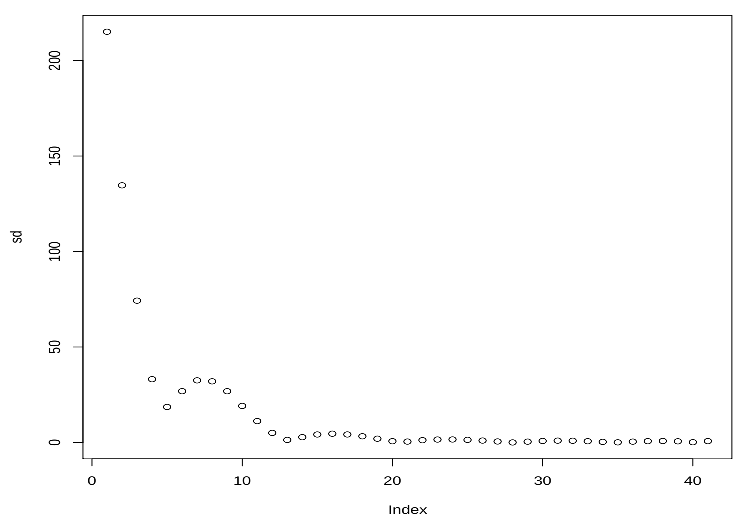

Figure 4: sd's are quite small

Summary for the random fields package

1. Simulation:
CondSimu: the function returns conditional simulations of a Gaussian random field
GaussRF: These functions simulate stationary spatial and spatio-temporal Gaussian random fields using turning bands/layers, circulant embedding, direct methods, and the random coin method.
SimulateRF: Simulation of Random Fields

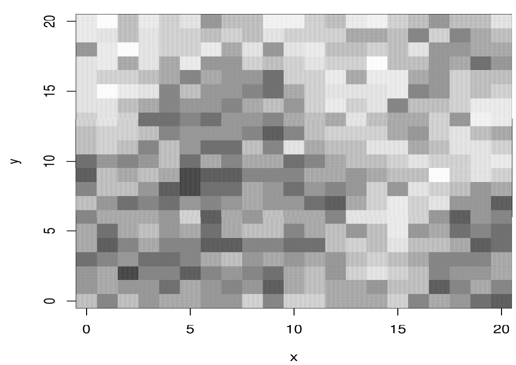

Figure 5: This is simulated Random Gaussian Field with mean=0, variance=4, nugget=1, scale=10, alpha=1. This covariance model is ”stable”, that means $C(X) = exp(-x^{\alpha})$, and the total covariance is nugget + variance*cov()/scale.

2. Fit model parameters
fitvario: LSQ and Maximum Likelihood Estimation of Random Field Parameters
RFparameters: RFparameters sets and returns control parameters for the simulation of random fields

3. Kriging:

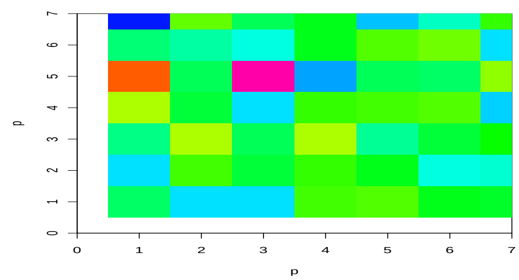

Figure 6: Before kriging

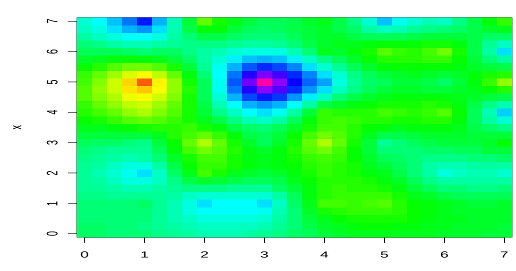

Figure 7: After kriging

4. Regression: Interactive Regression plot
5. other commands that i don't understand.