

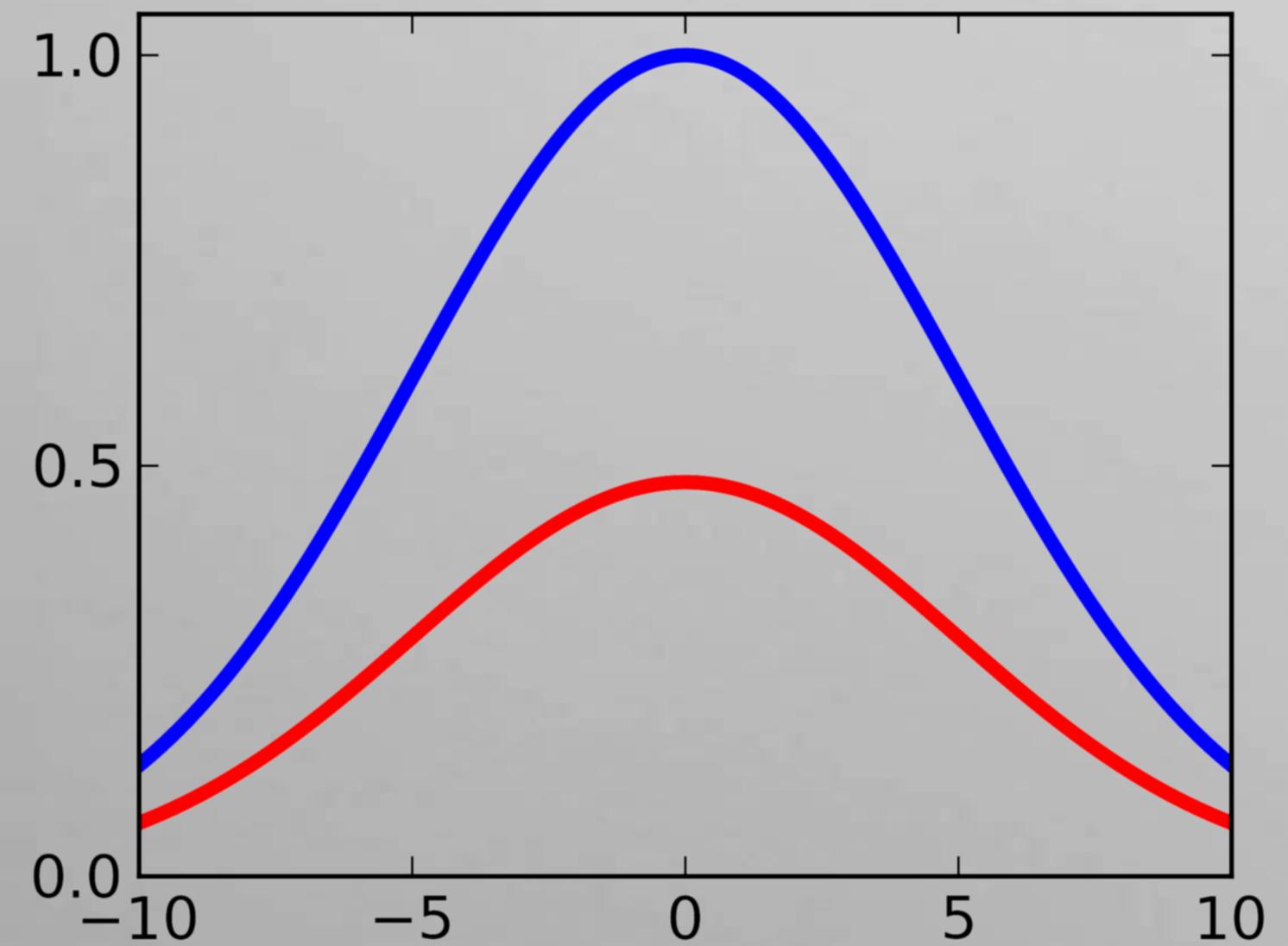


Use of the “shape-of-anomaly” data misfit in 3D inversion by planting anomalous densities

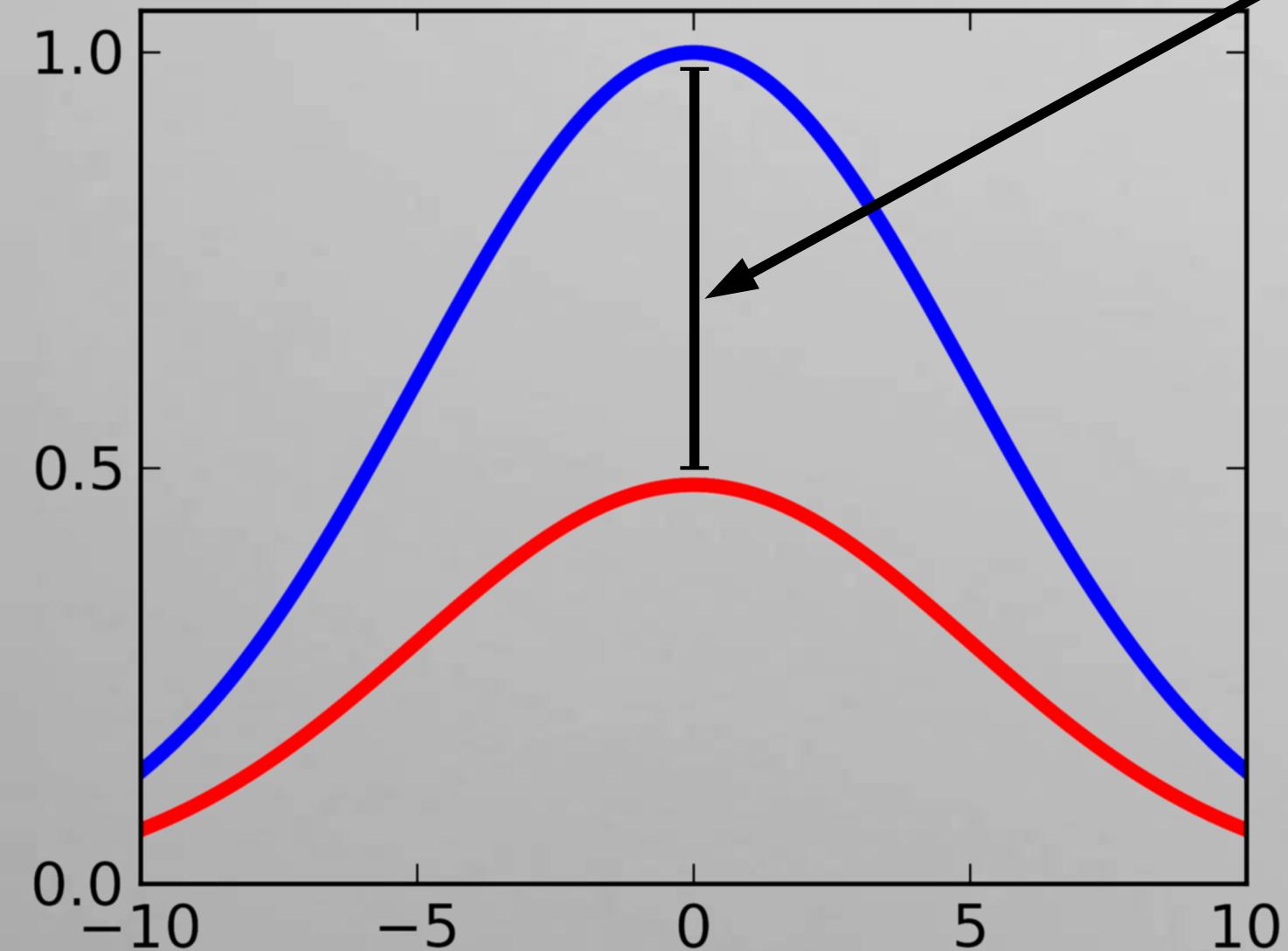
Leonardo Uieda

Valéria C. F. Barbosa

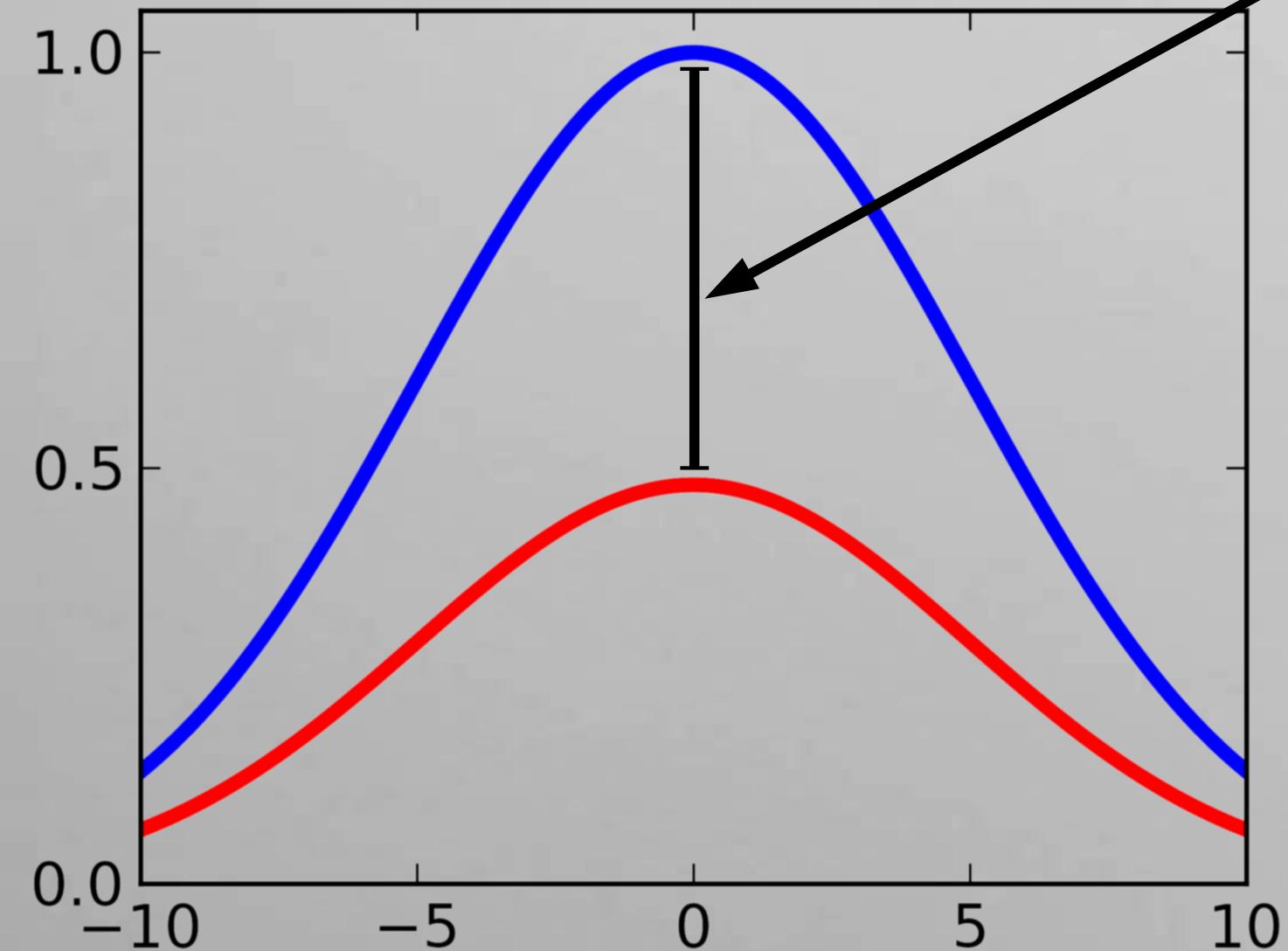
Difference in shape



Scale factor: $d_i = \alpha g_i$

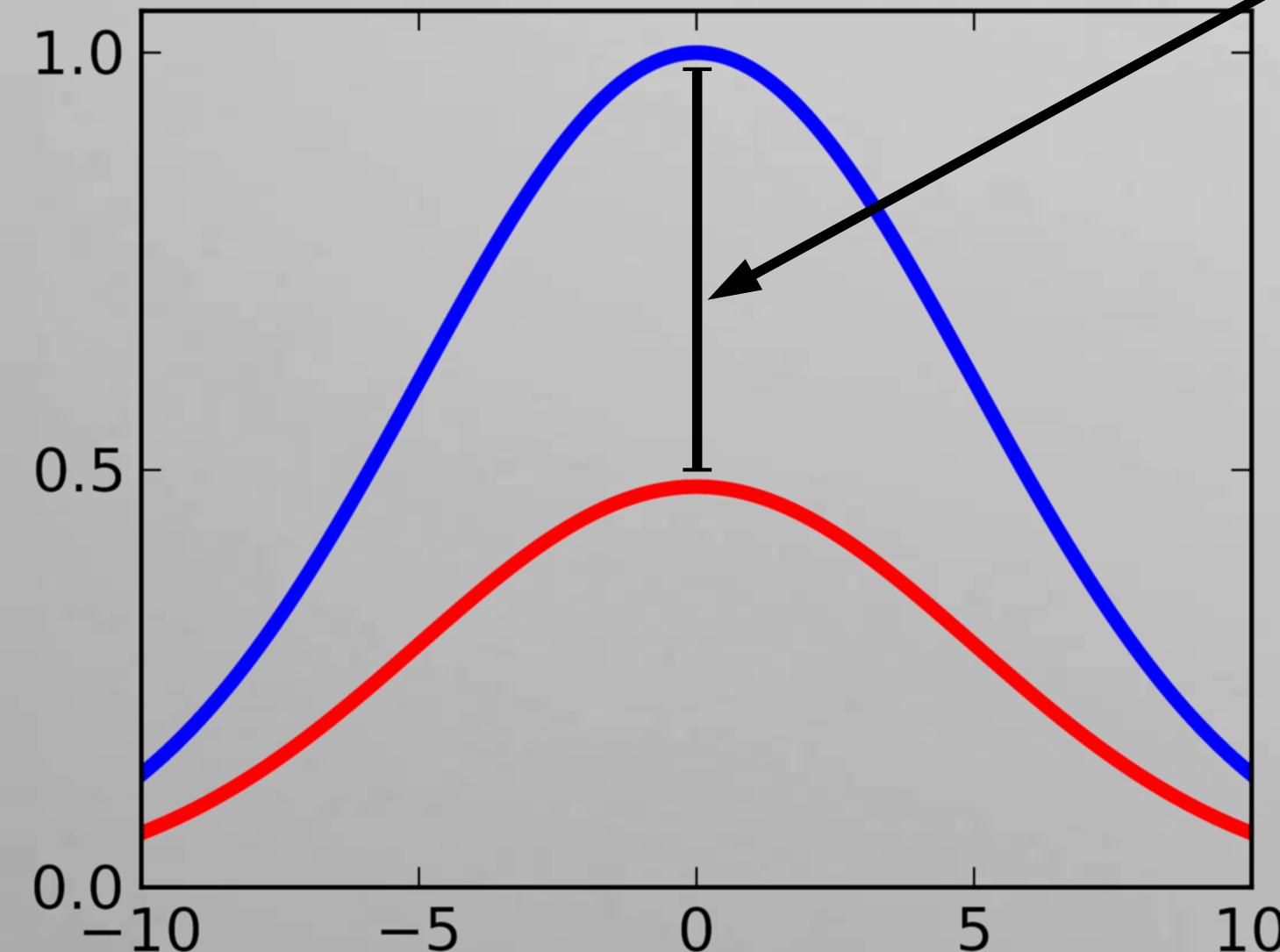


Scale factor: $d_i = \alpha g_i$



$$SOA = \sqrt{\sum_{i=1}^N (\alpha g_i - d_i)^2}$$

Scale factor: $d_i = \alpha g_i$

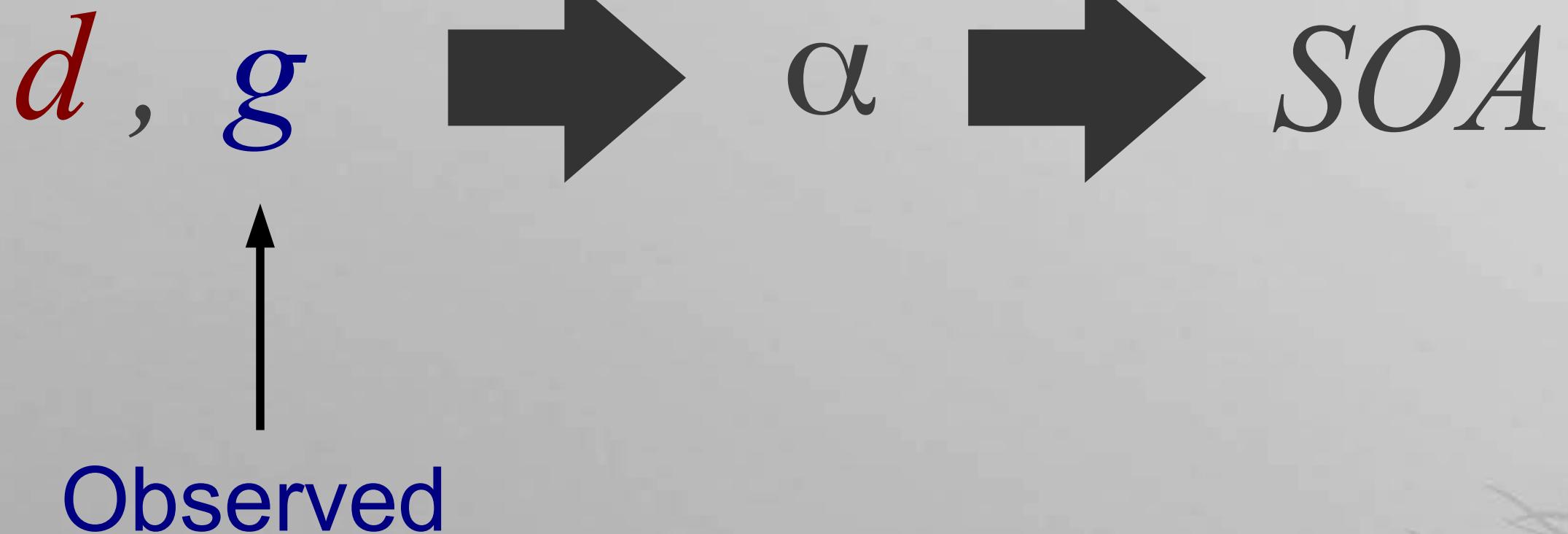


$$SOA = \sqrt{\sum_{i=1}^N (\alpha g_i - d_i)^2}$$

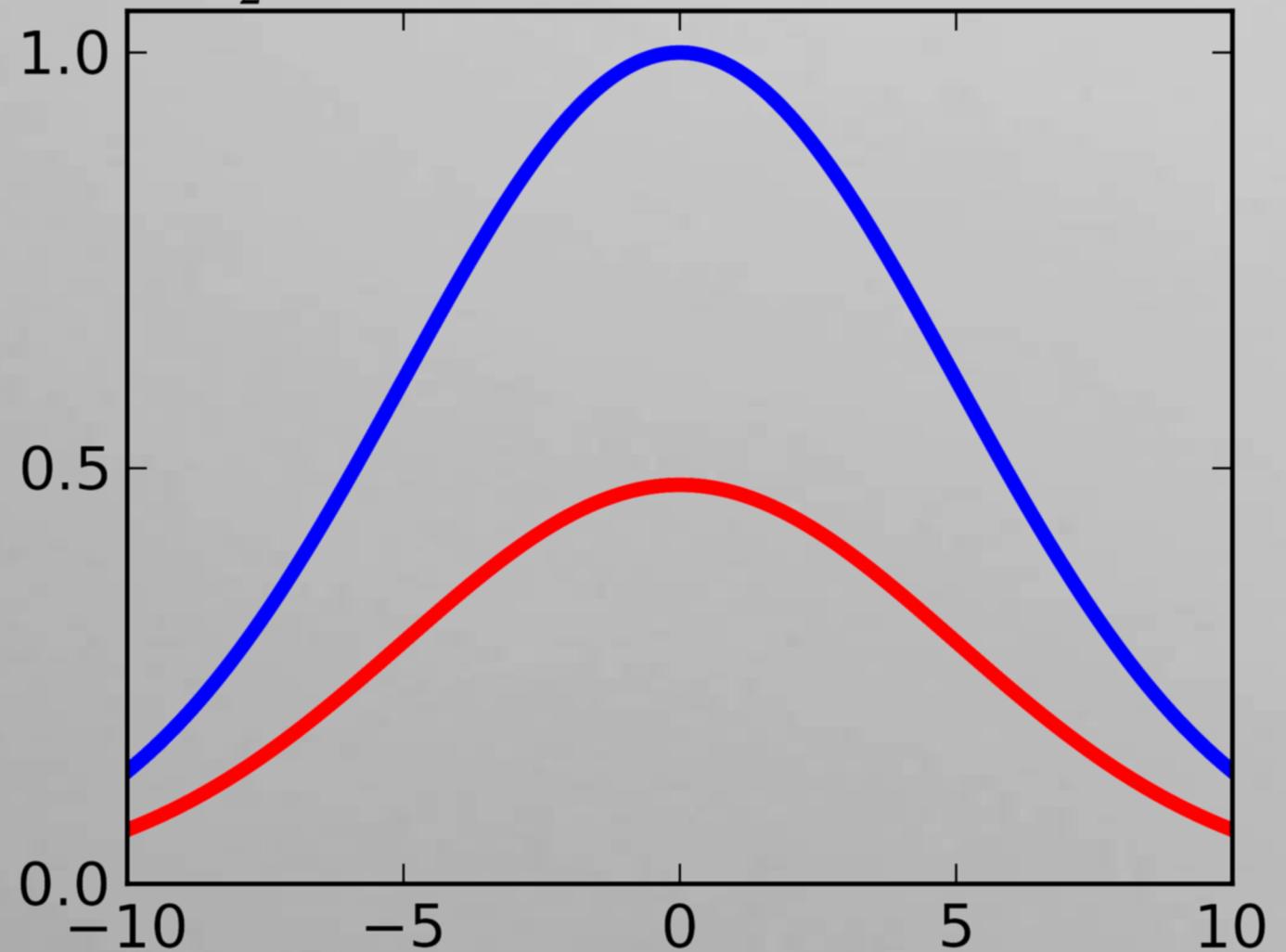
$\min SOA \rightarrow$

$$\alpha = \frac{\sum_{i=1}^N g_i d_i}{\sum_{i=1}^N g_i^2}$$

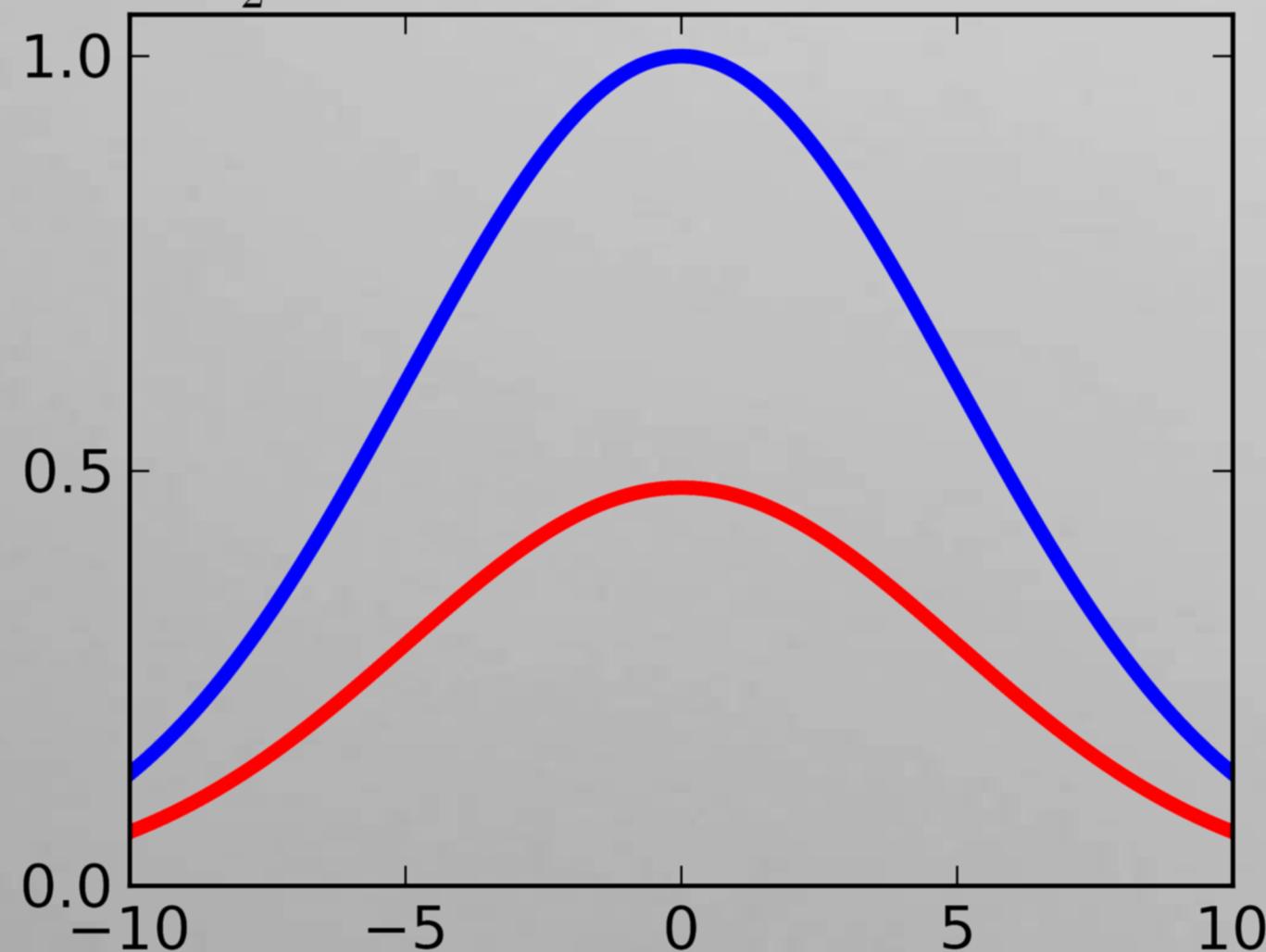
Predicted (model)



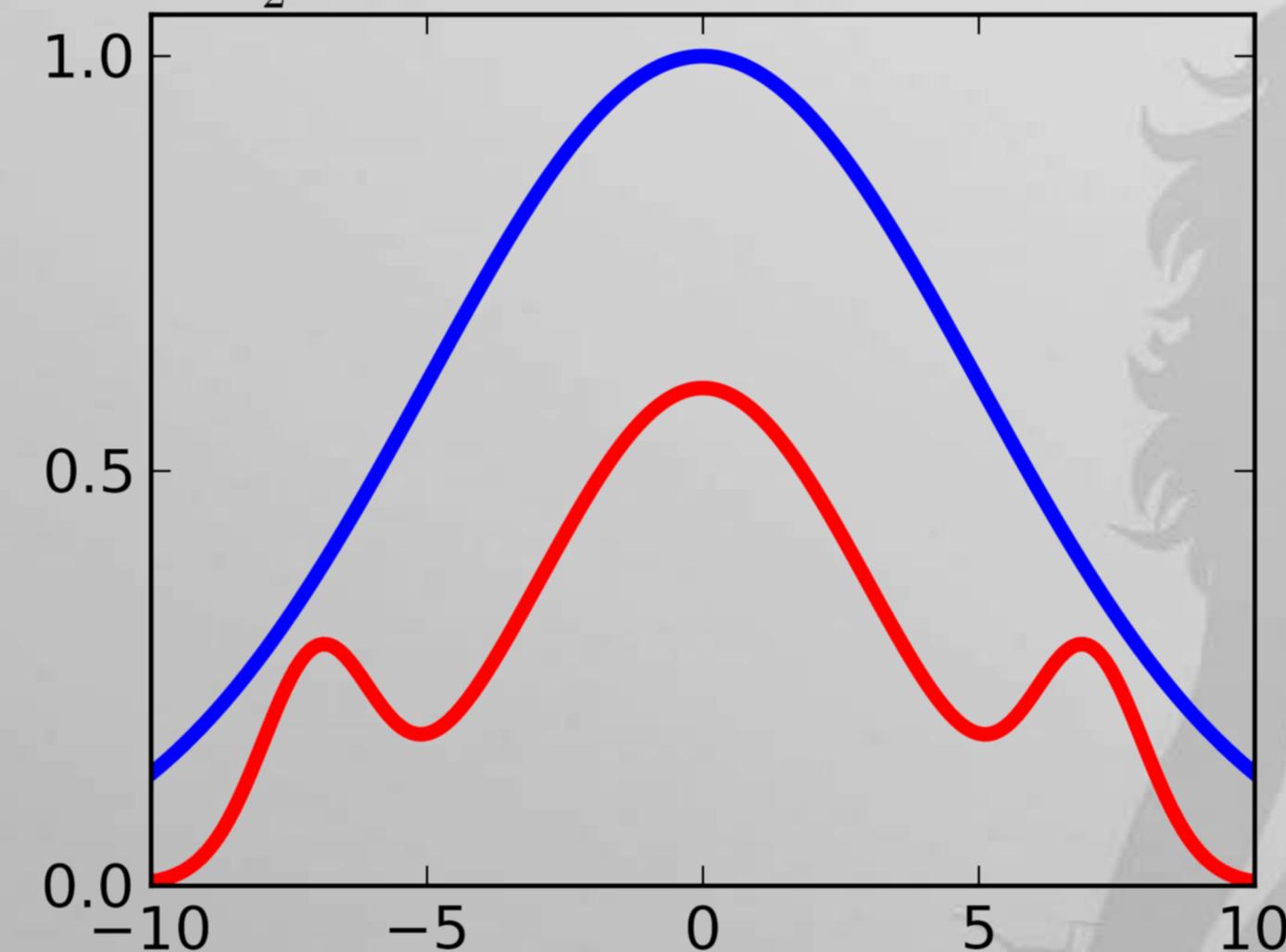
shape-of-anomaly = 0.00
 ℓ_2 -norm data-misfit = 0.52



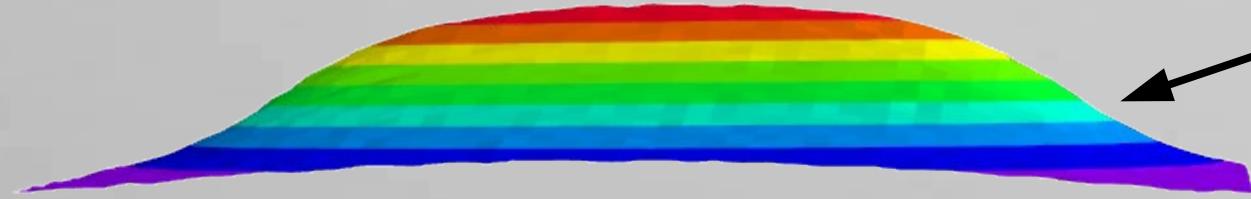
shape-of-anomaly = 0.00
 ℓ_2 -norm data-misfit = 0.52



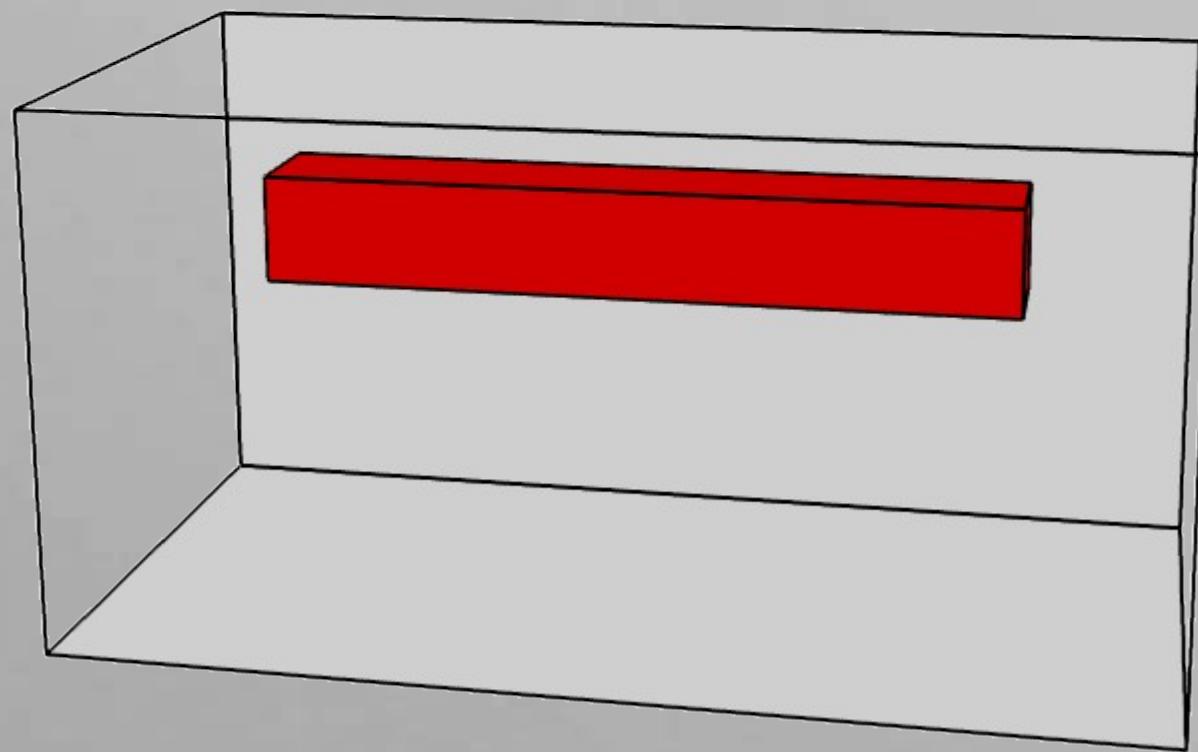
shape-of-anomaly = 1.08
 ℓ_2 -norm data-misfit = 0.52

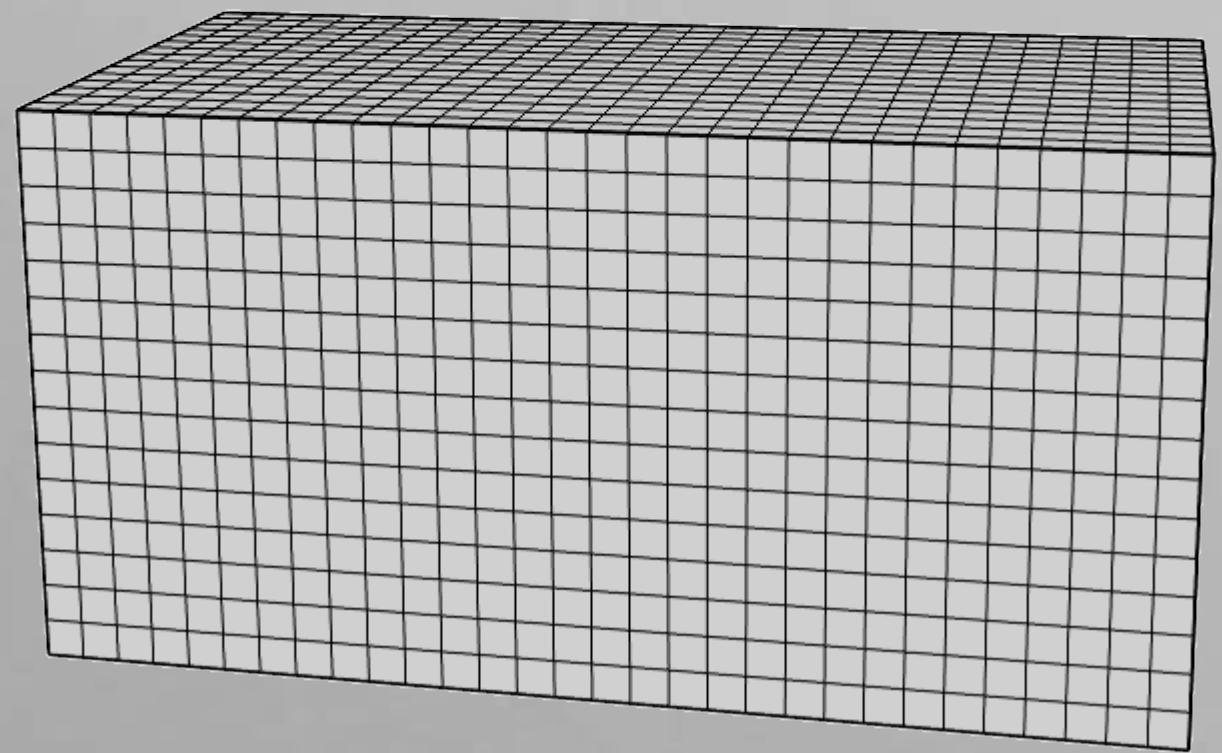
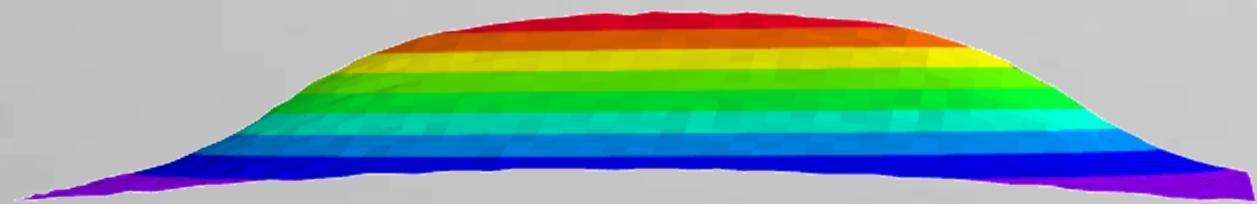


Planting anomalous densities

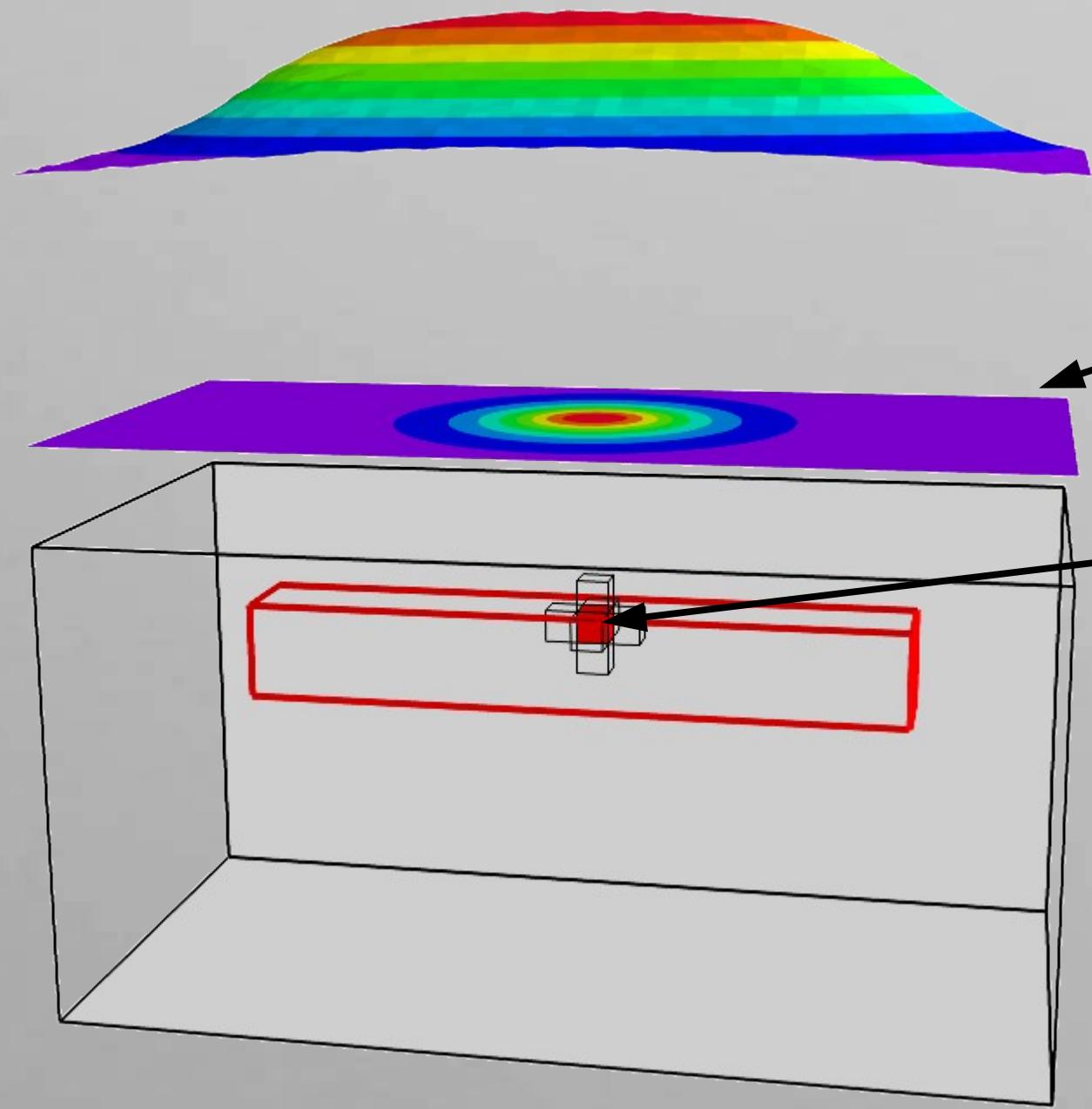


g_i (observed)





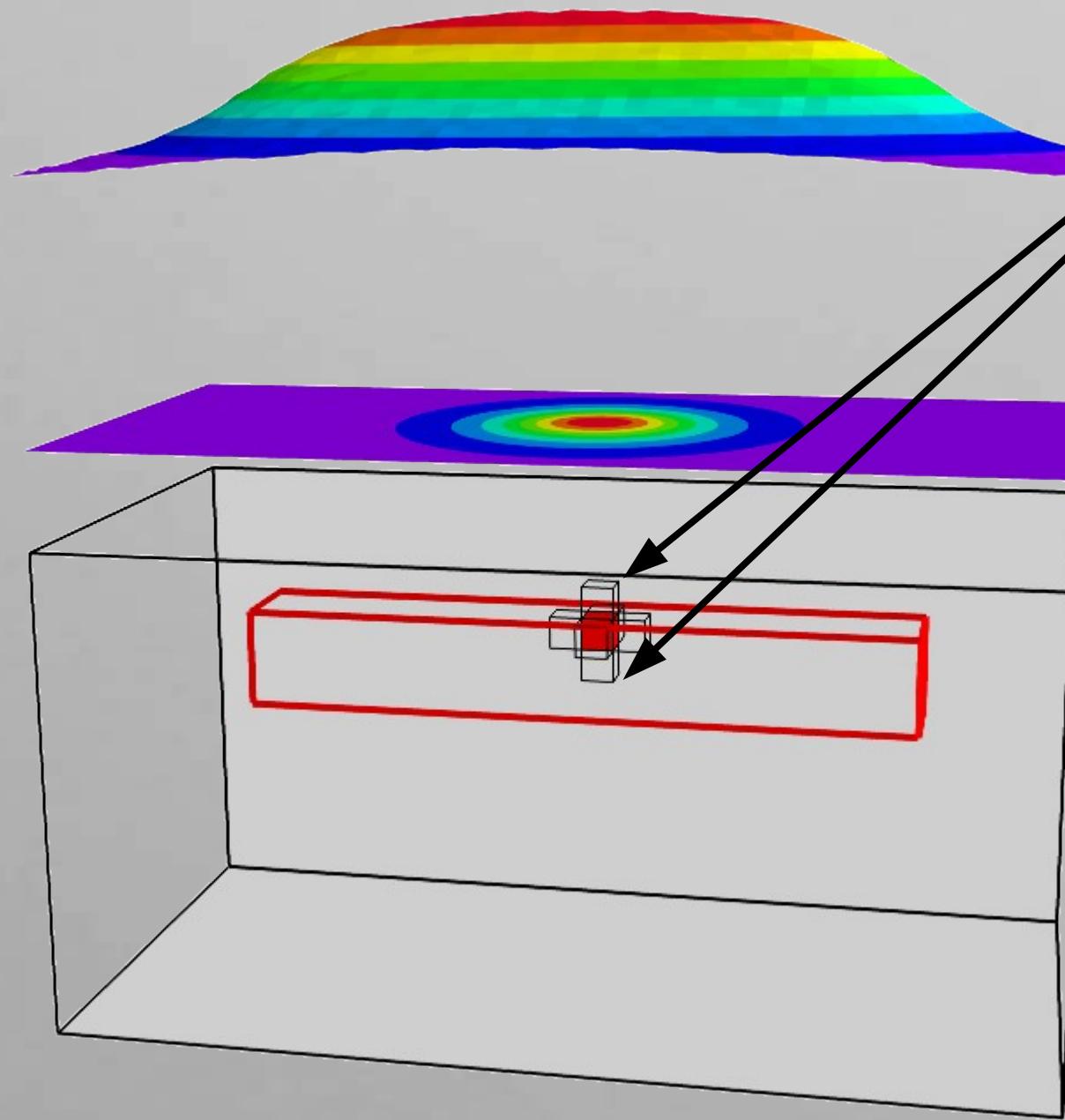
mesh



d_i (predicted)

seed

Choose the best:

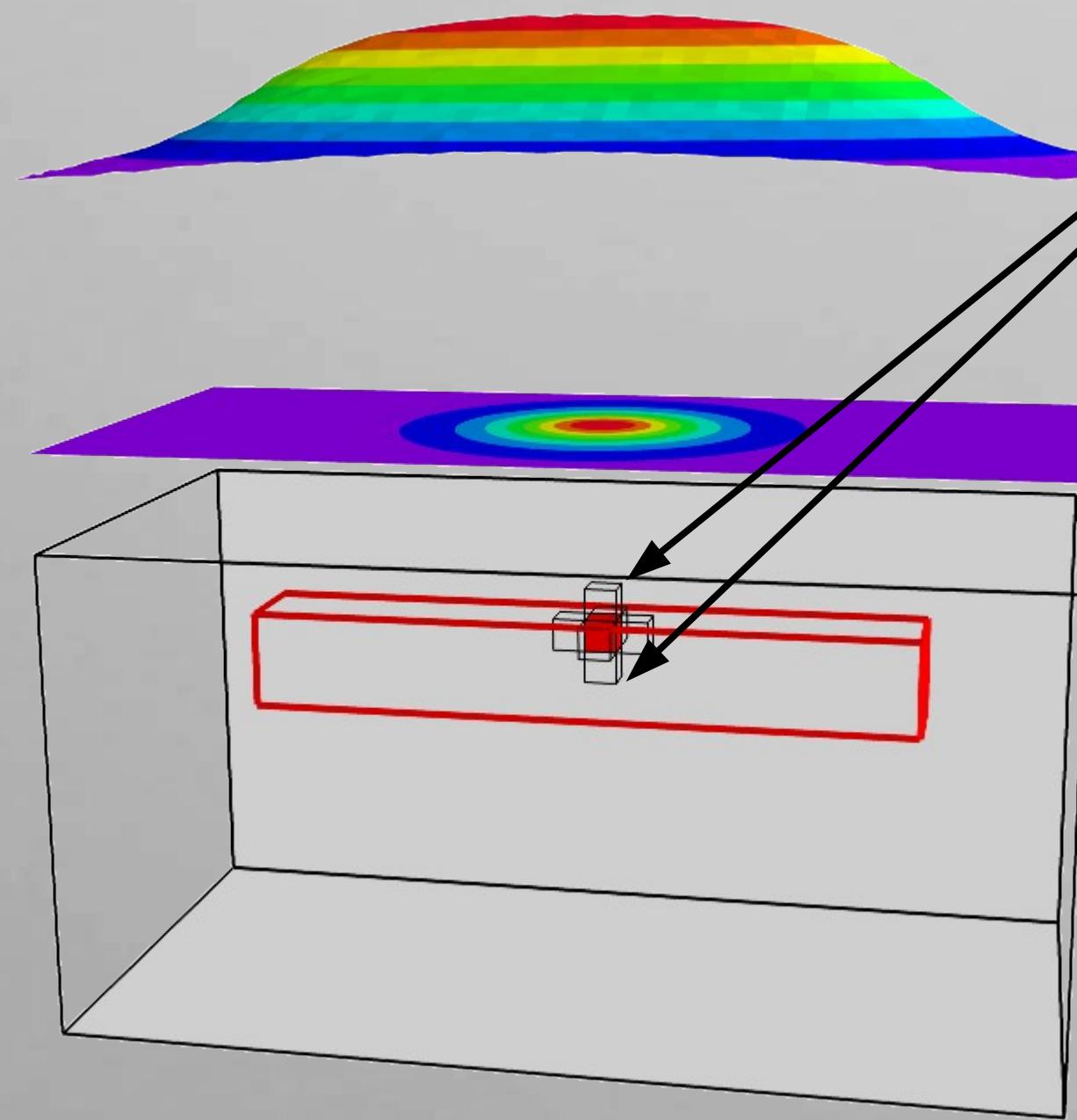


$$\phi = \sqrt{\sum_{i=1}^N (g_i - d_i)^2}$$

&

$$\min \text{ of } \Gamma = \phi + \mu \theta$$

compactness



Choose the best:

$$\phi = \sqrt{\sum_{i=1}^N (g_i - d_i)^2}$$

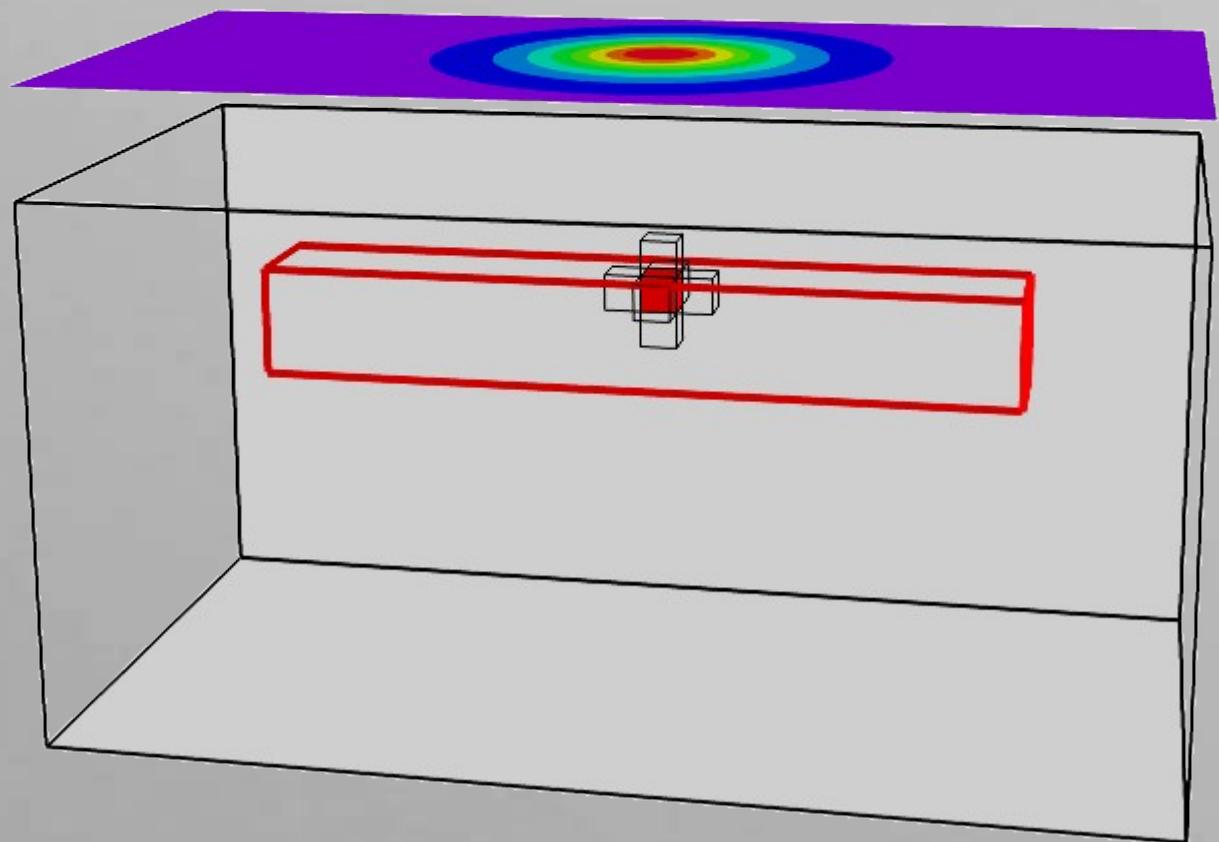
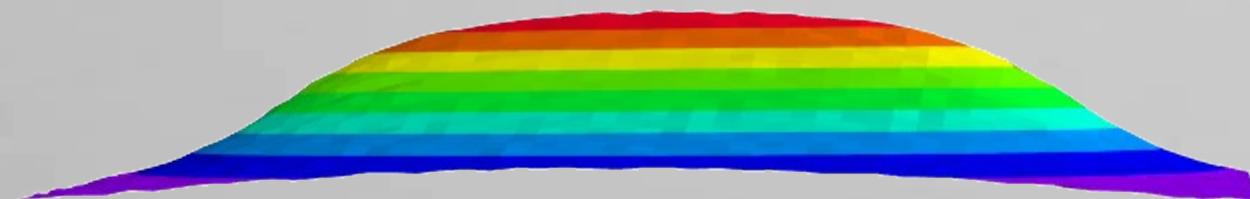
&

$$\min \text{ of } \Gamma = SOA + \mu \theta$$

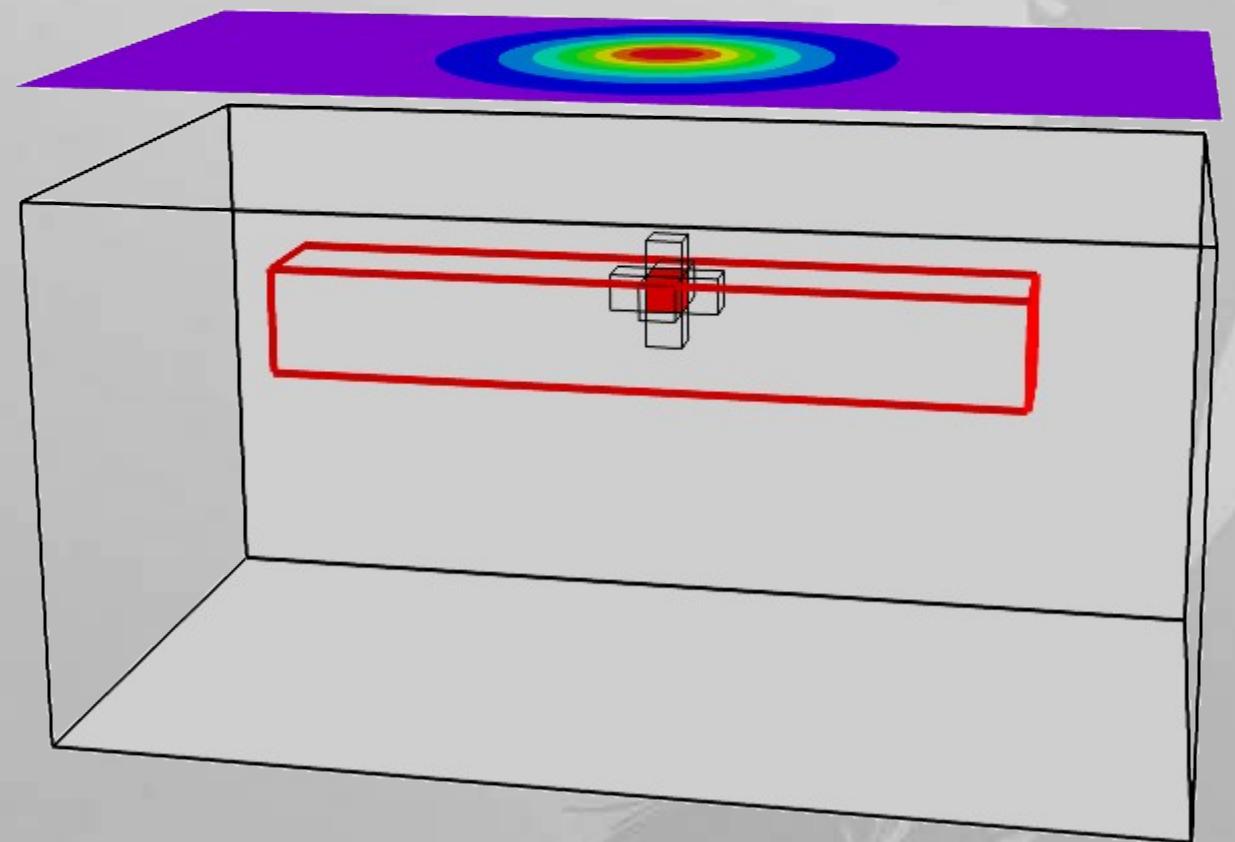
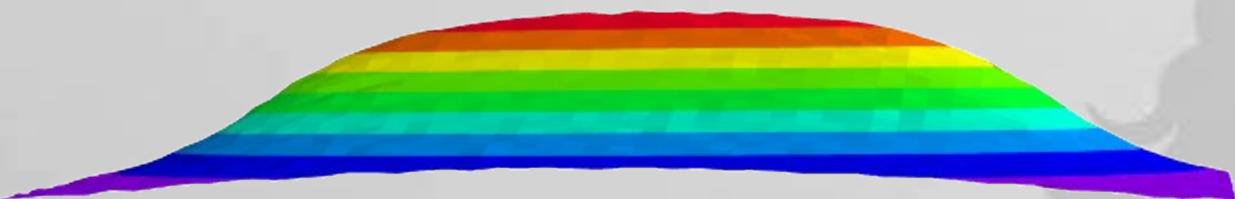
Exchange for shape-of-anomaly



$$\Gamma = \phi + \mu \theta$$

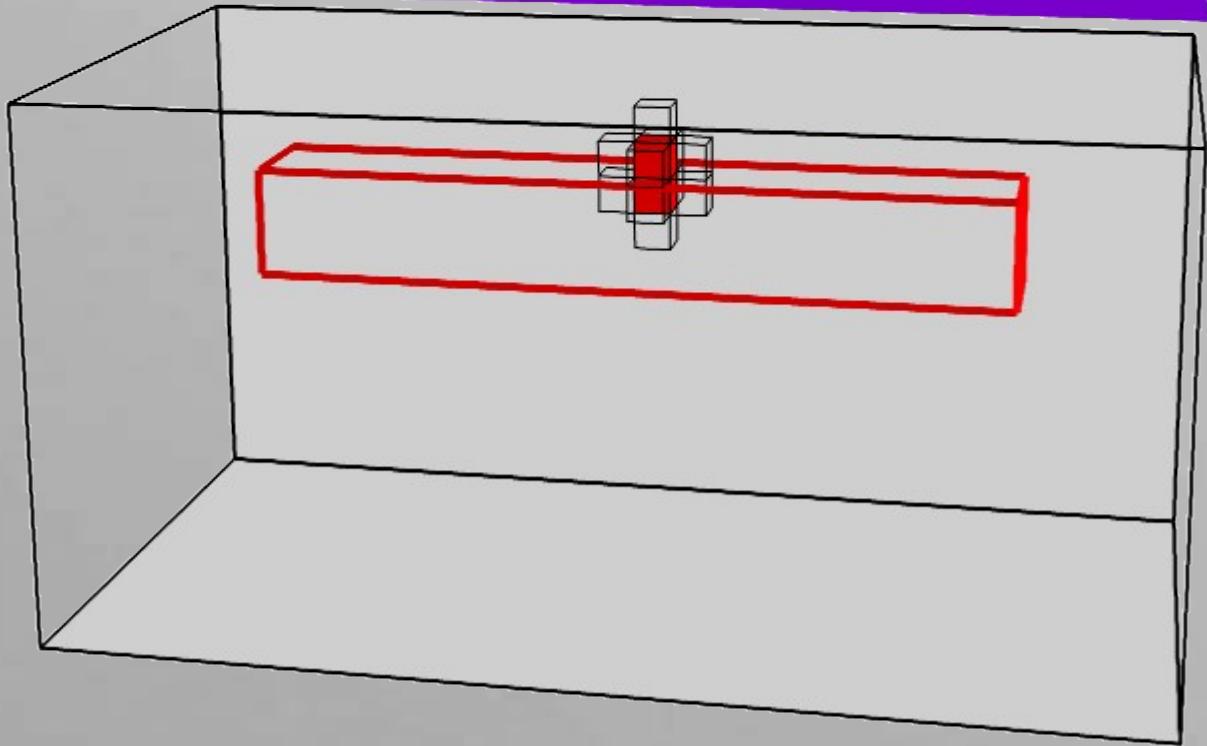
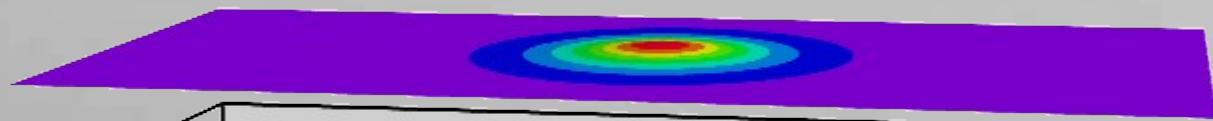


$$\Gamma = SOA + \mu \theta$$

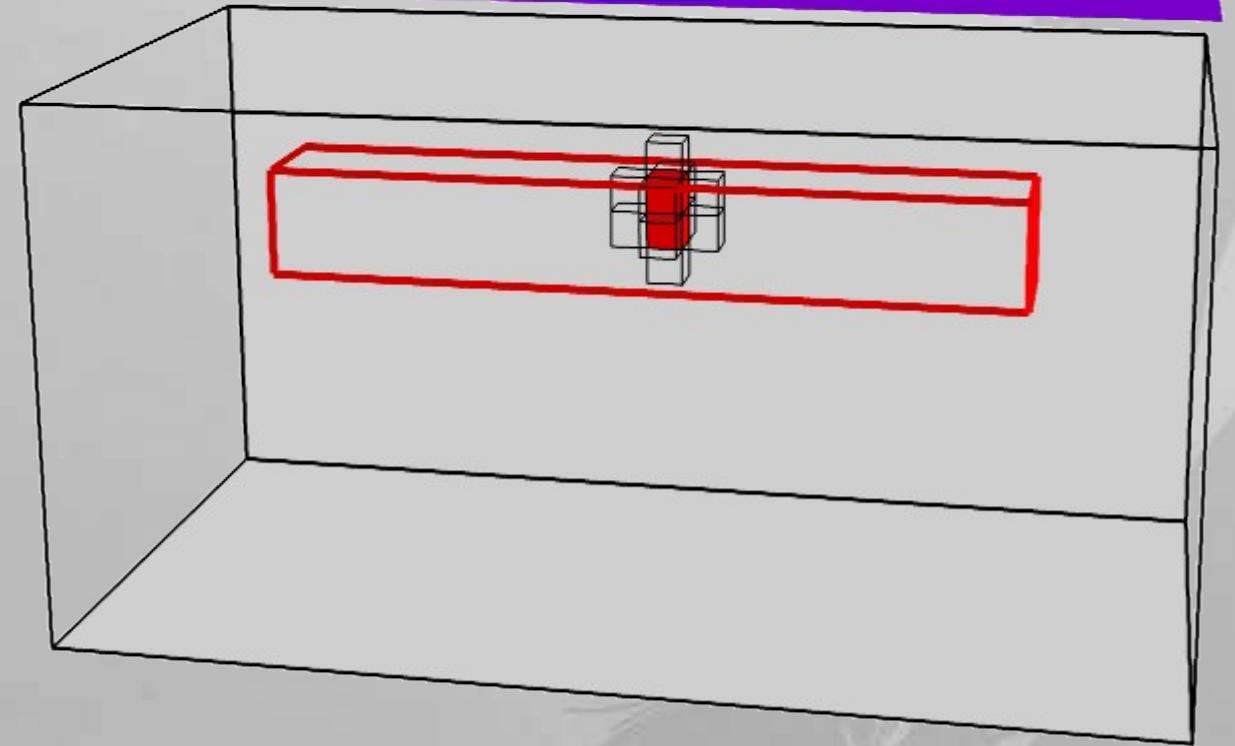
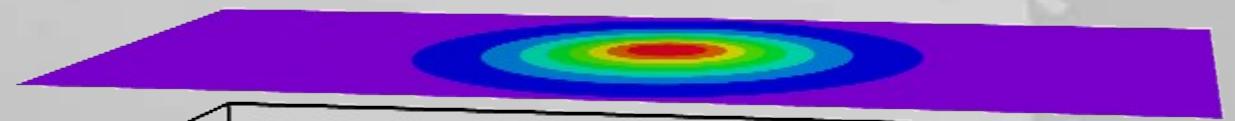




$$\Gamma = \phi + \mu \theta$$

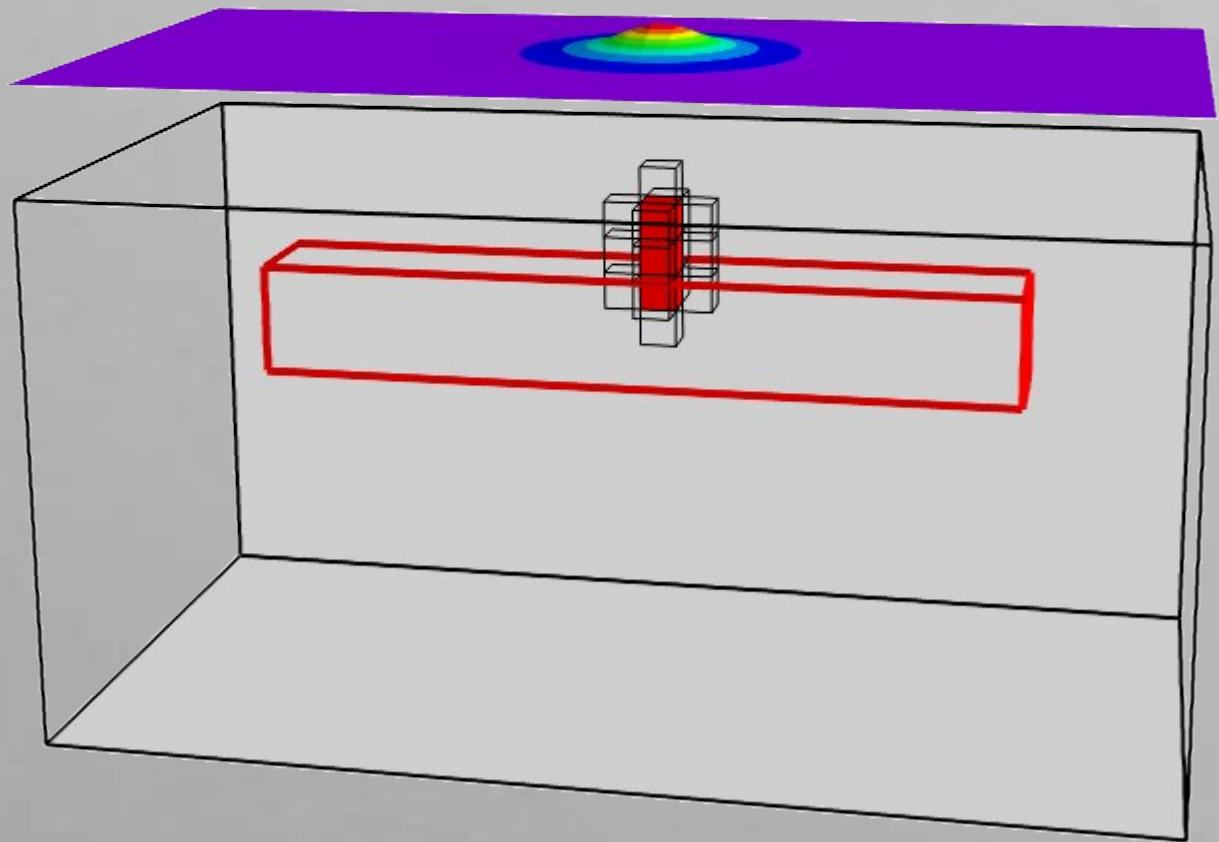


$$\Gamma = SOA + \mu \theta$$

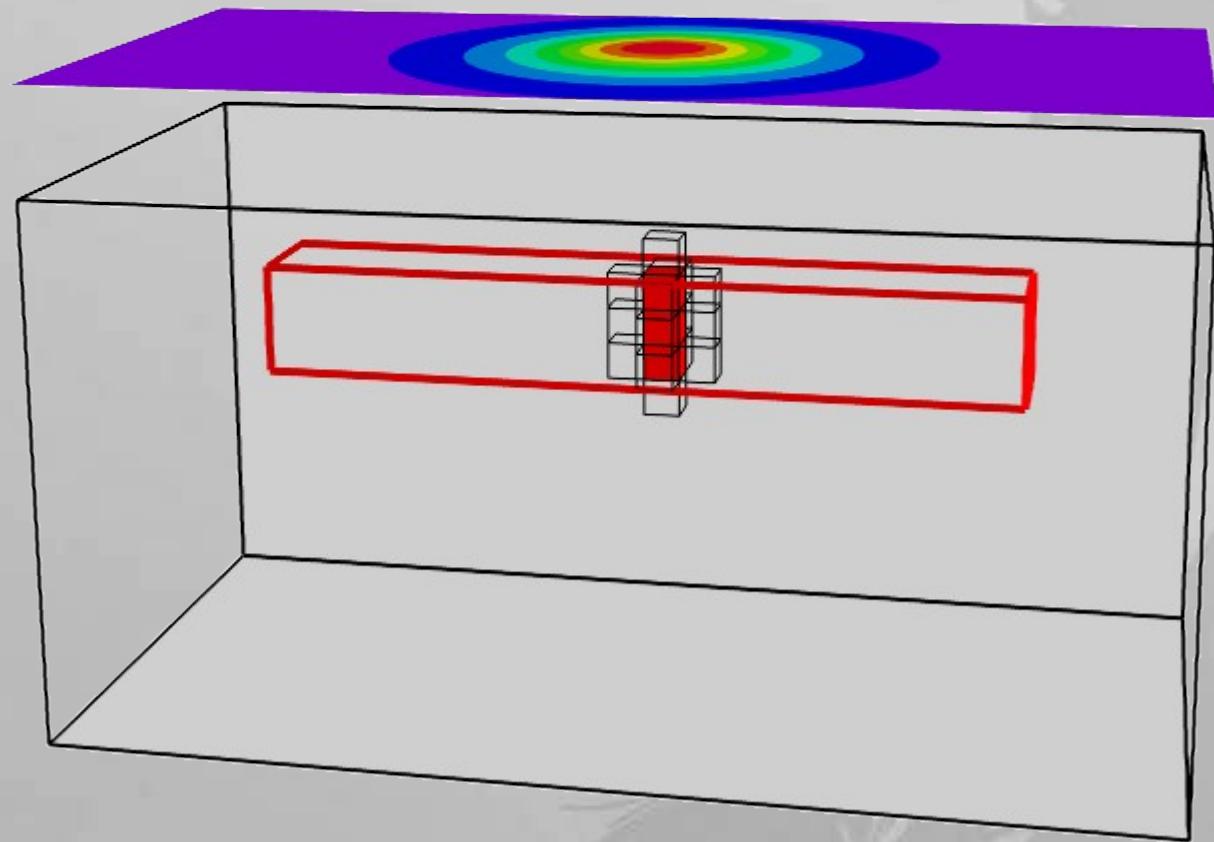
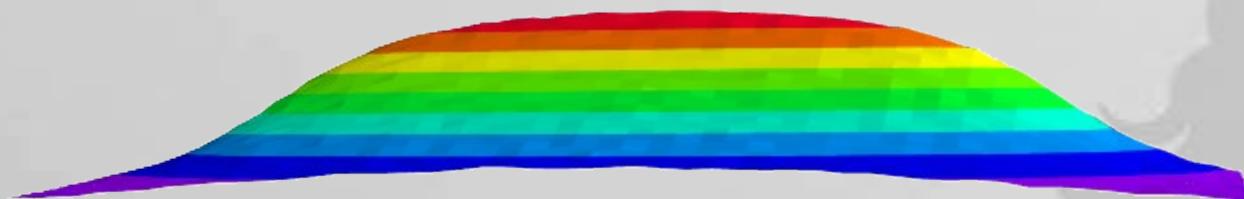




$$\Gamma = \phi + \mu \theta$$

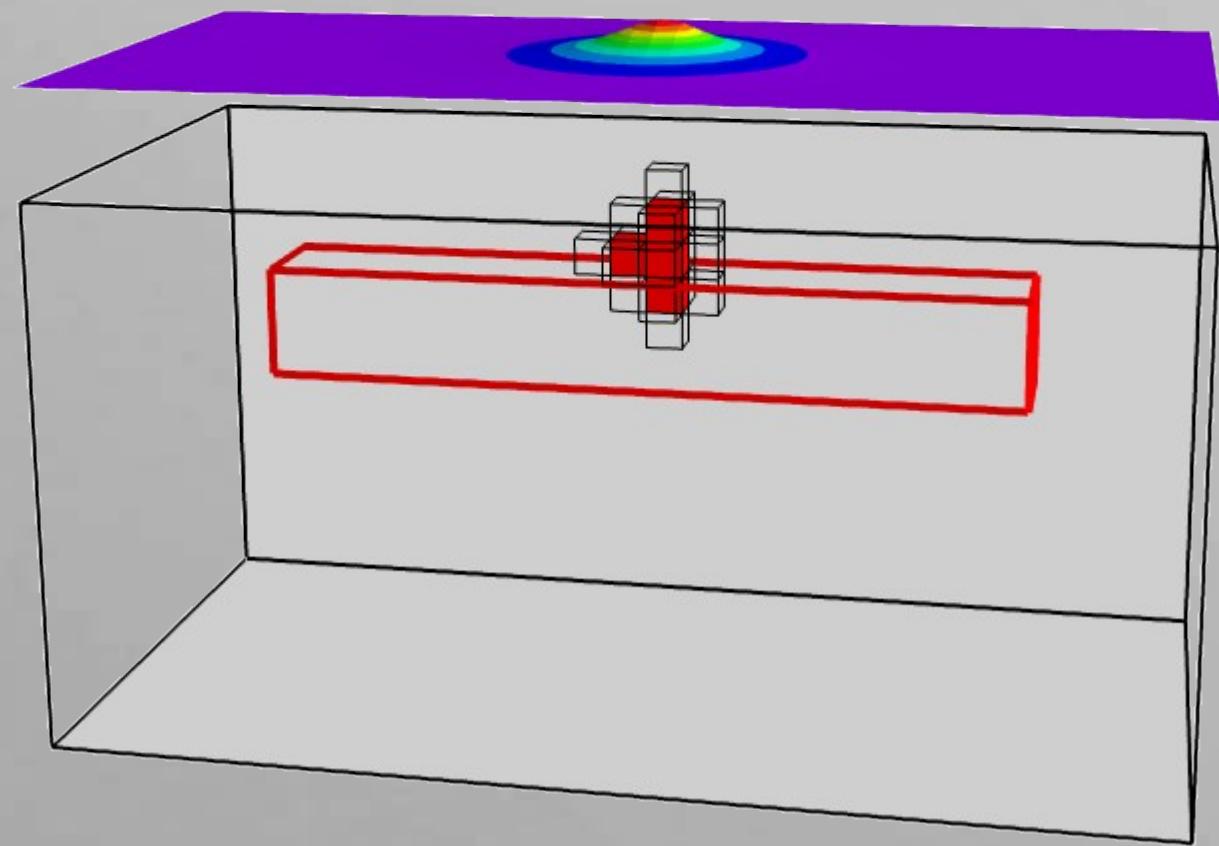
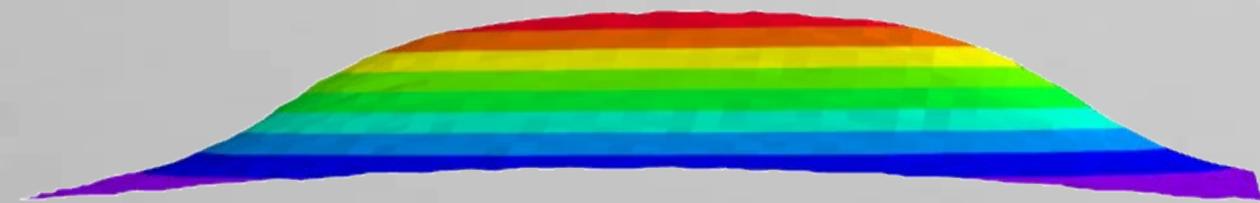


$$\Gamma = SOA + \mu \theta$$

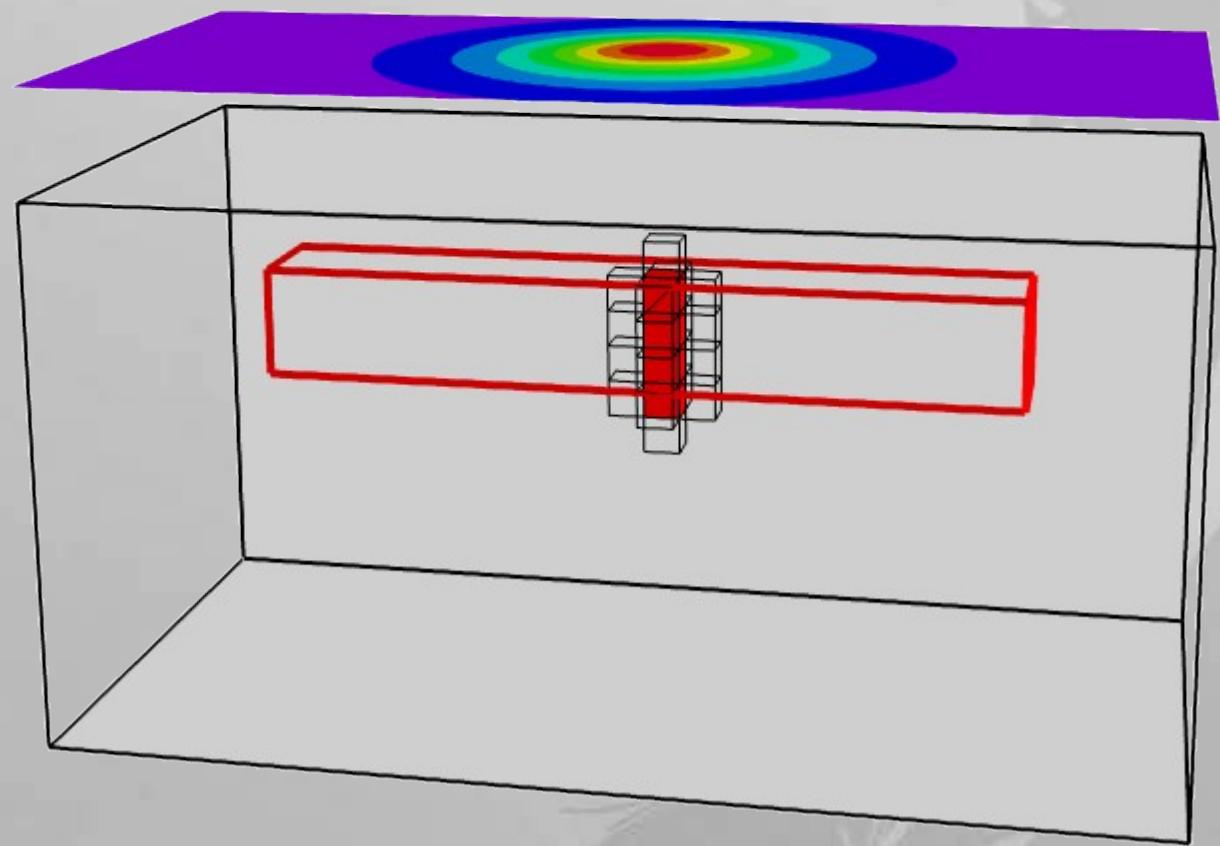




$$\Gamma = \phi + \mu \theta$$

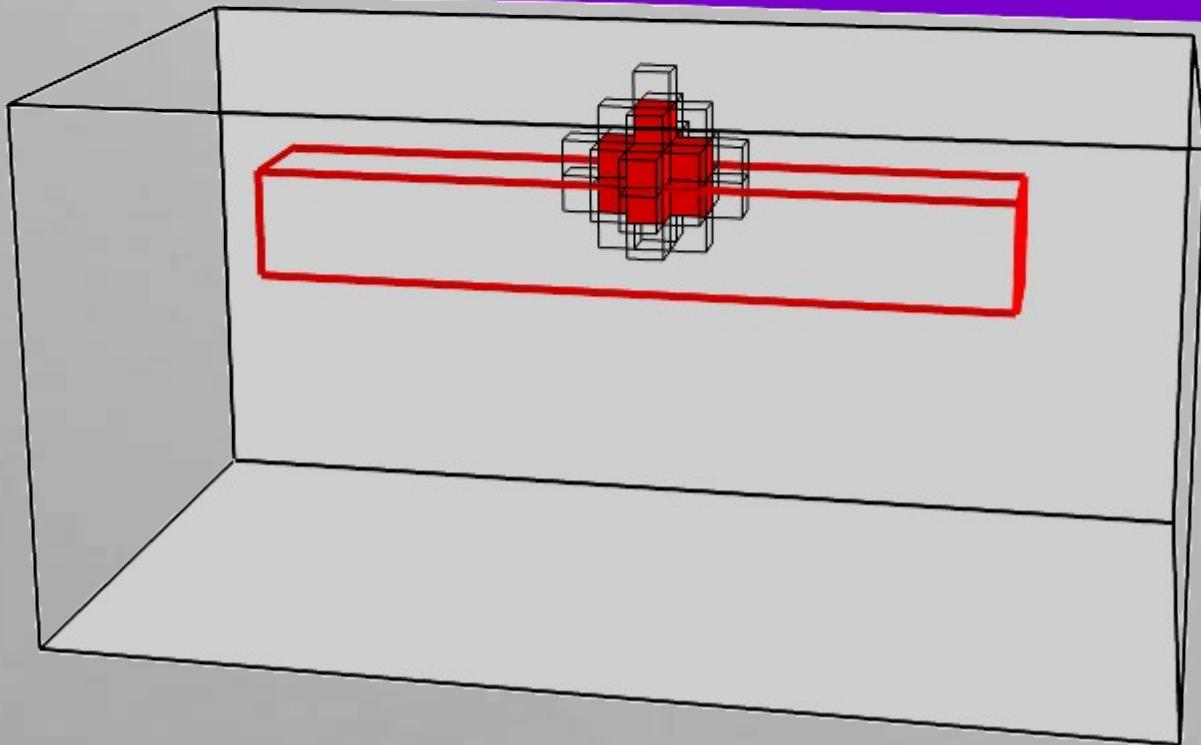
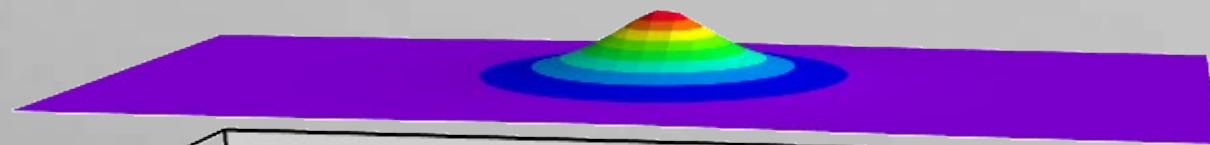
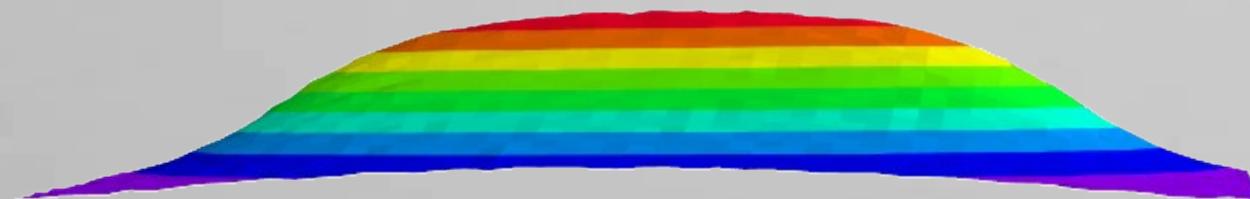


$$\Gamma = SOA + \mu \theta$$

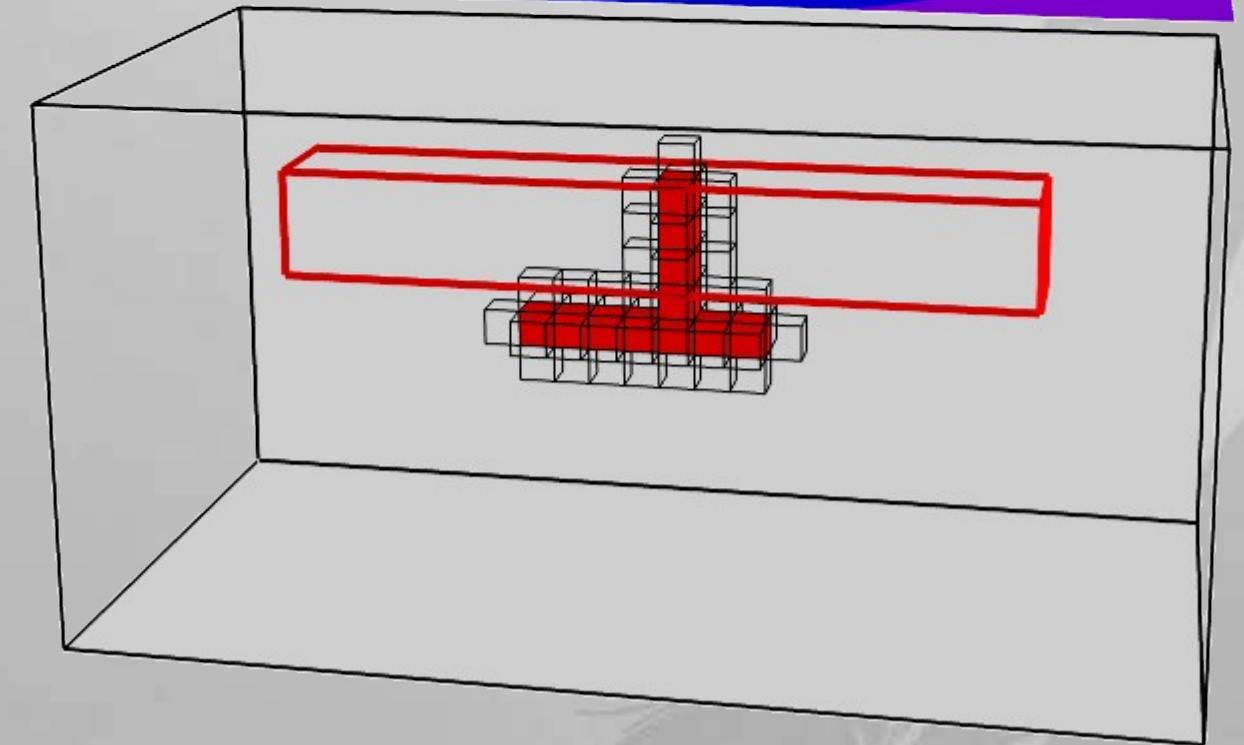
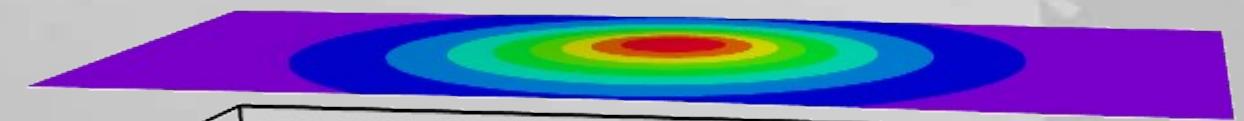
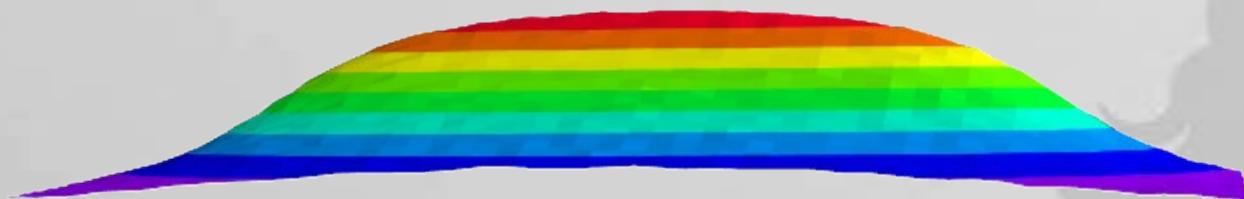




$$\Gamma = \phi + \mu \theta$$

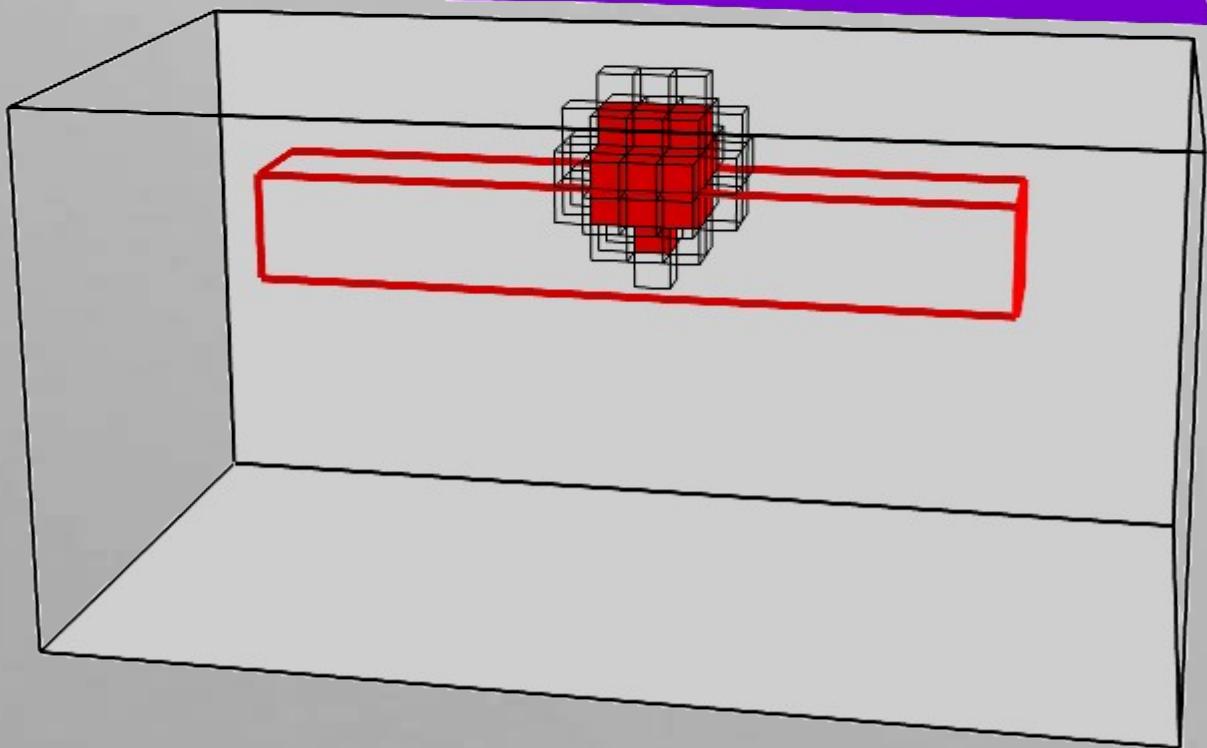
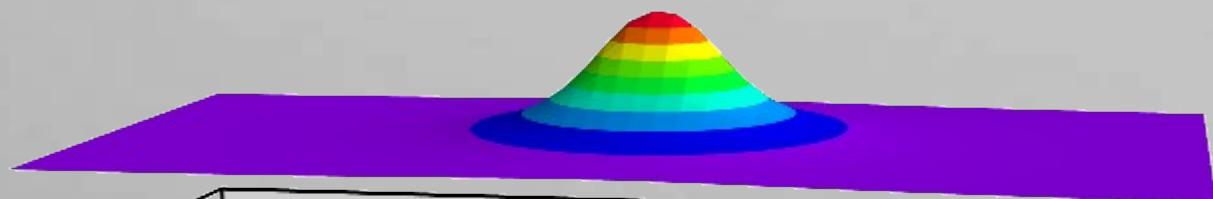
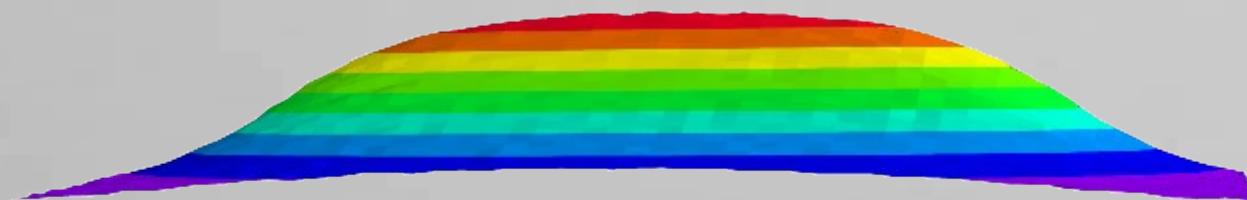


$$\Gamma = SOA + \mu \theta$$

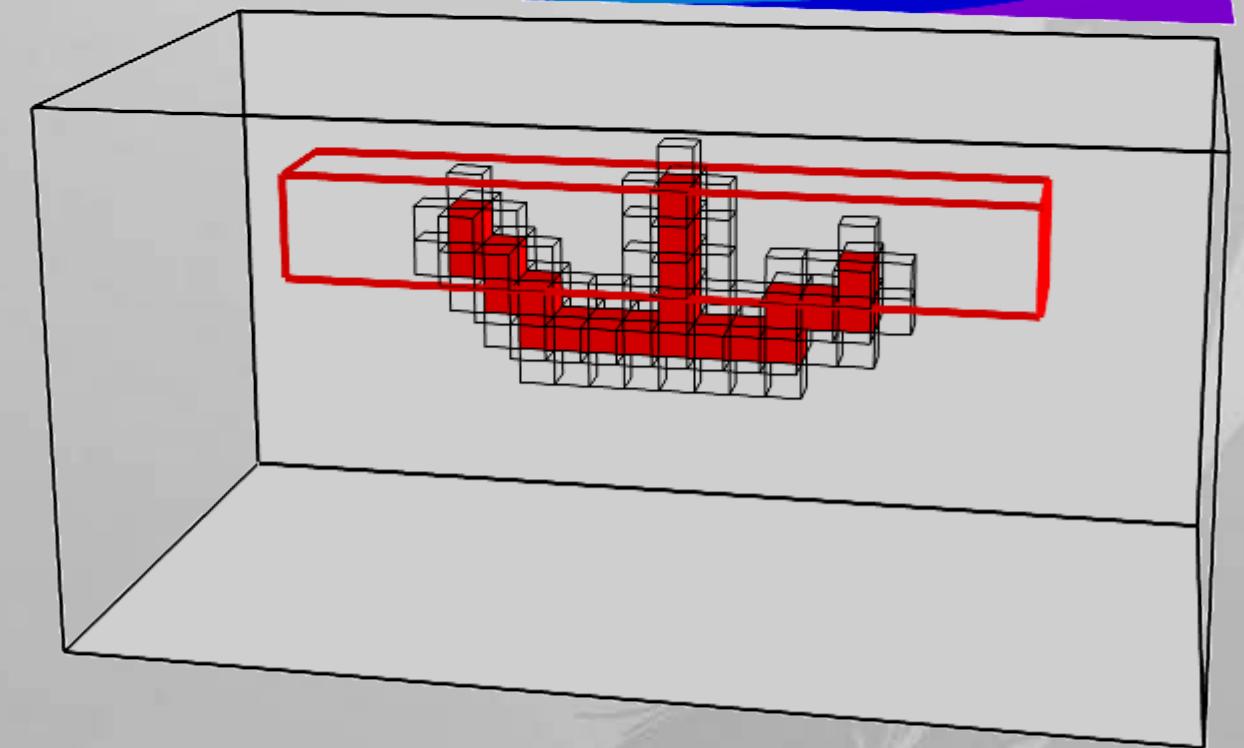
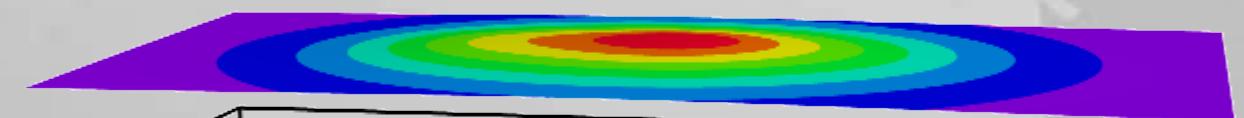




$$\Gamma = \phi + \mu \theta$$

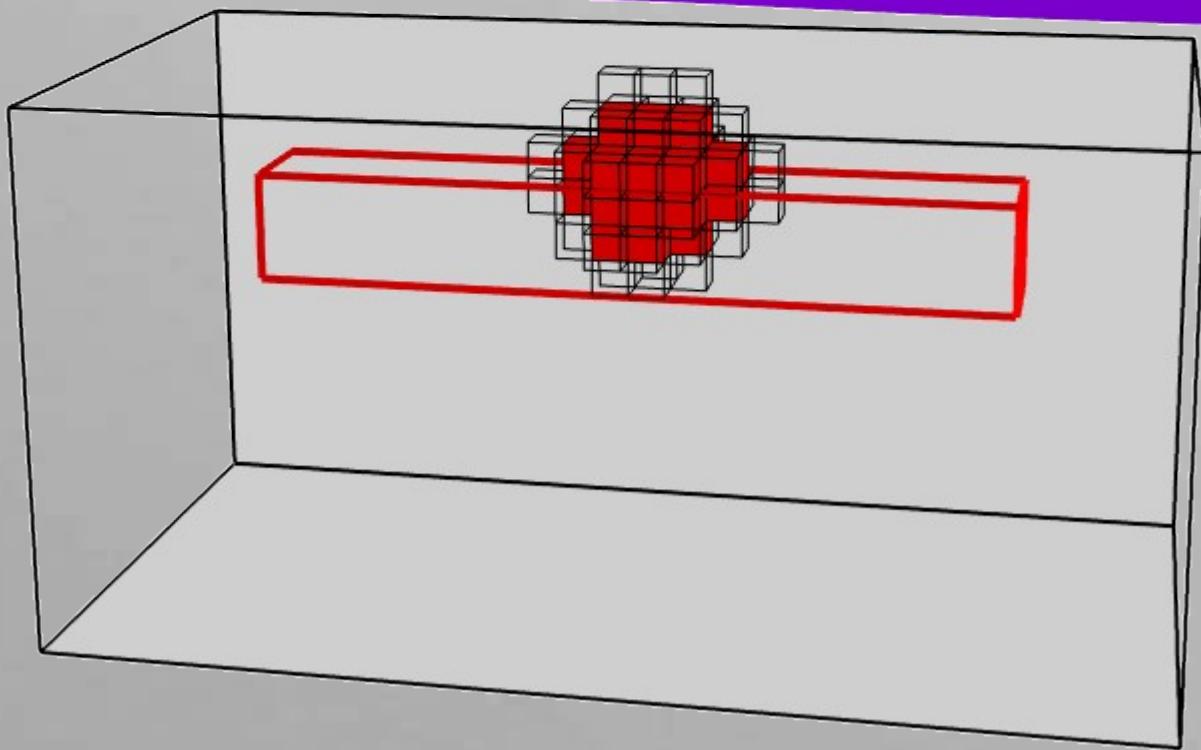
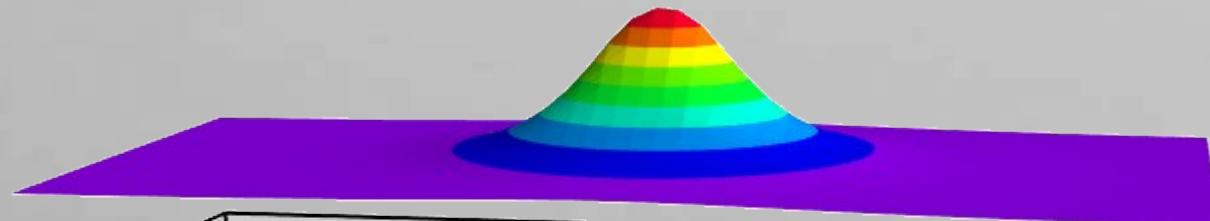
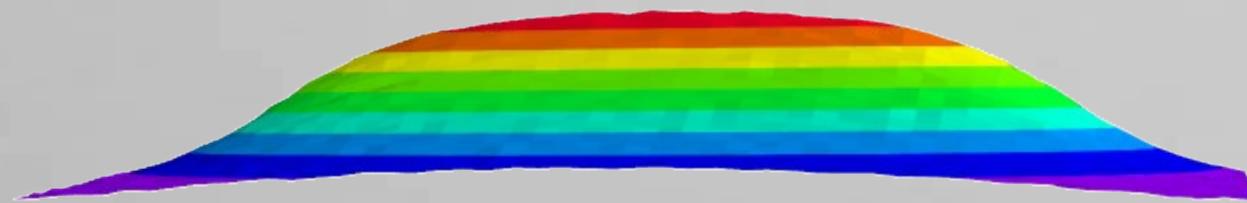


$$\Gamma = SOA + \mu \theta$$

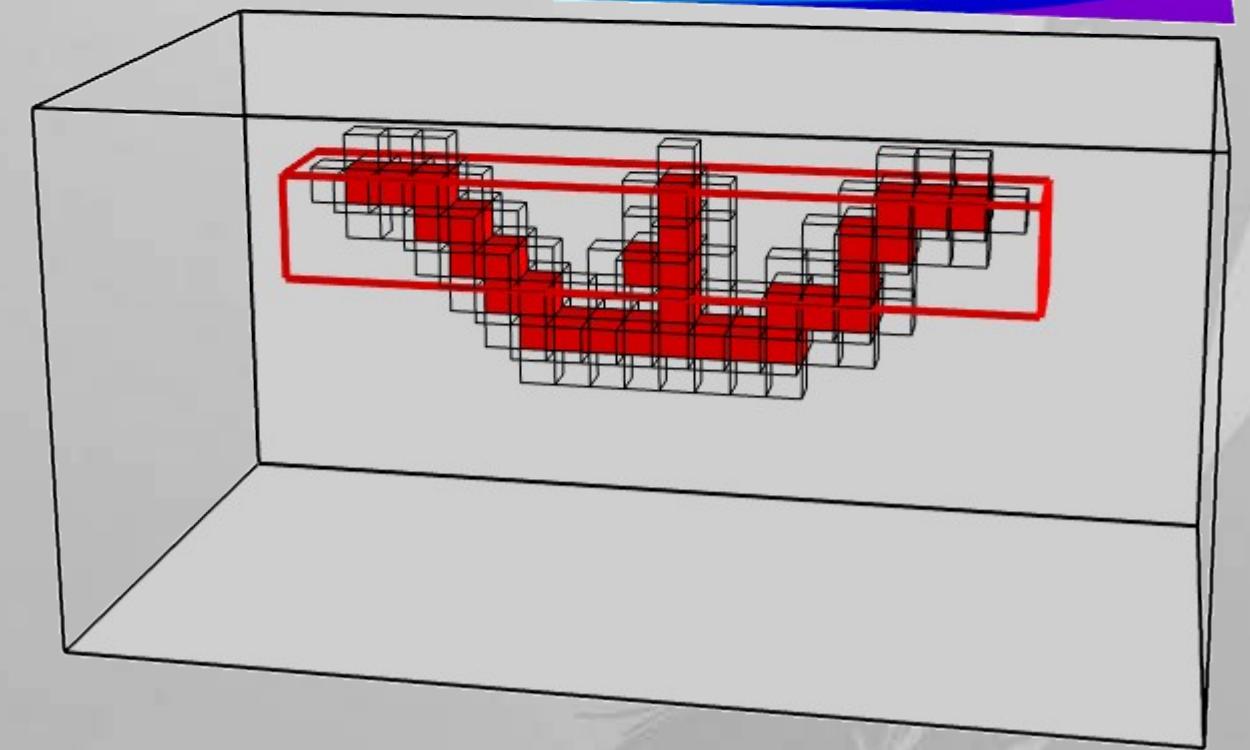
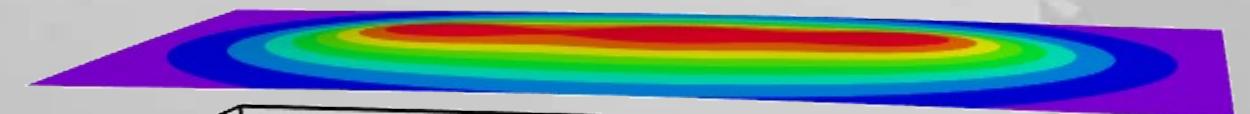




$$\Gamma = \phi + \mu \theta$$

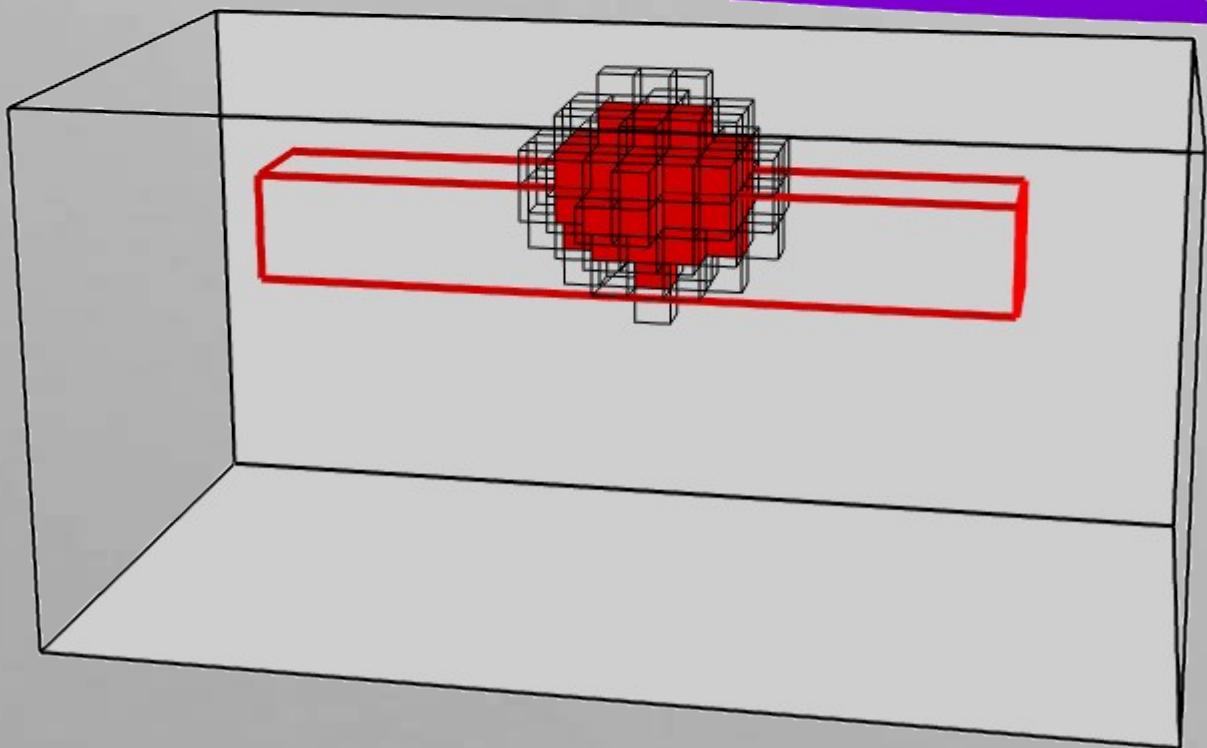
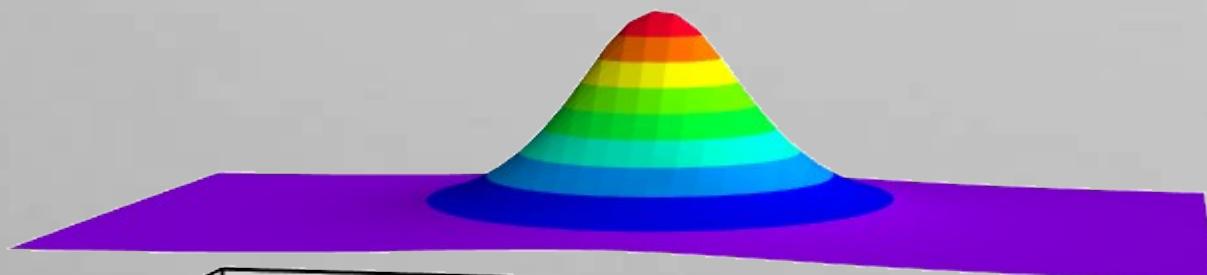
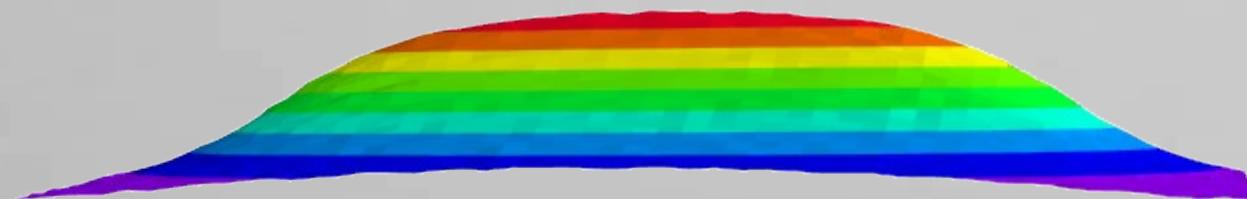


$$\Gamma = SOA + \mu \theta$$

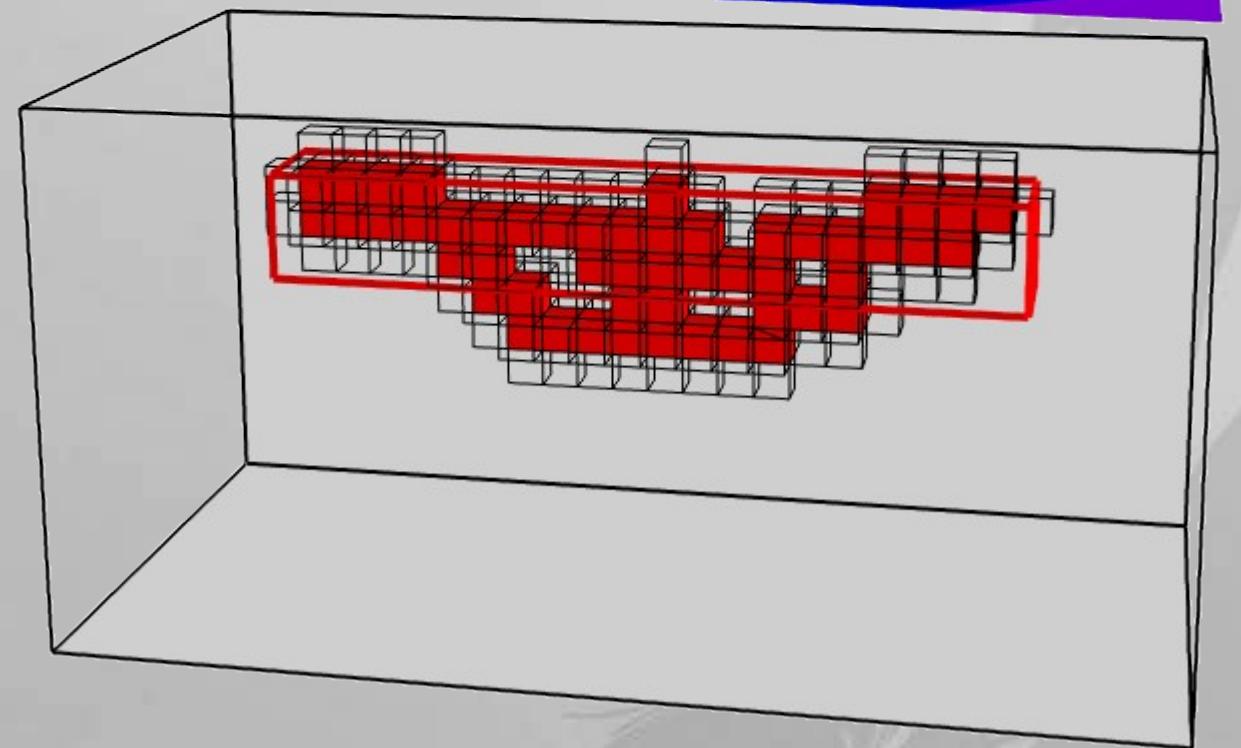
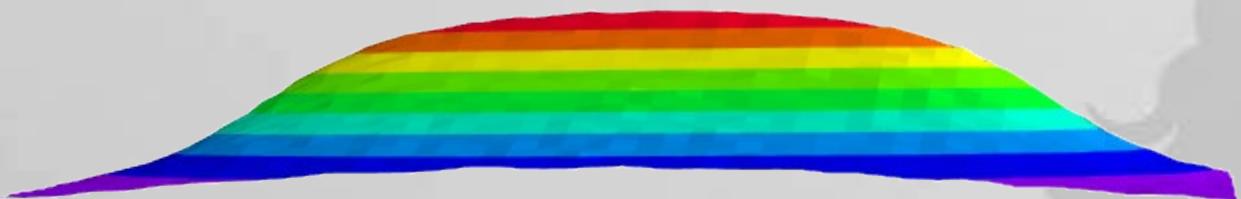




$$\Gamma = \phi + \mu \theta$$

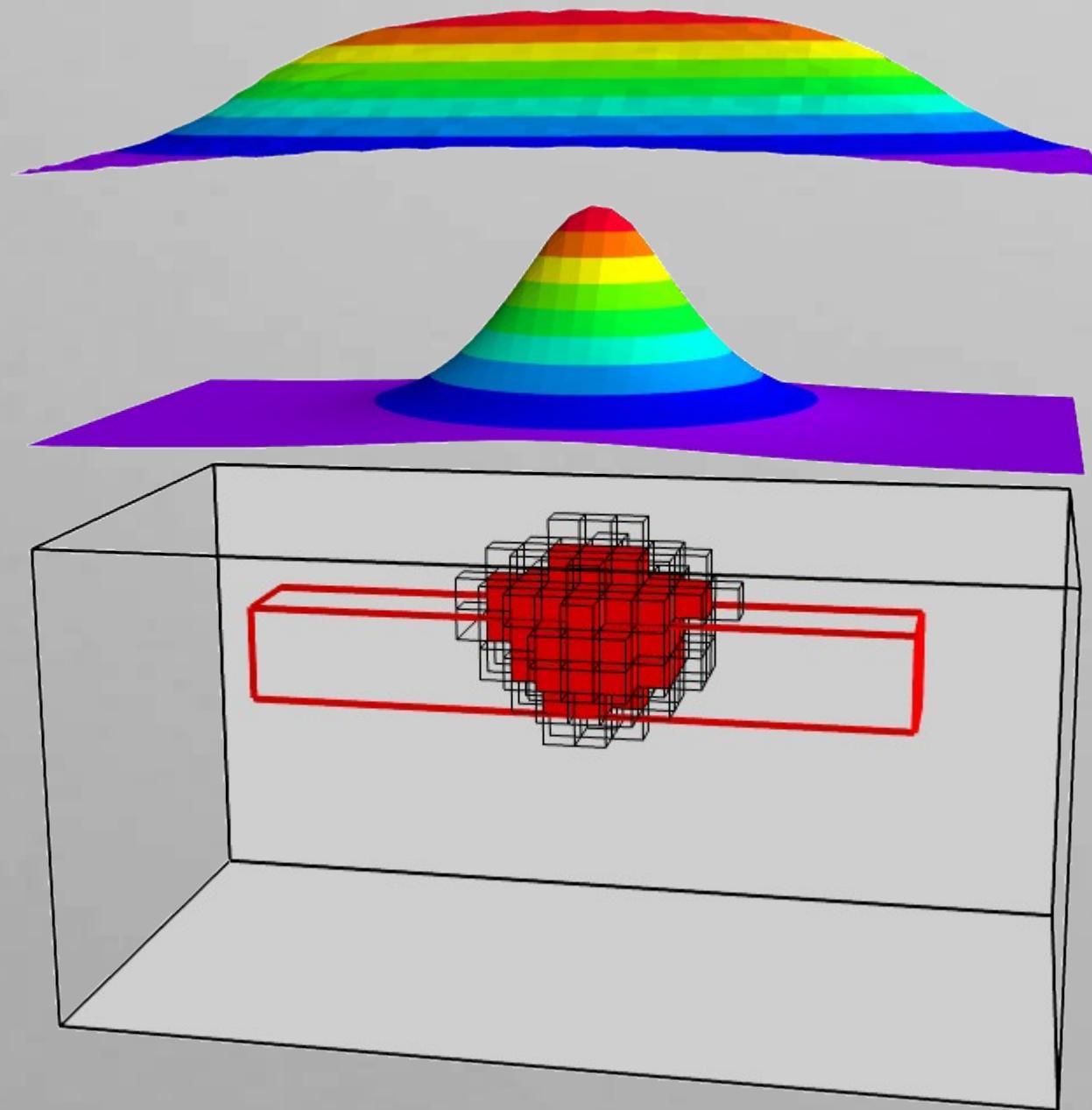


$$\Gamma = SOA + \mu \theta$$

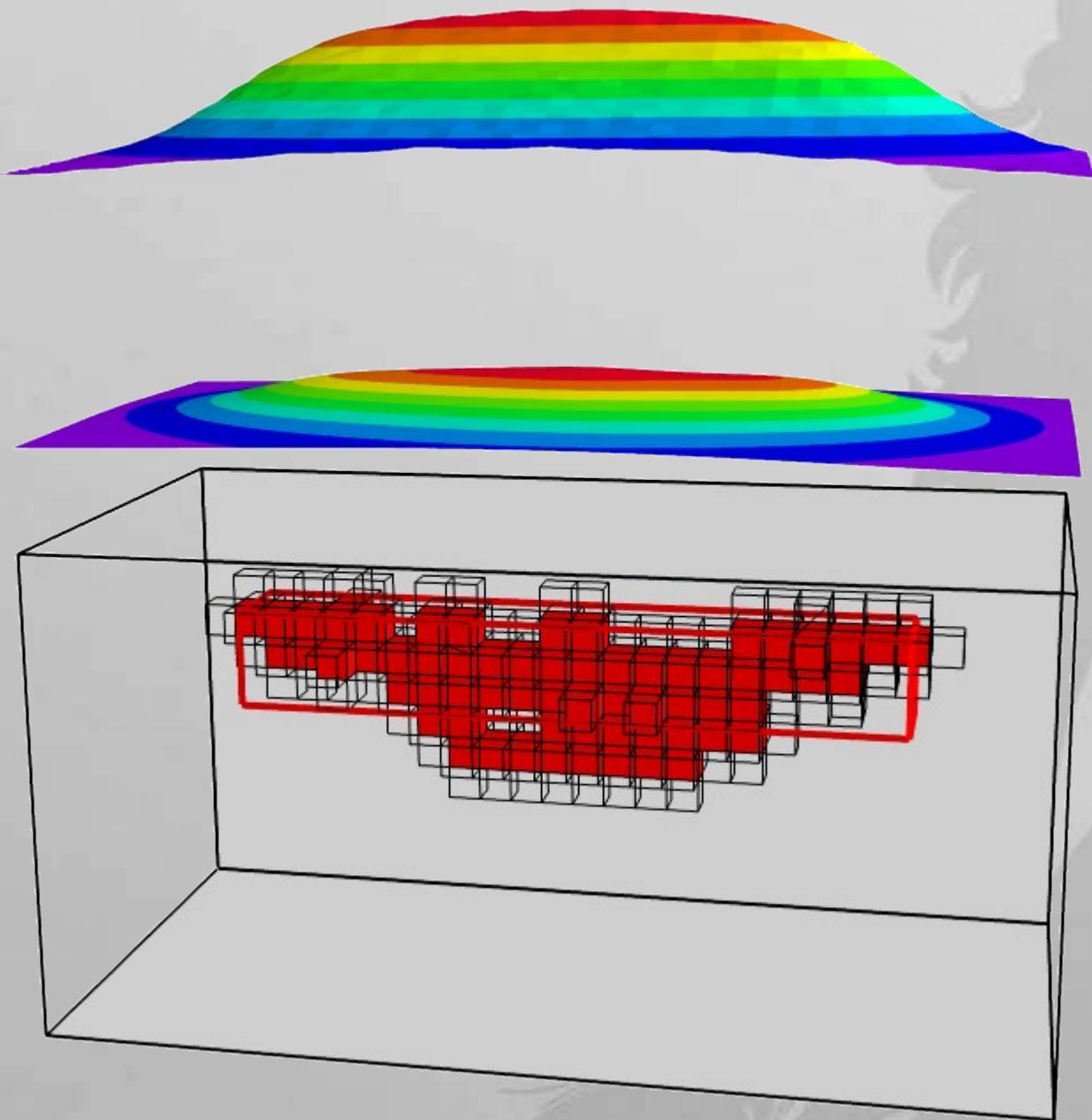




$$\Gamma = \phi + \mu \theta$$

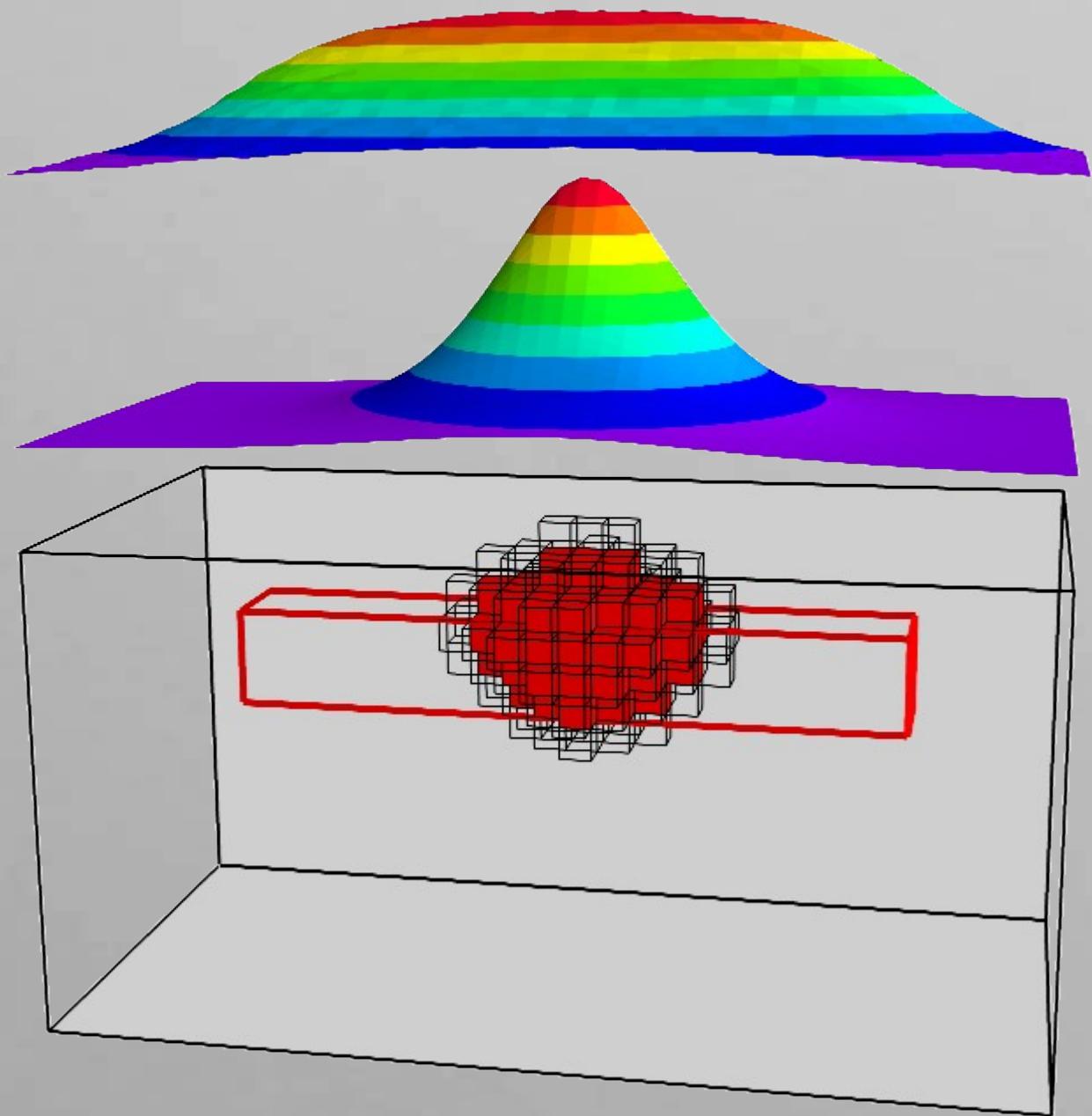


$$\Gamma = SOA + \mu \theta$$

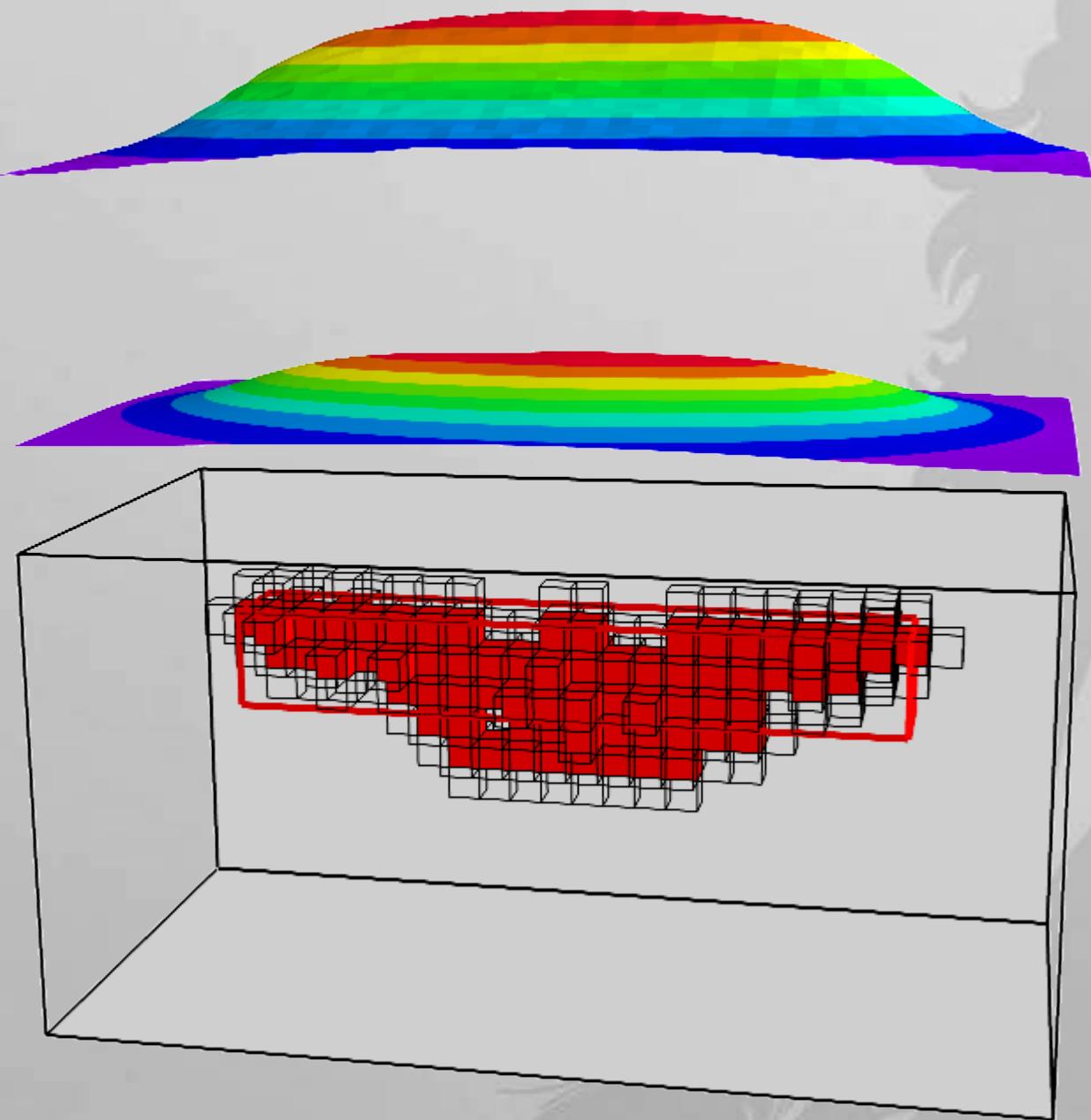




$$\Gamma = \phi + \mu \theta$$

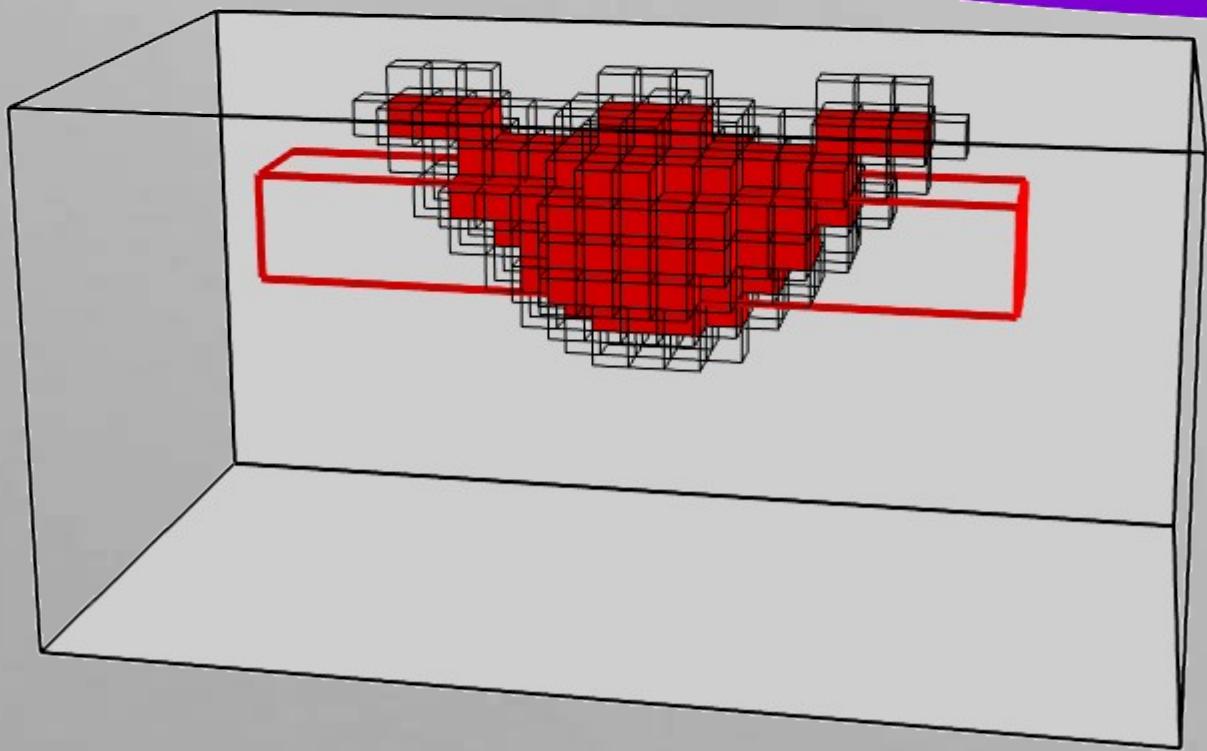
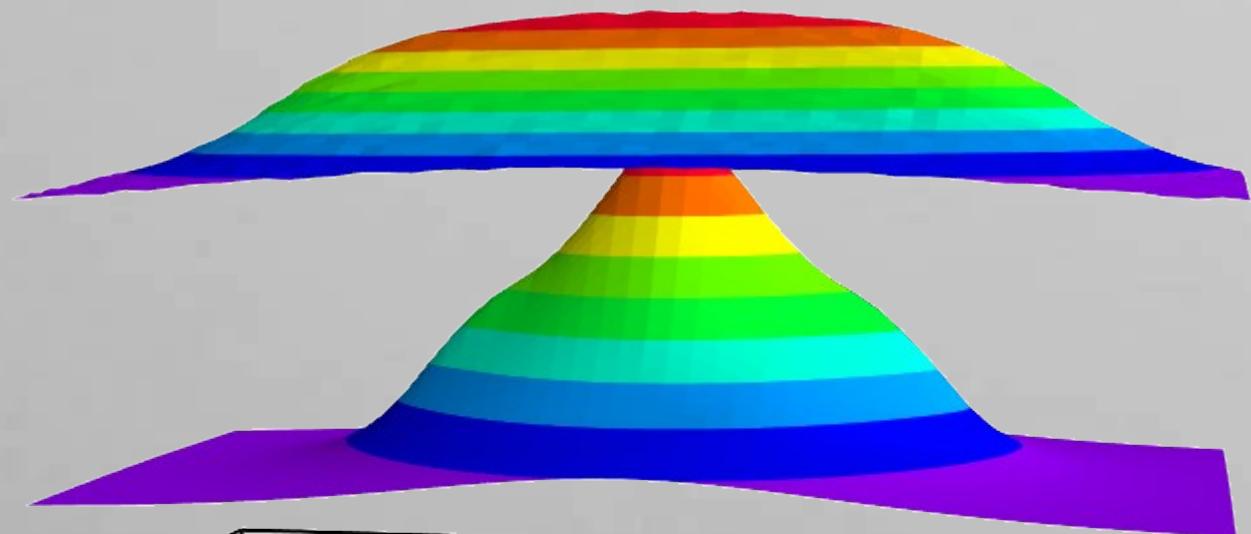


$$\Gamma = SOA + \mu \theta$$

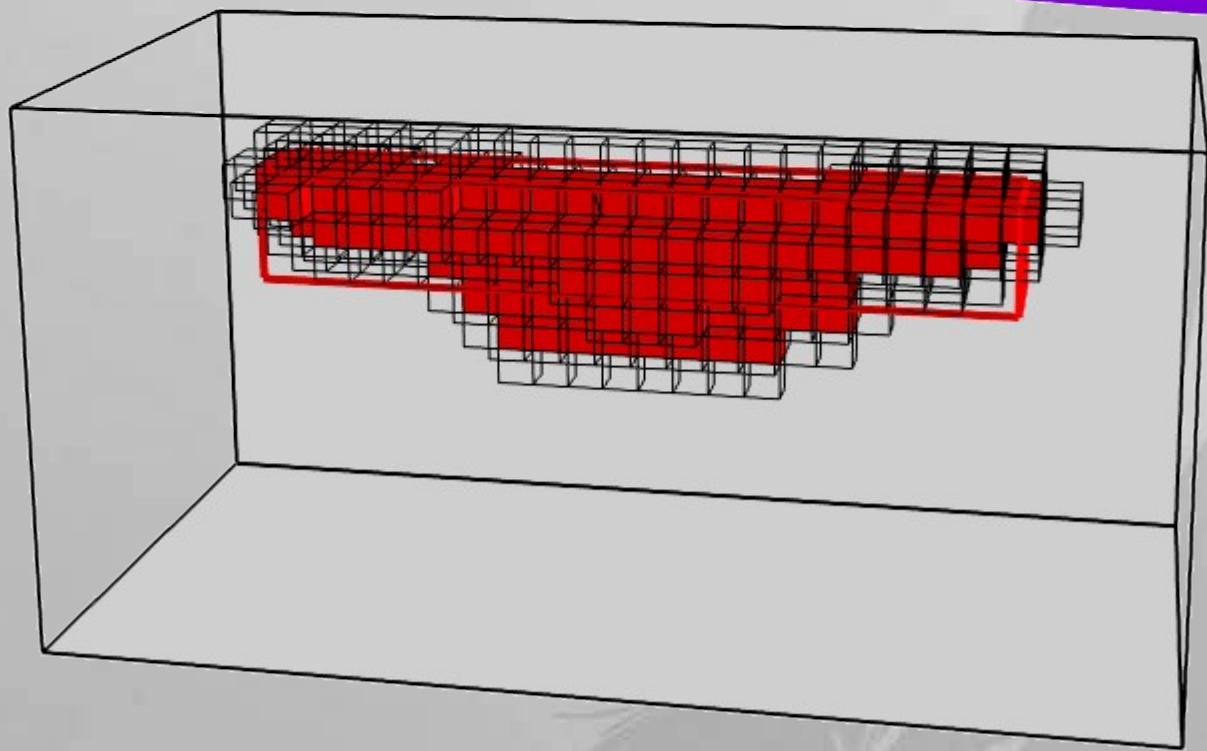
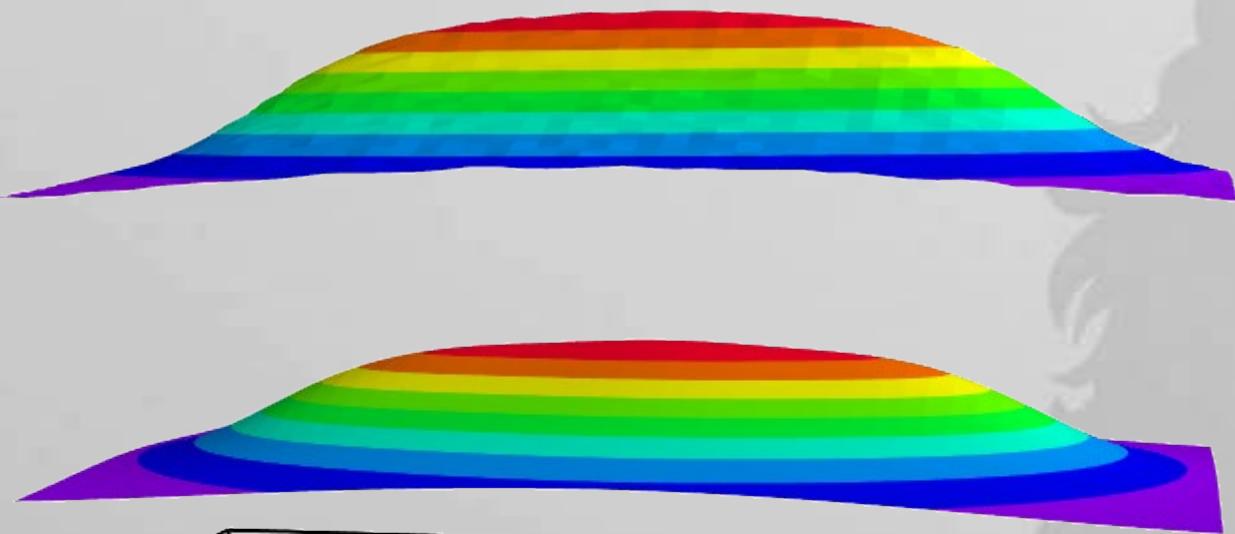




$$\Gamma = \phi + \mu \theta$$

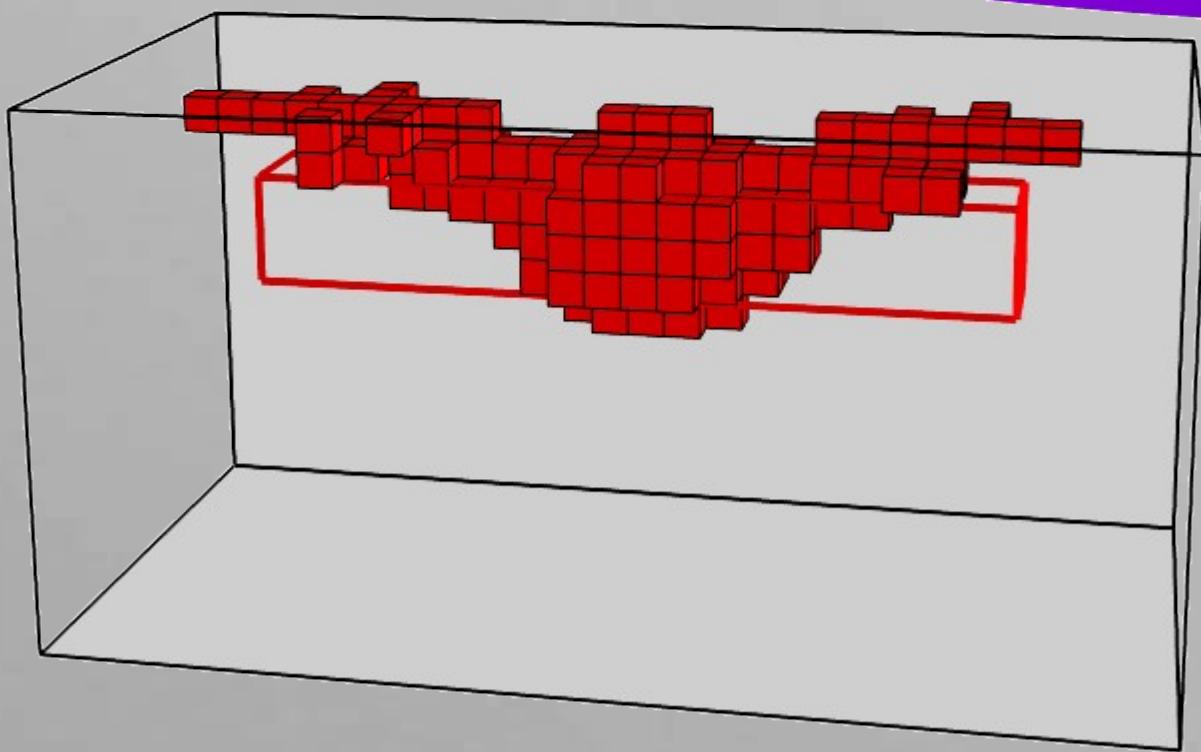
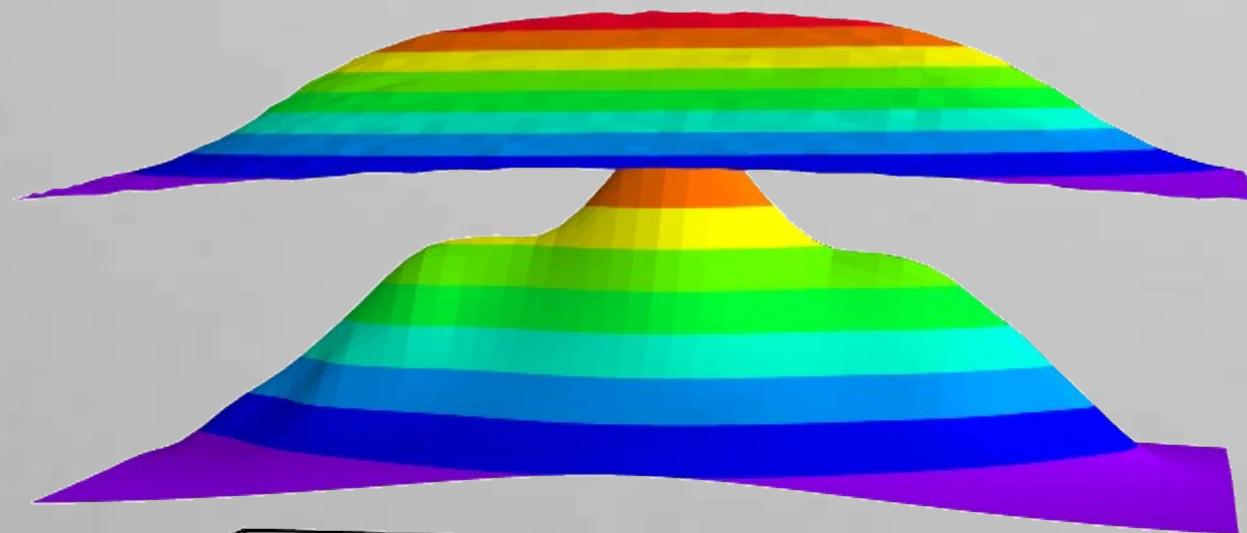


$$\Gamma = SOA + \mu \theta$$

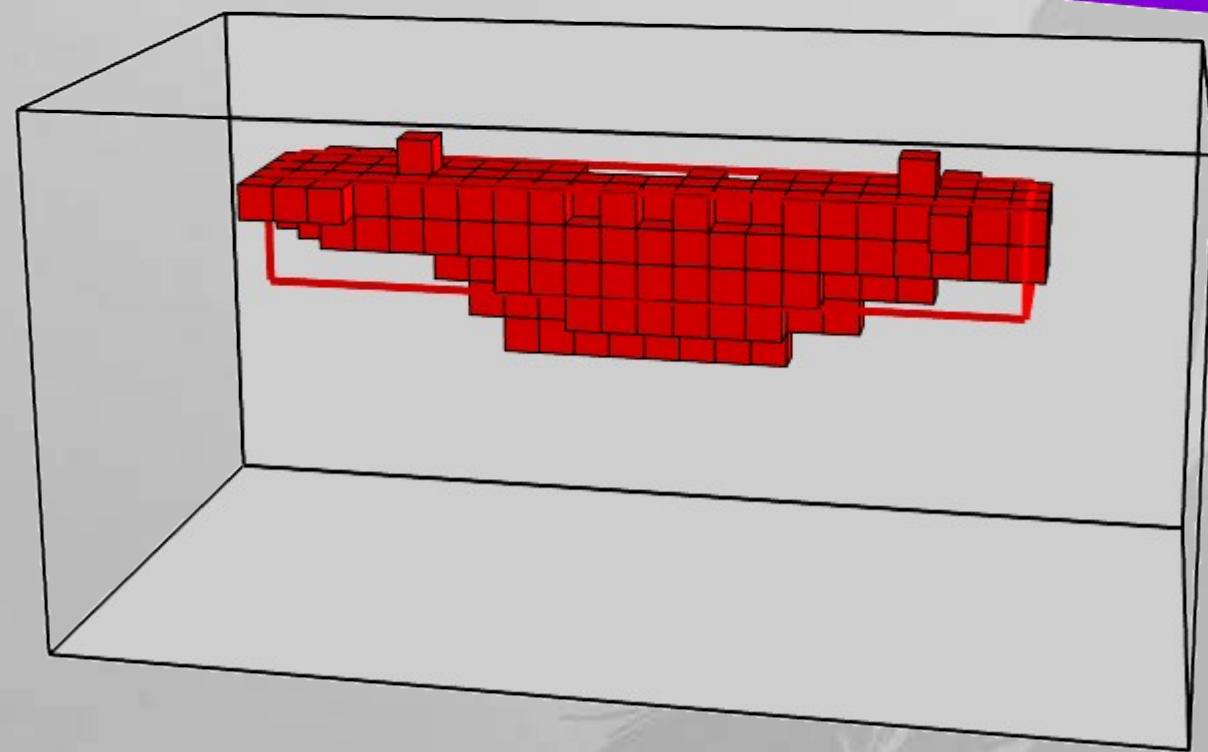
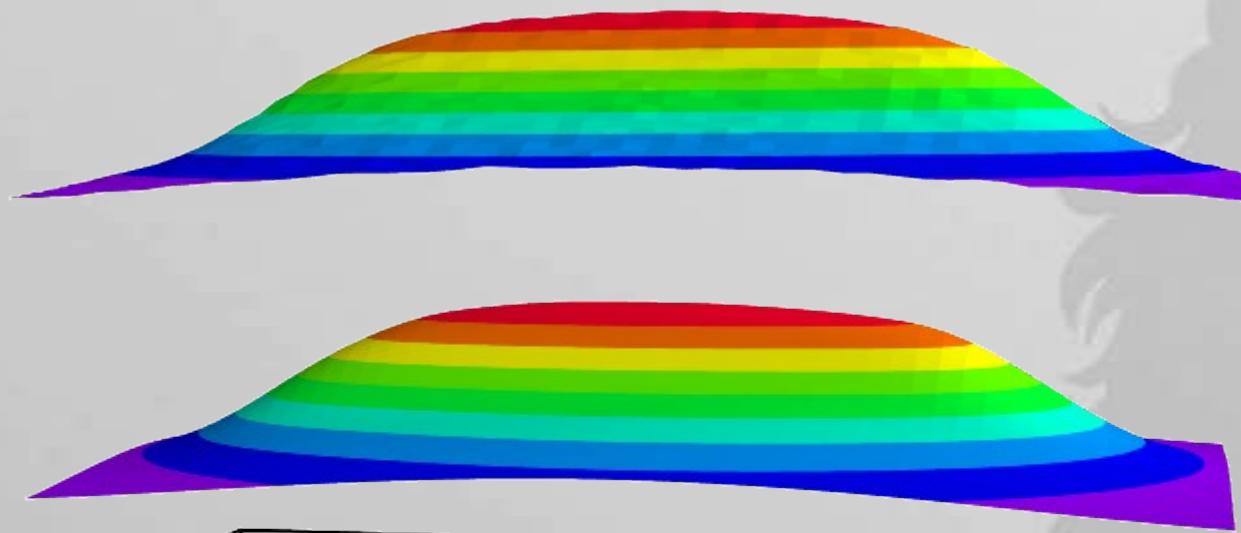




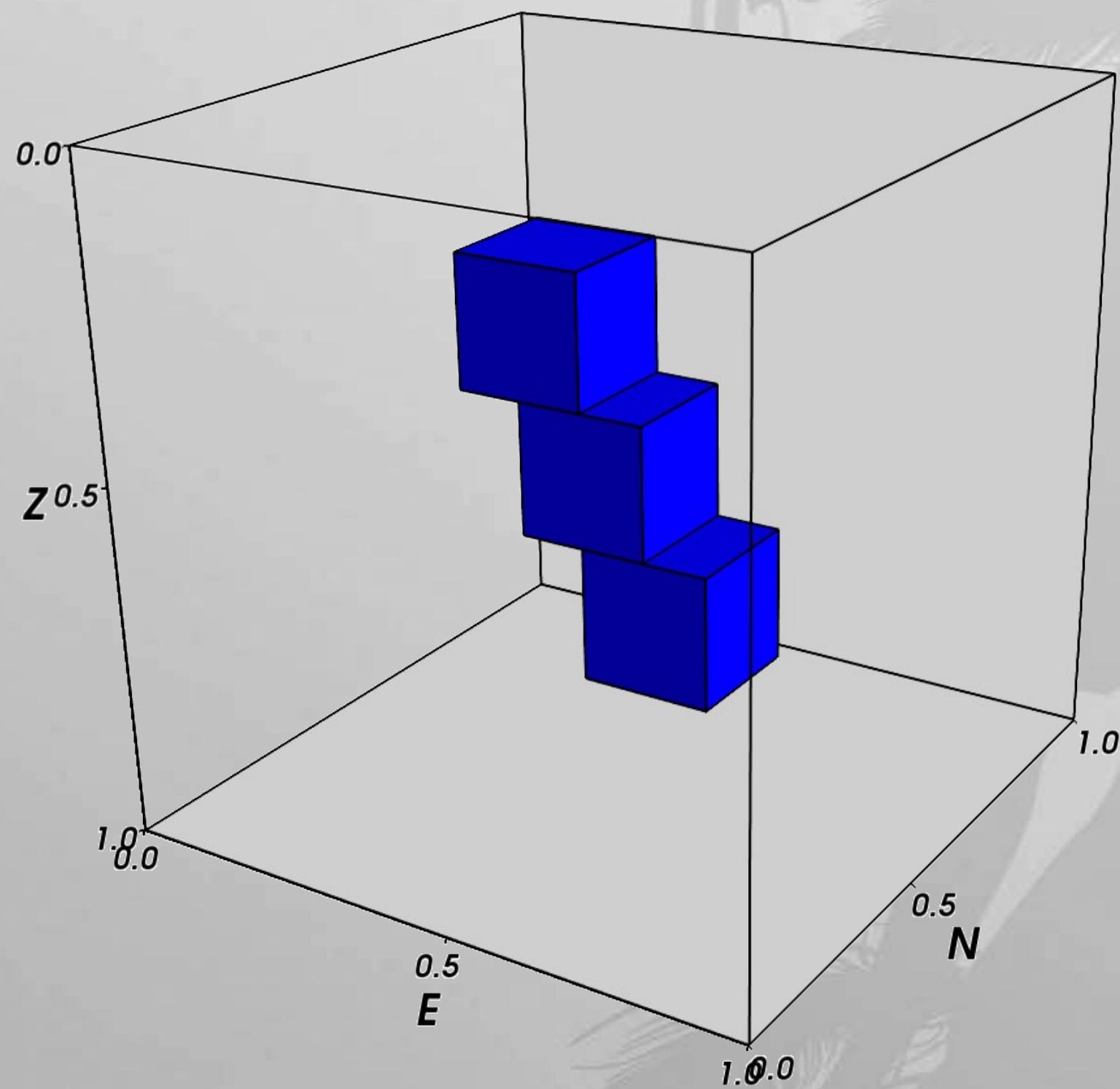
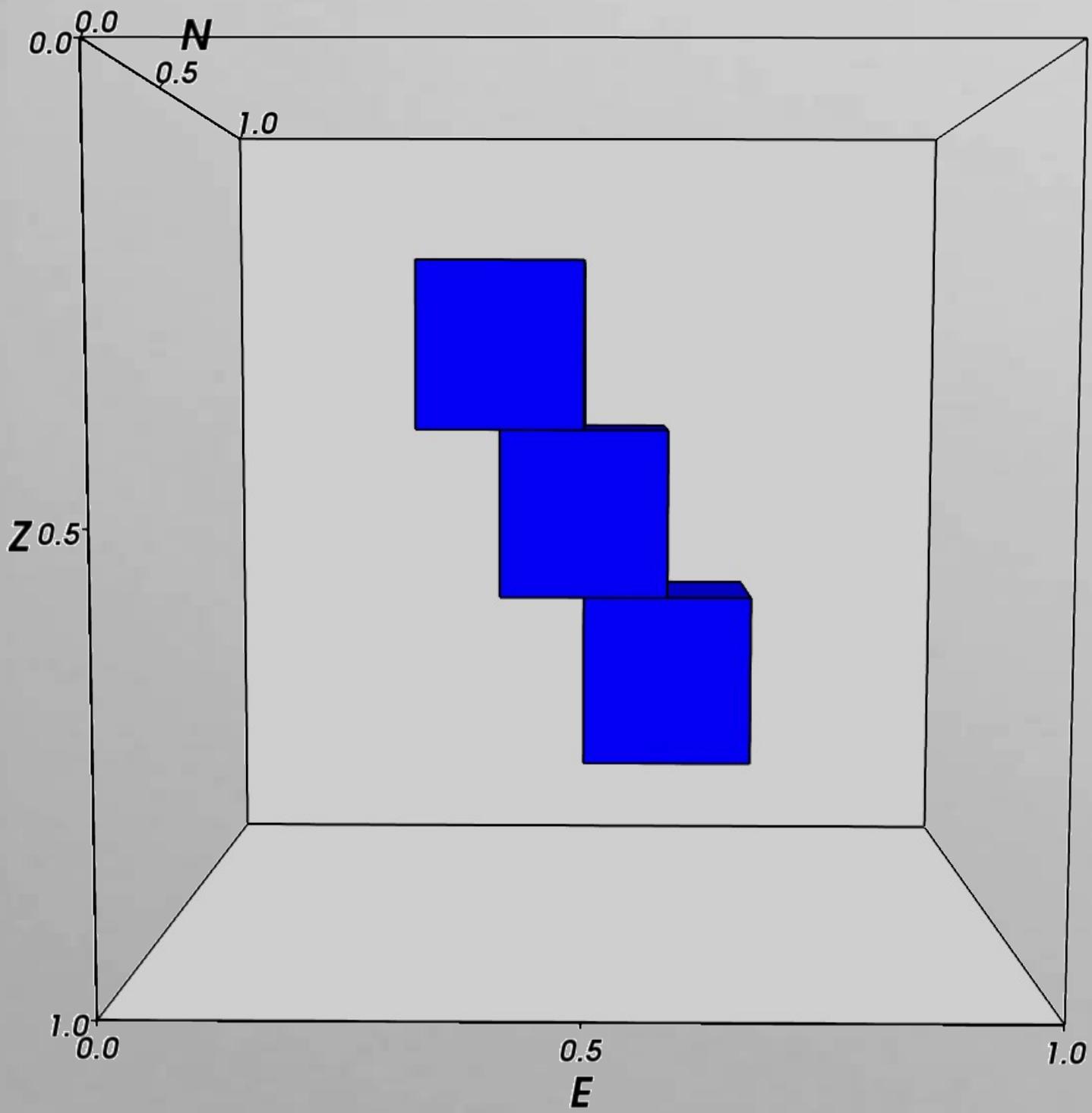
$$\Gamma = \phi + \mu \theta$$

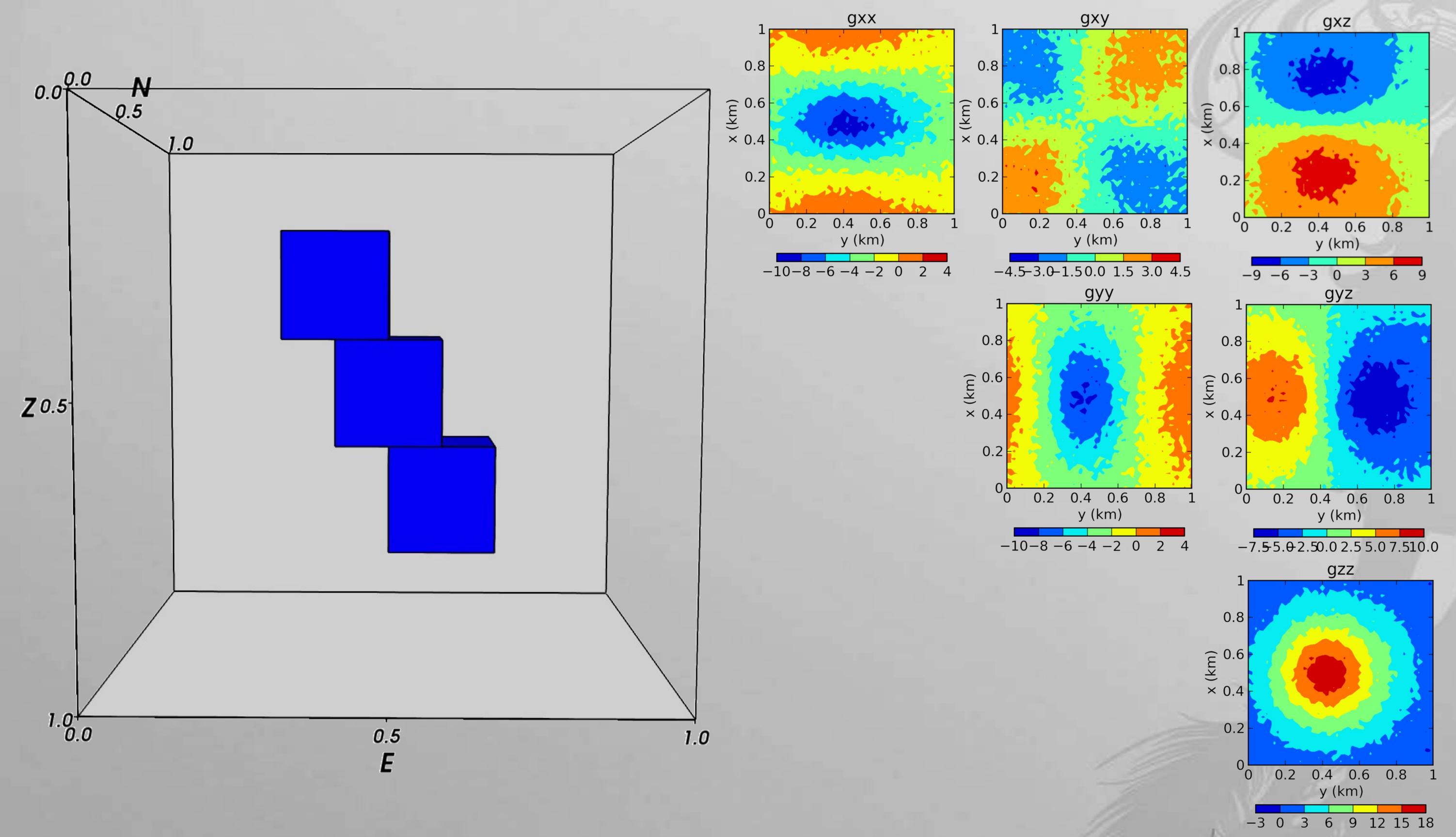


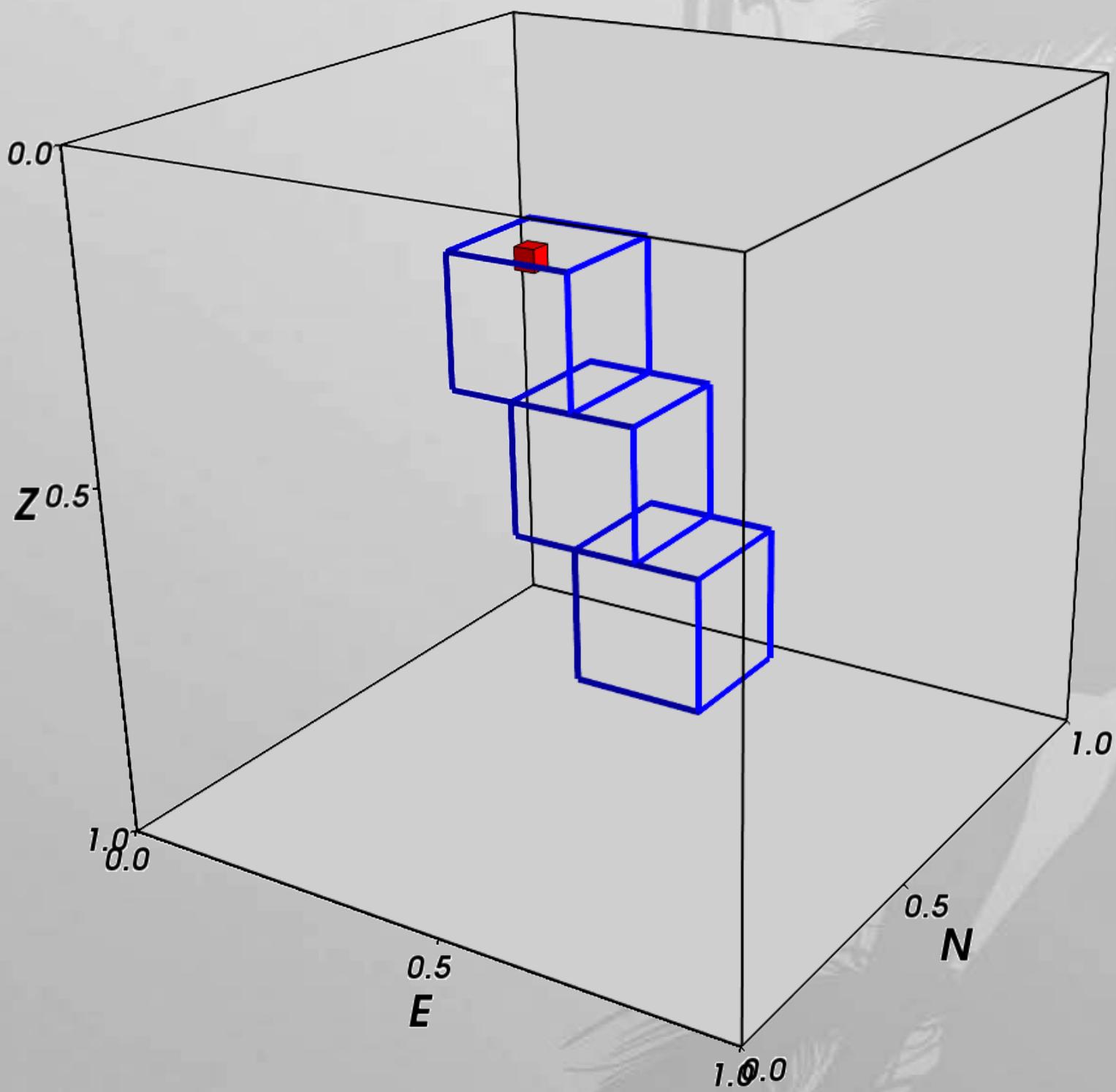
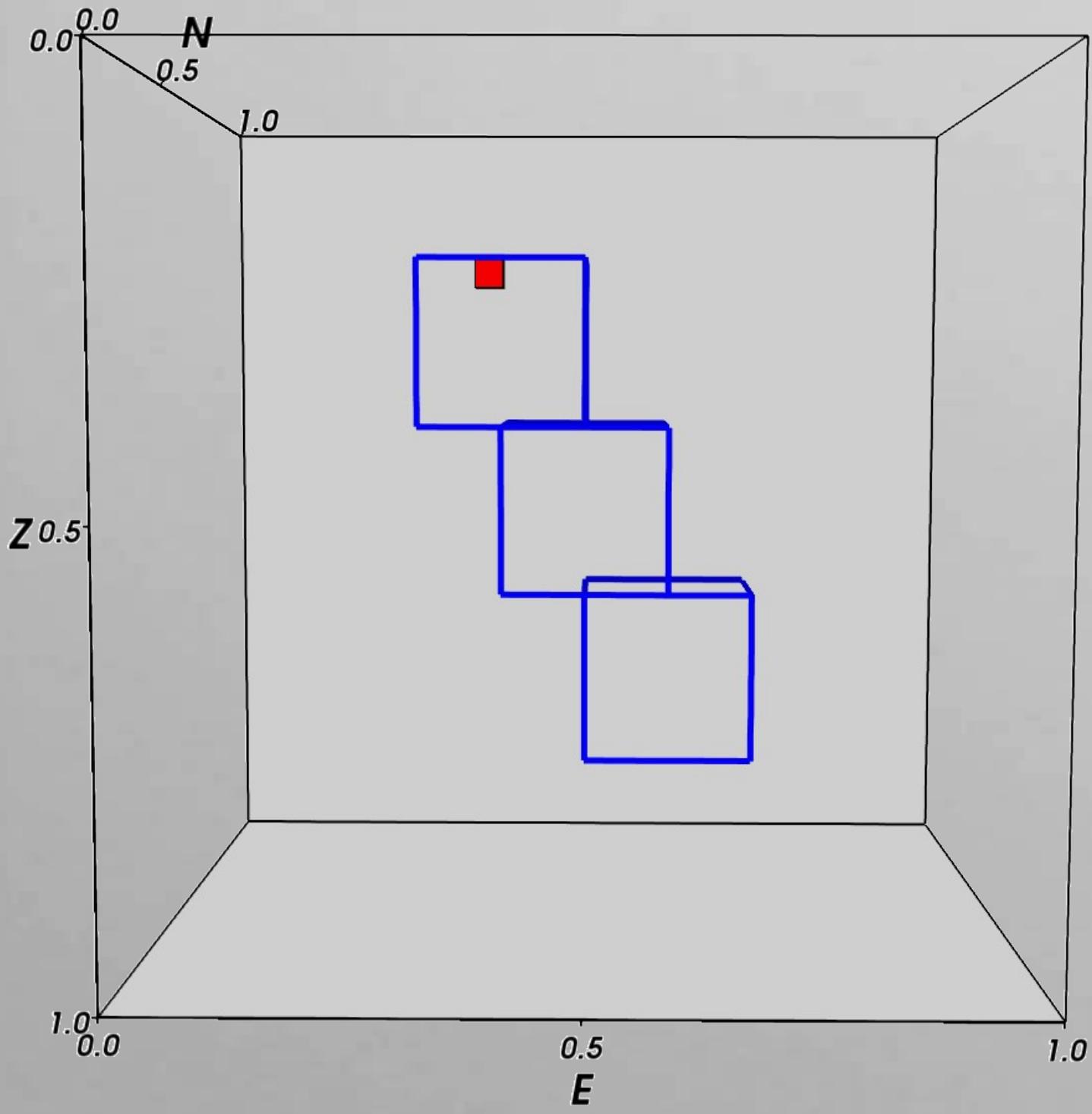
$$\Gamma = SOA + \mu \theta$$

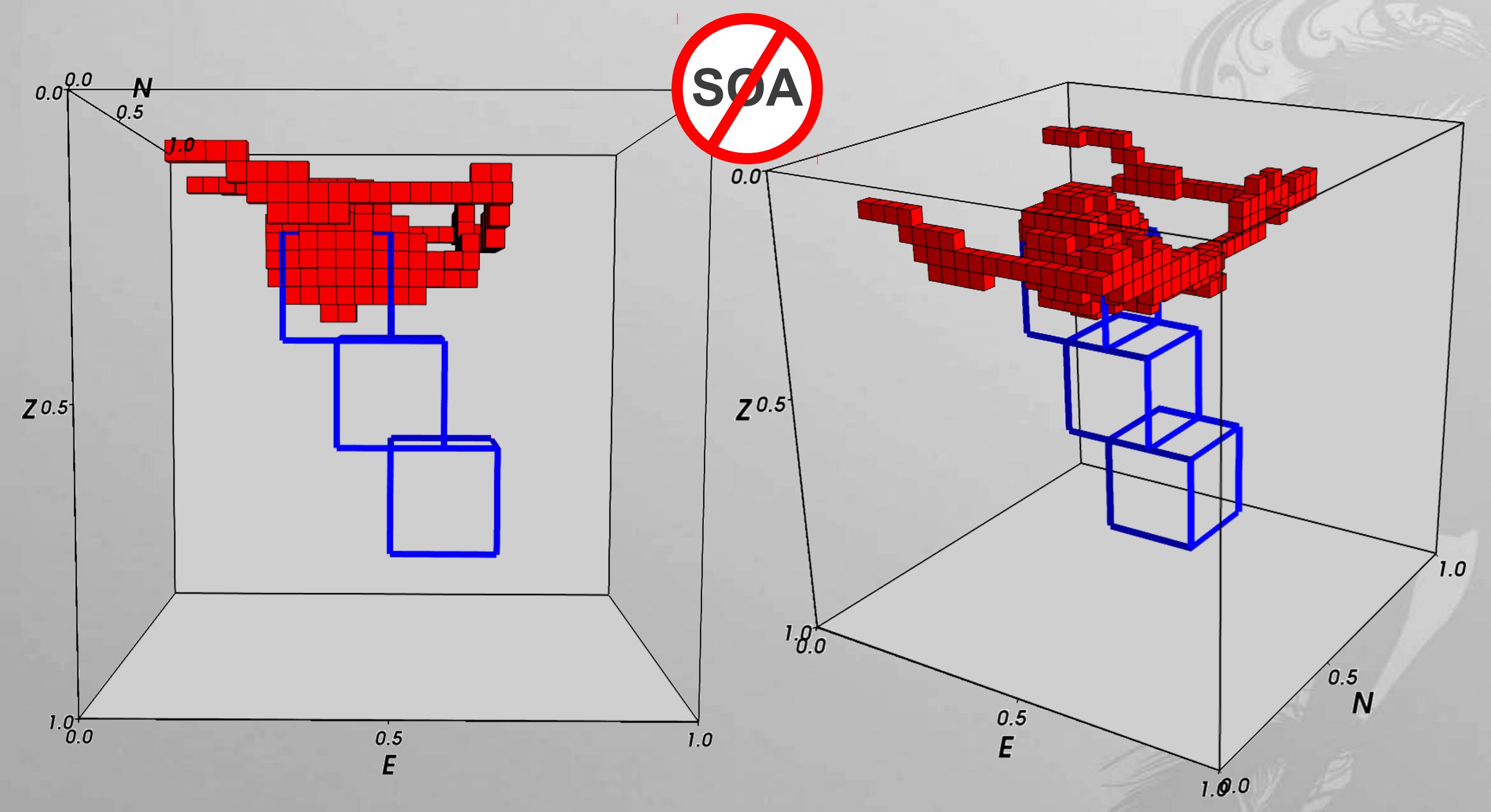


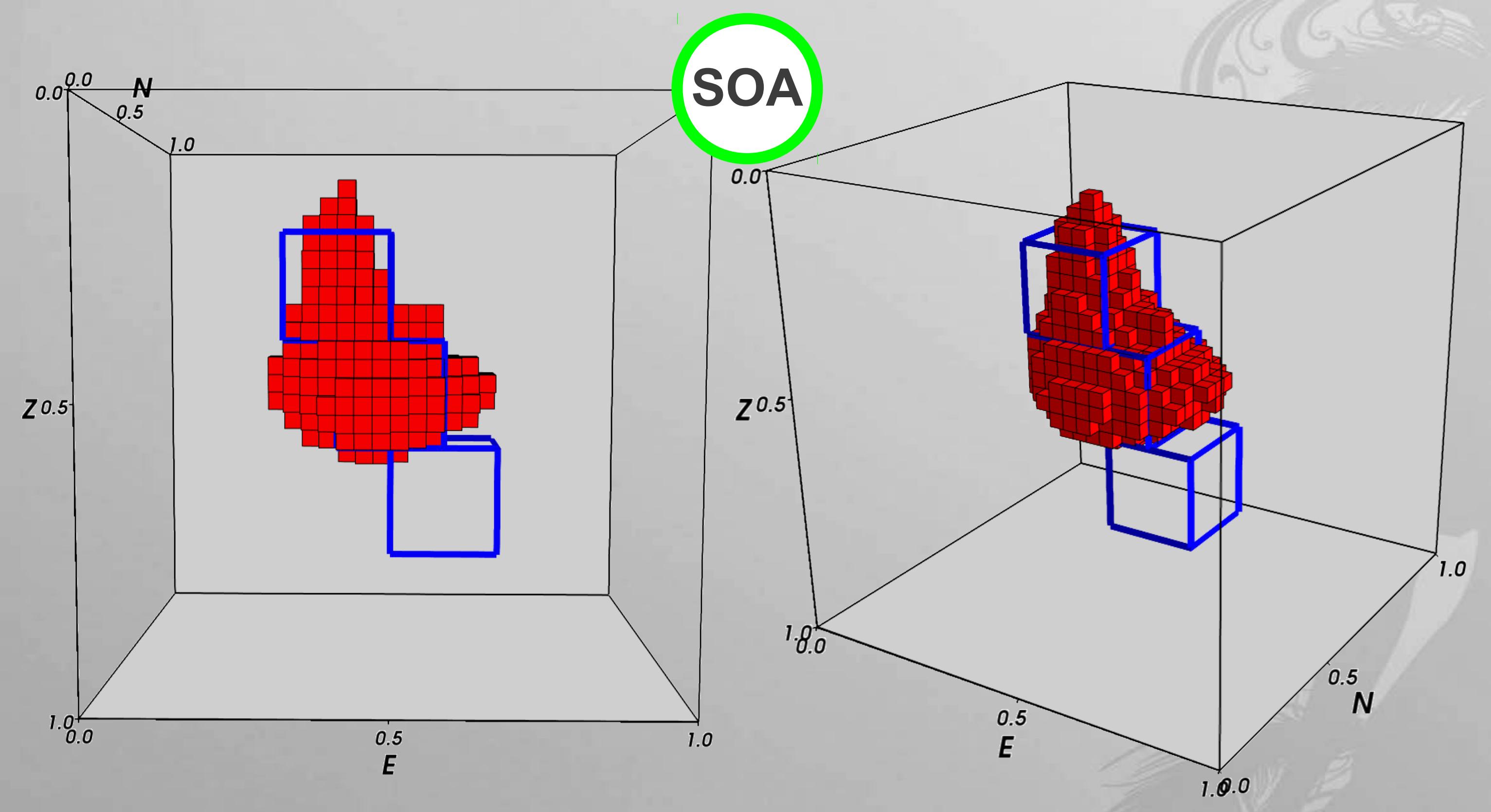
Synthetic tests

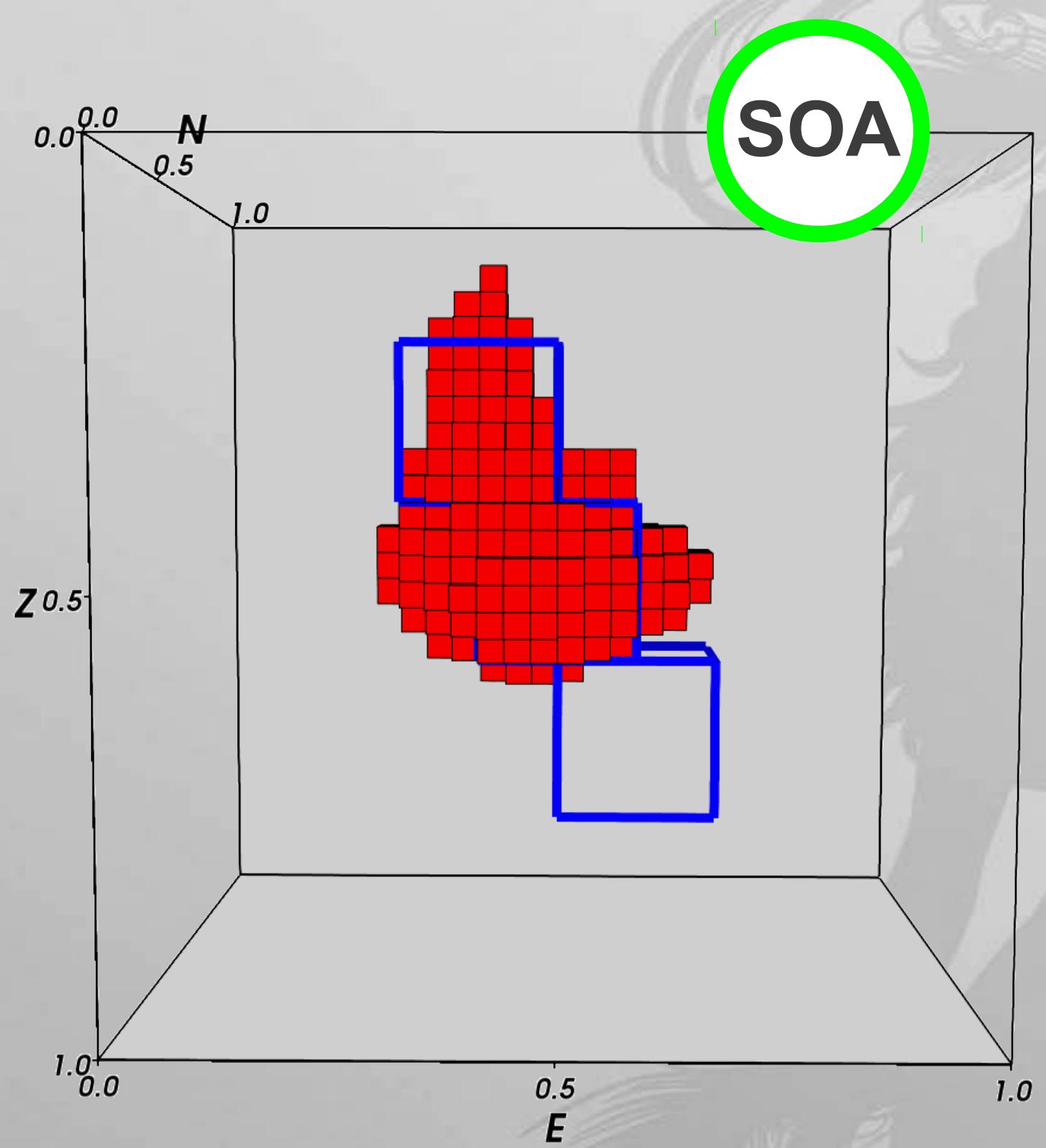
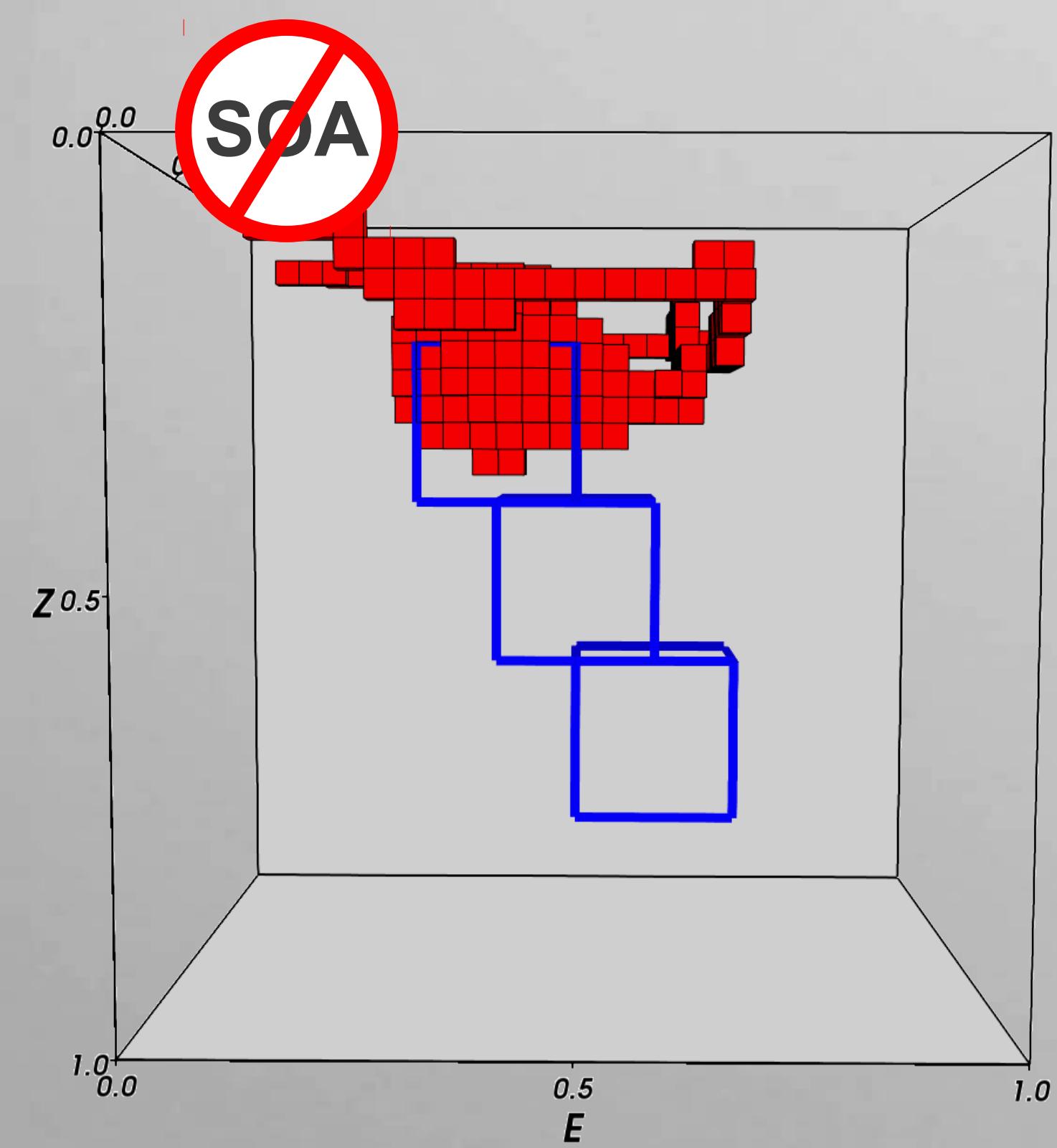


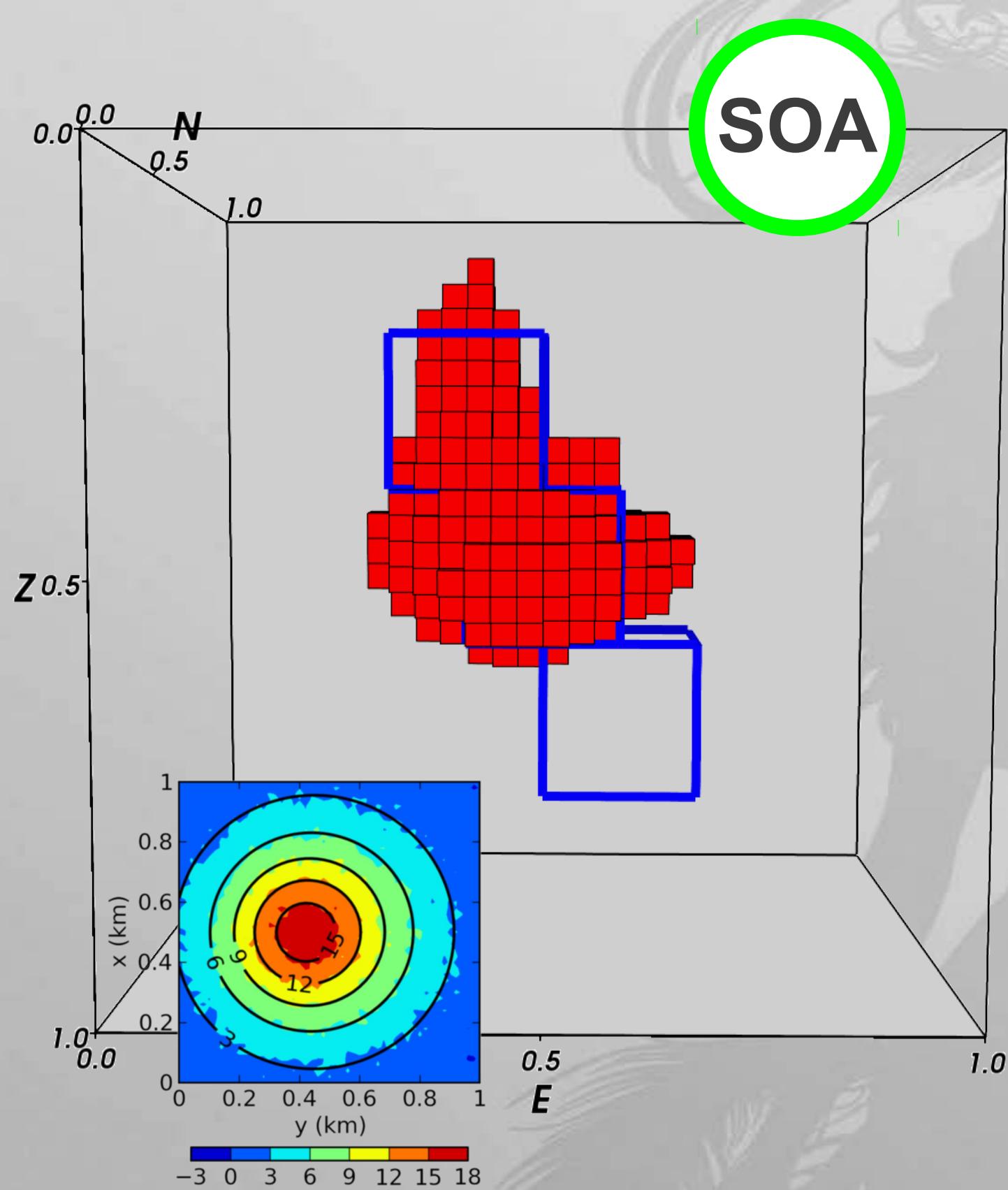
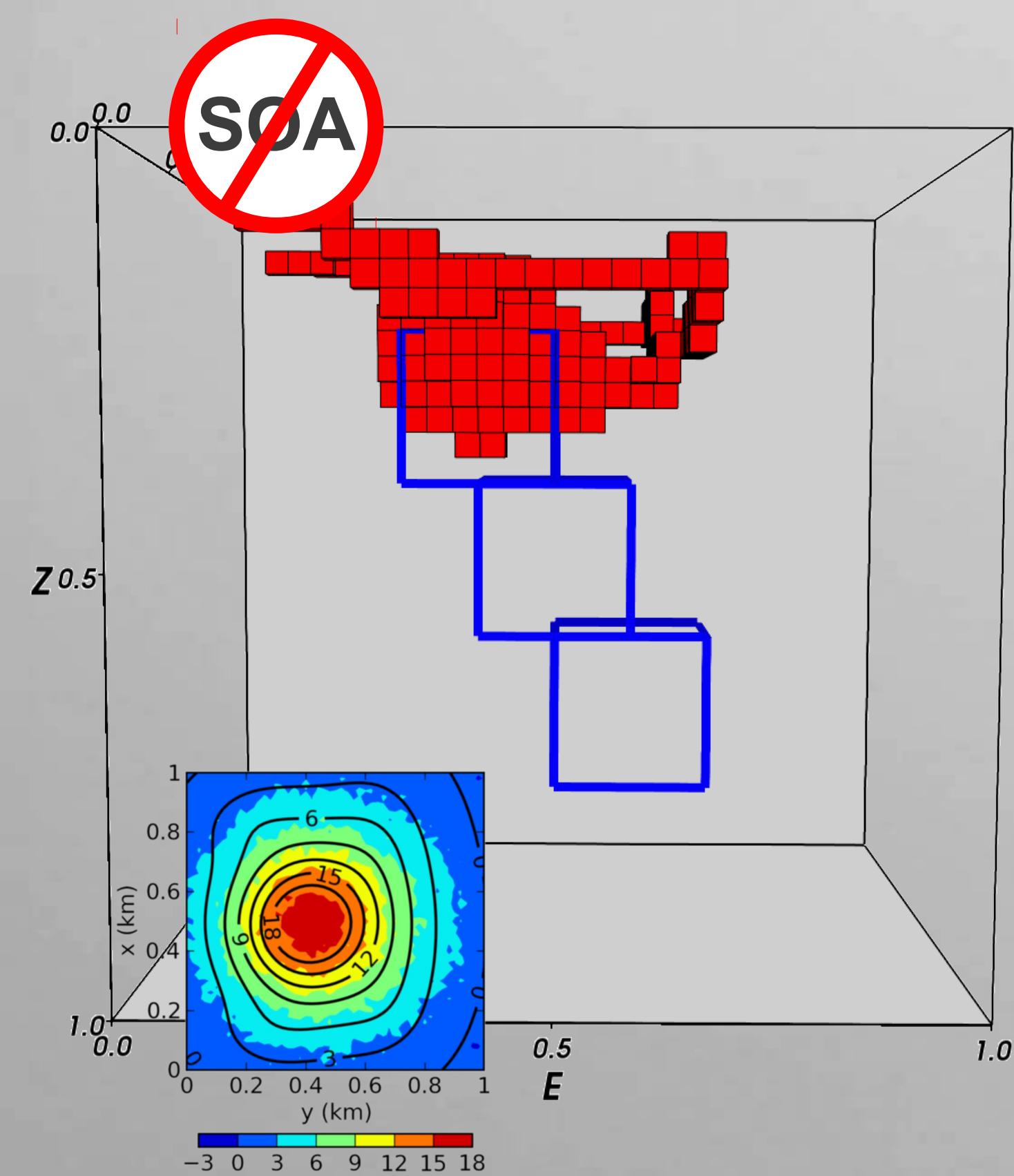


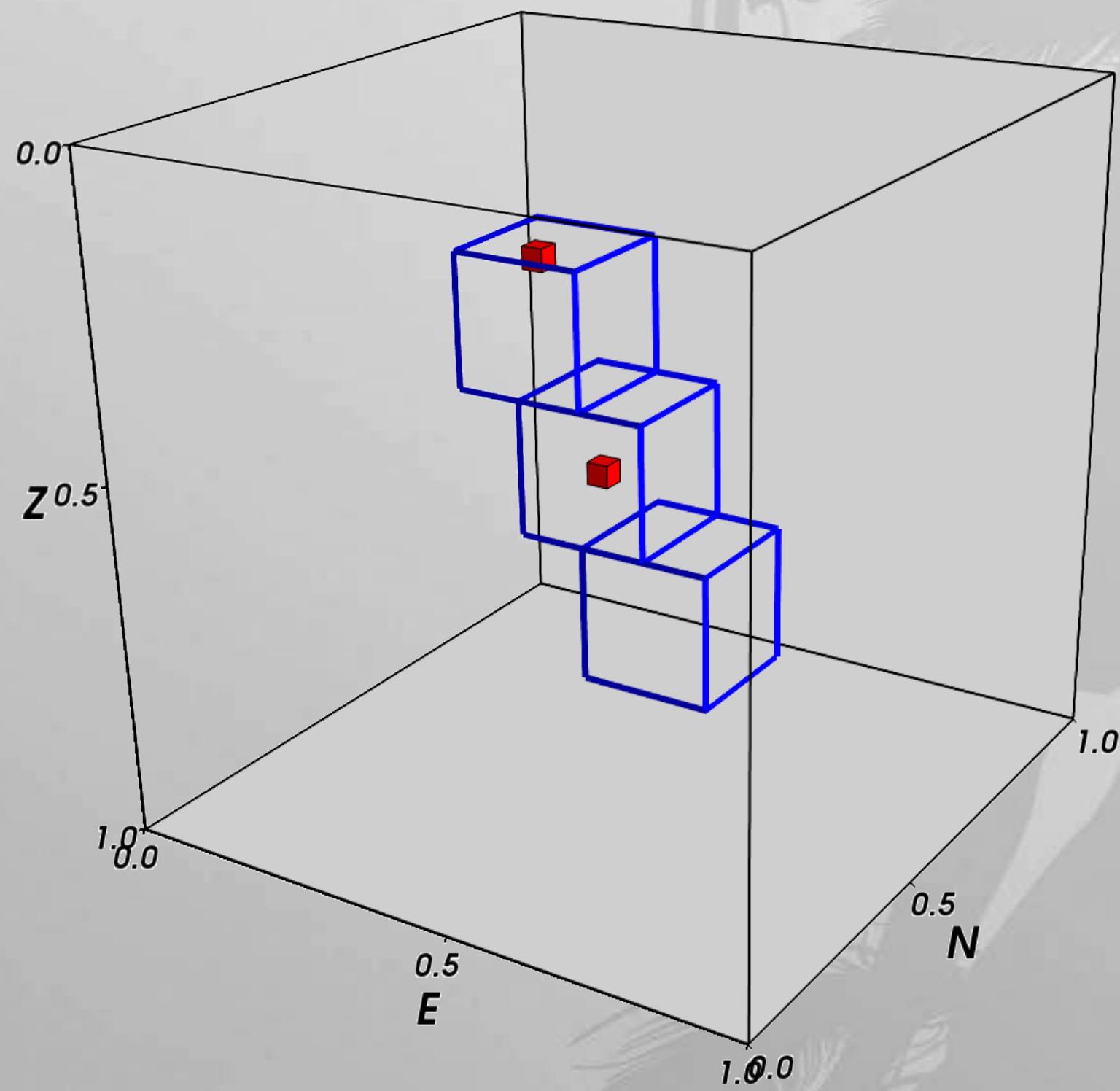
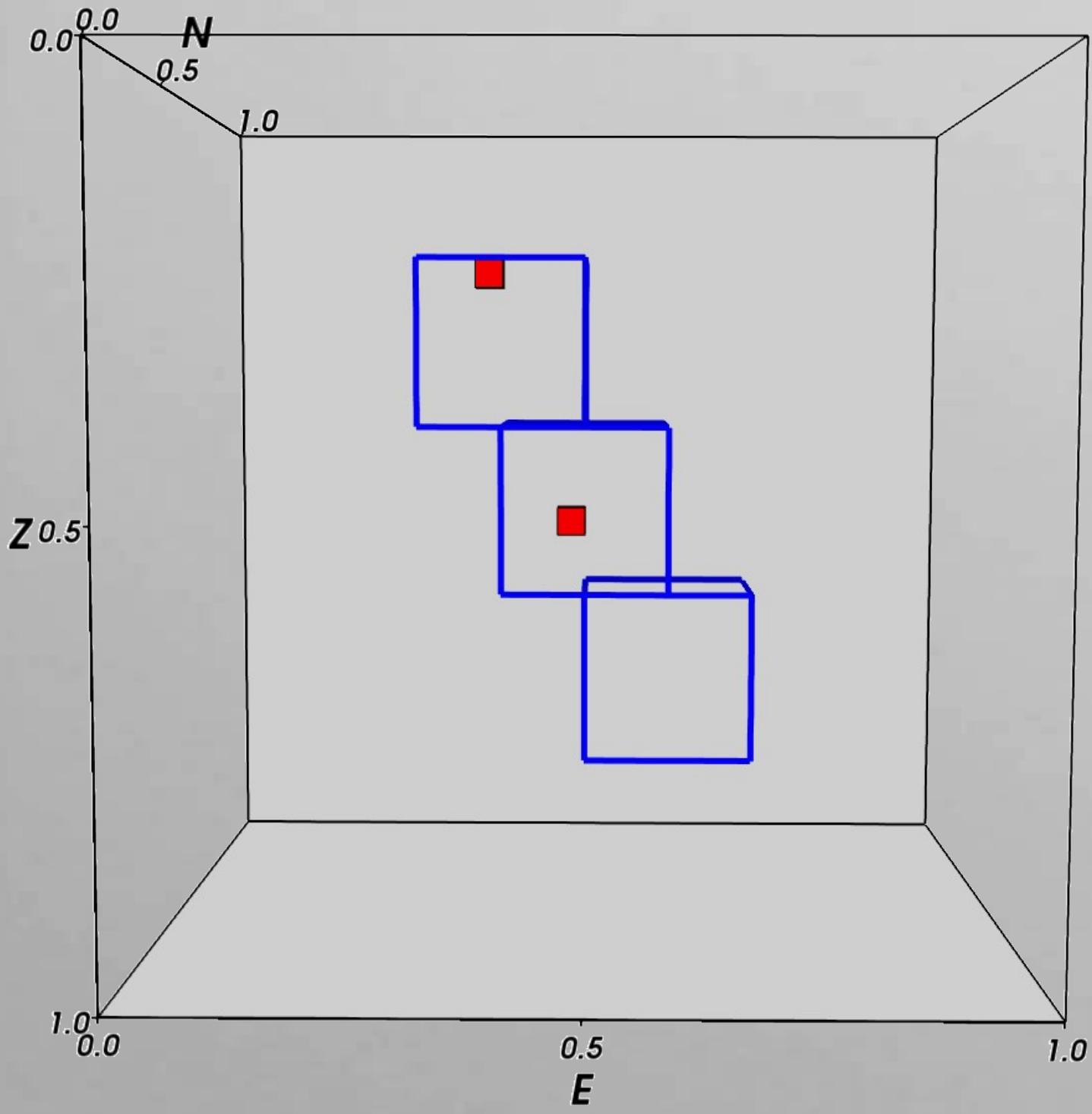


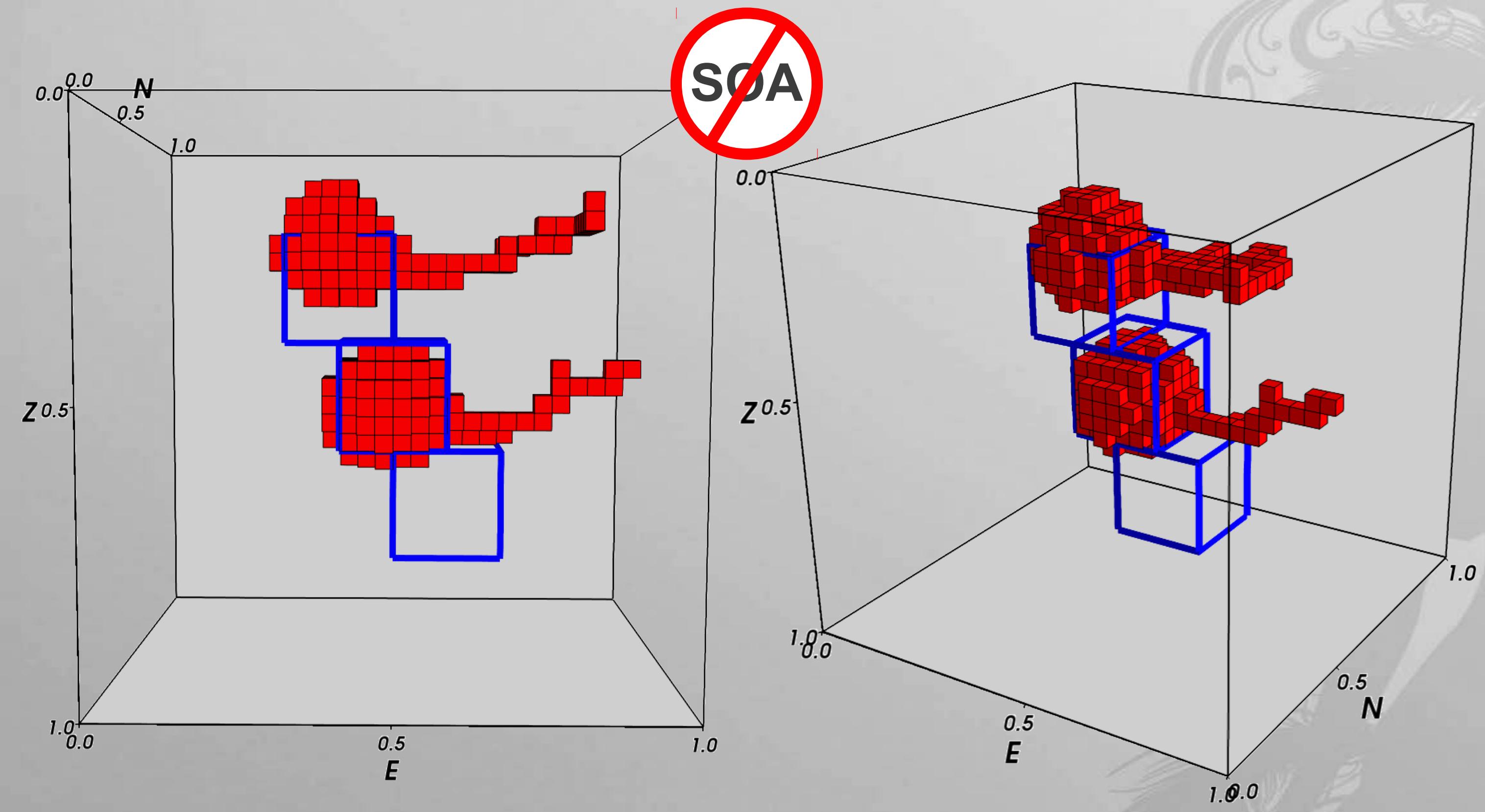






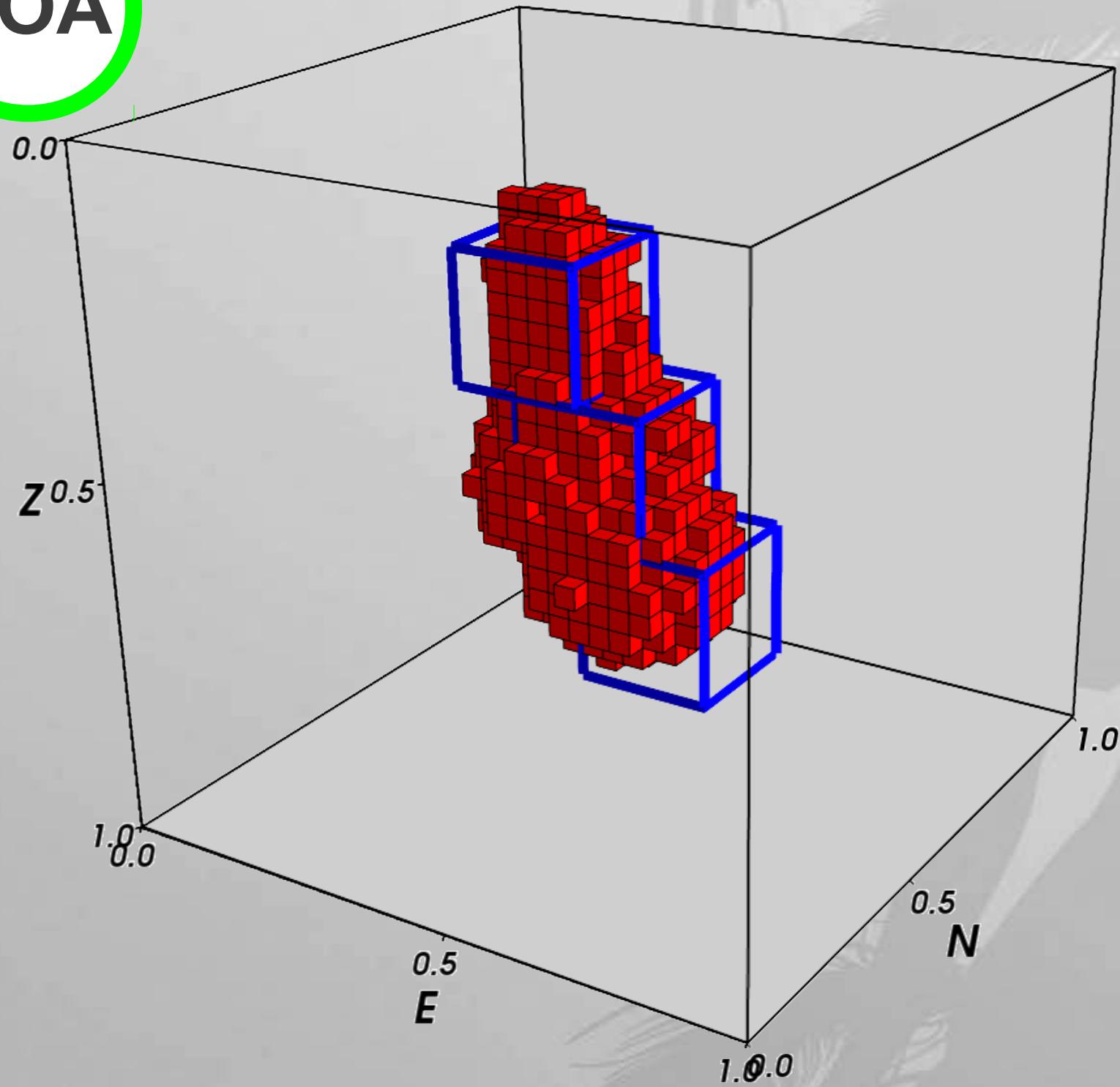
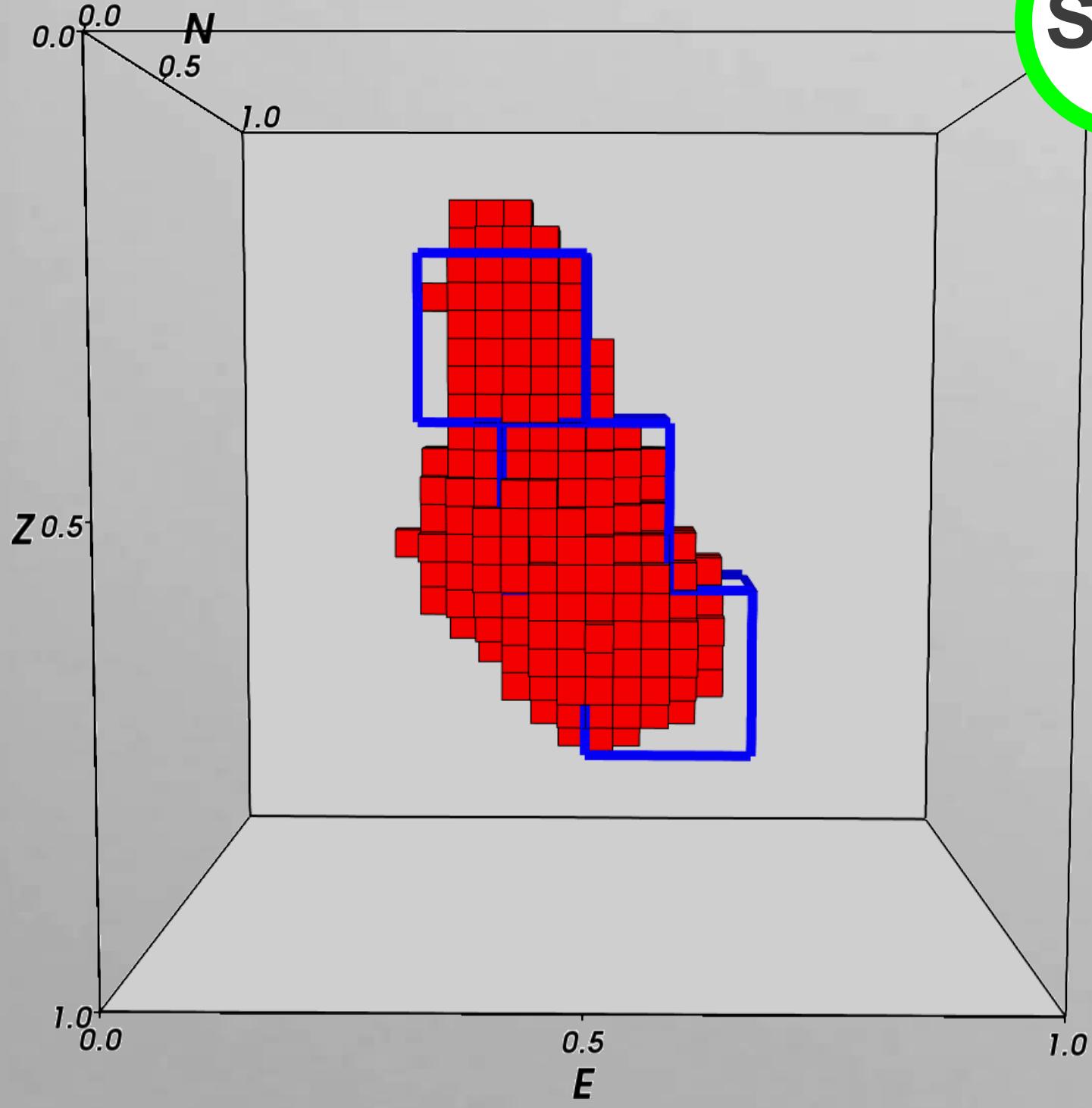






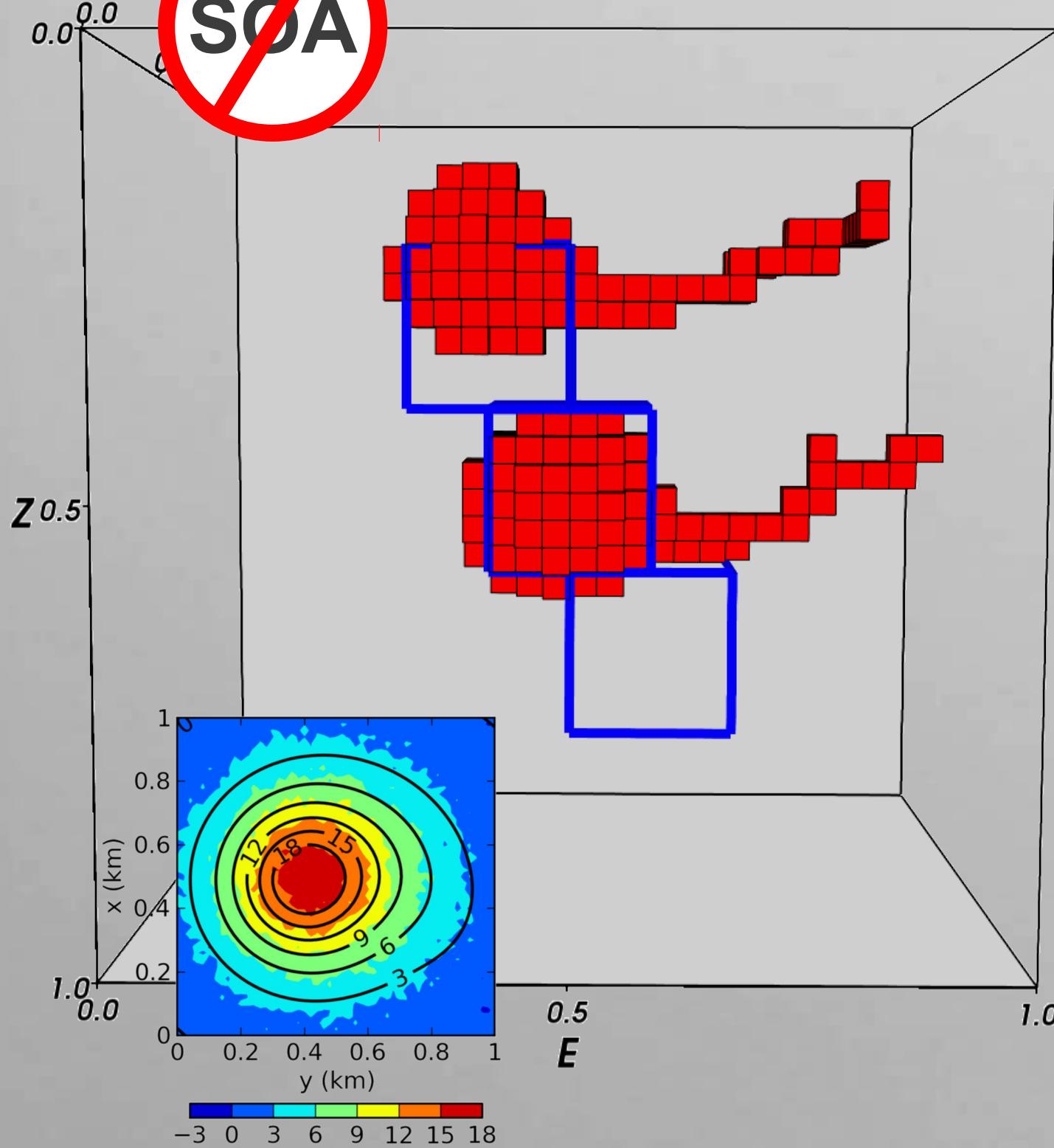


SOA

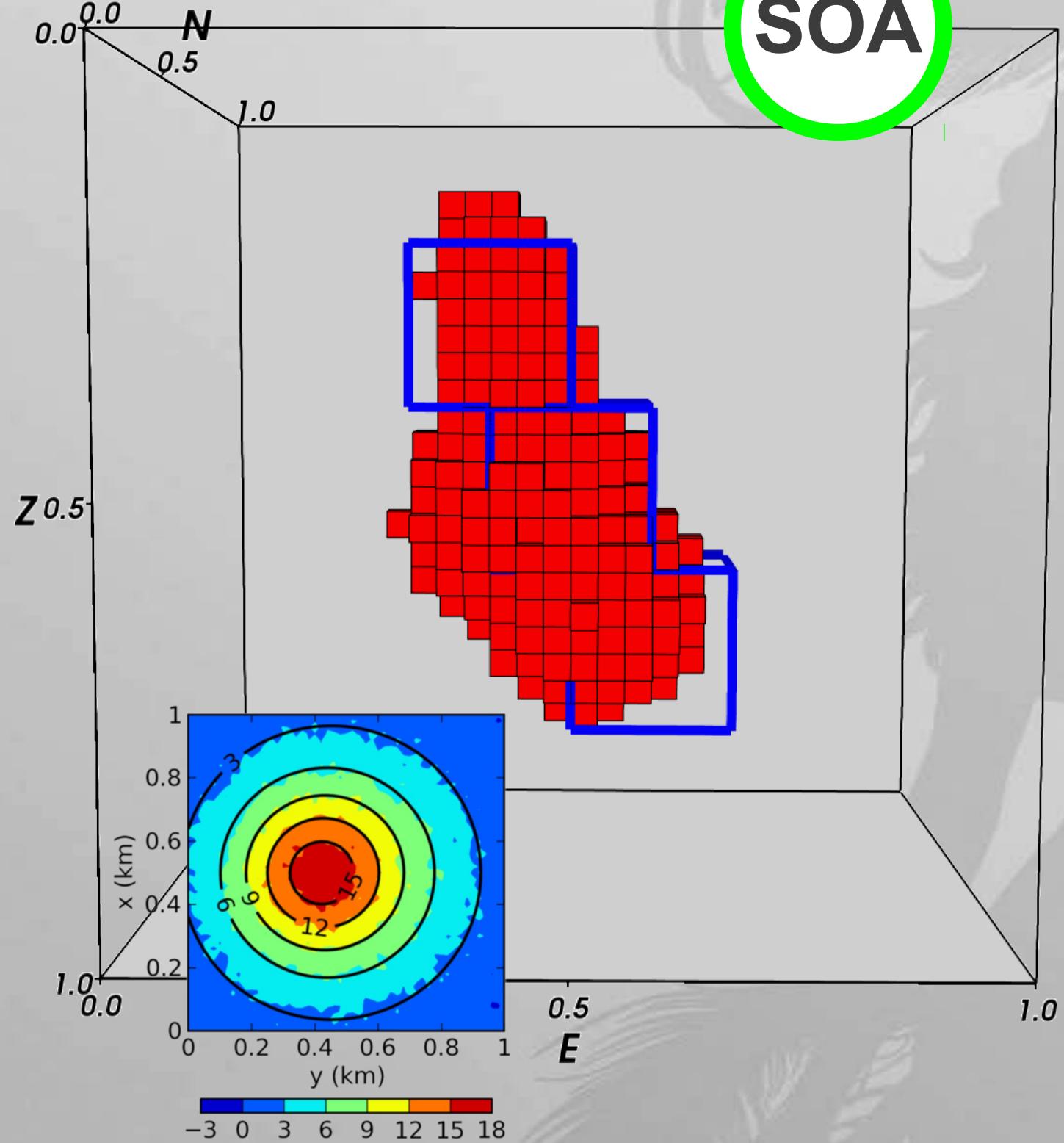


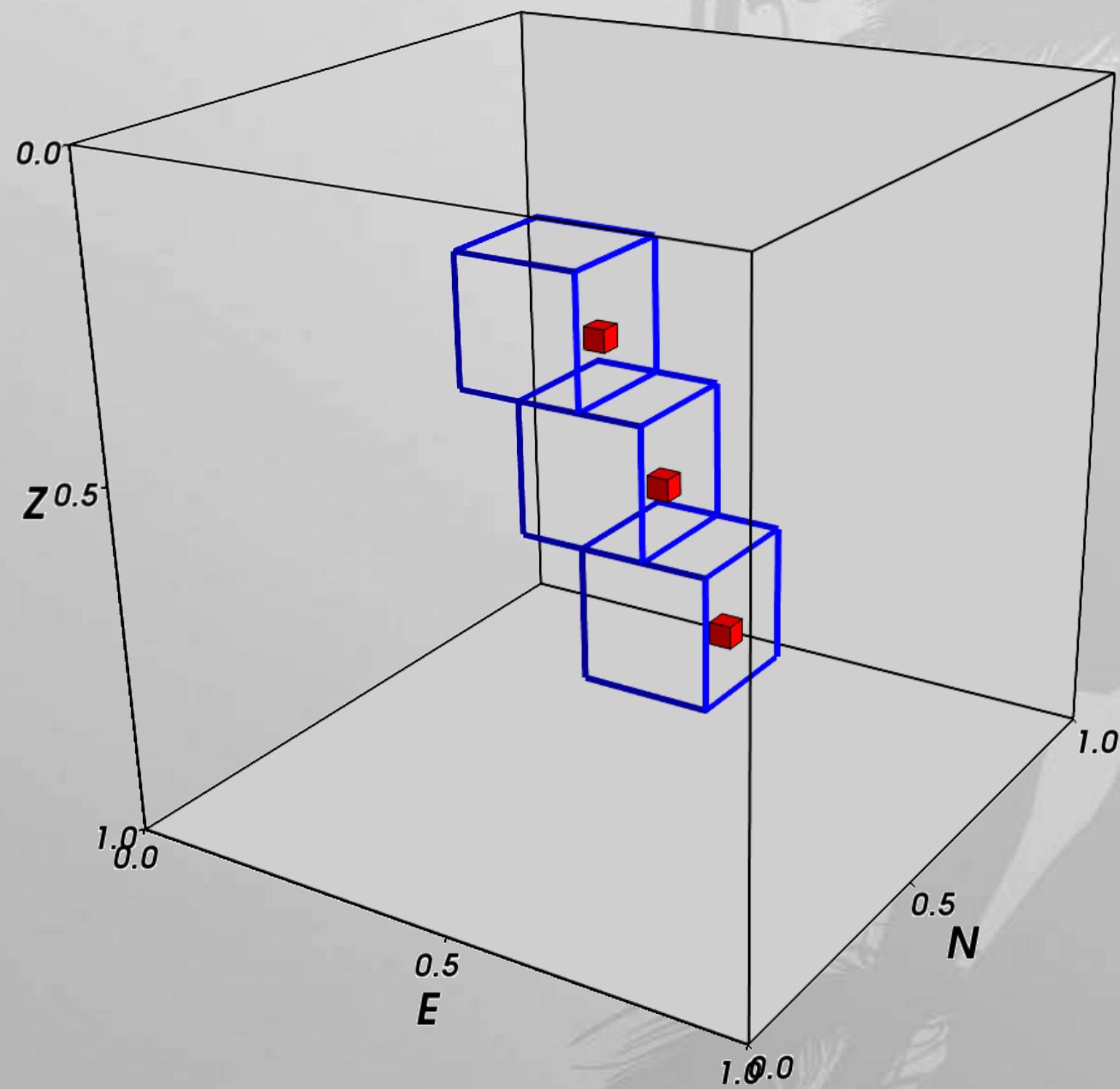
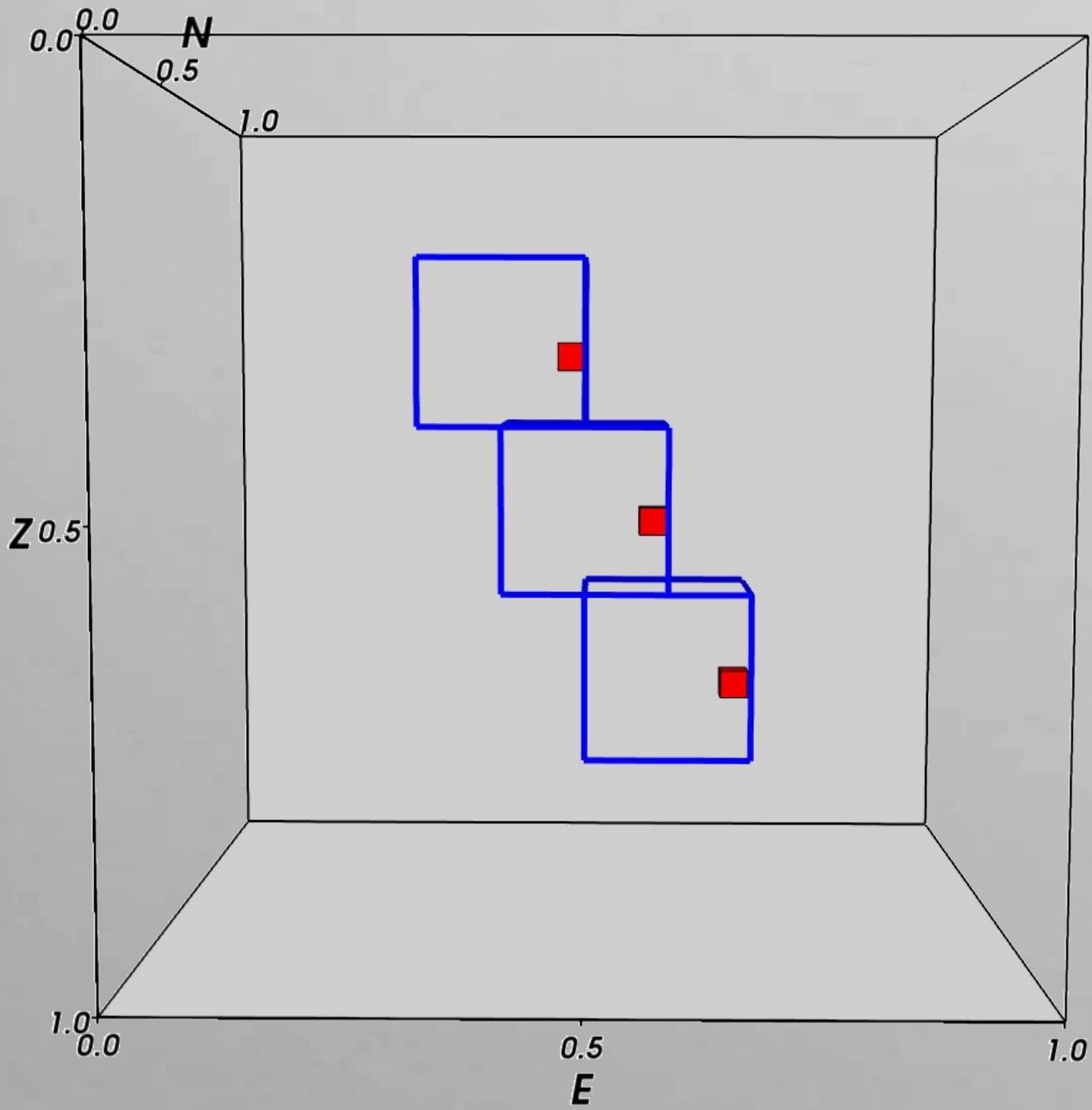


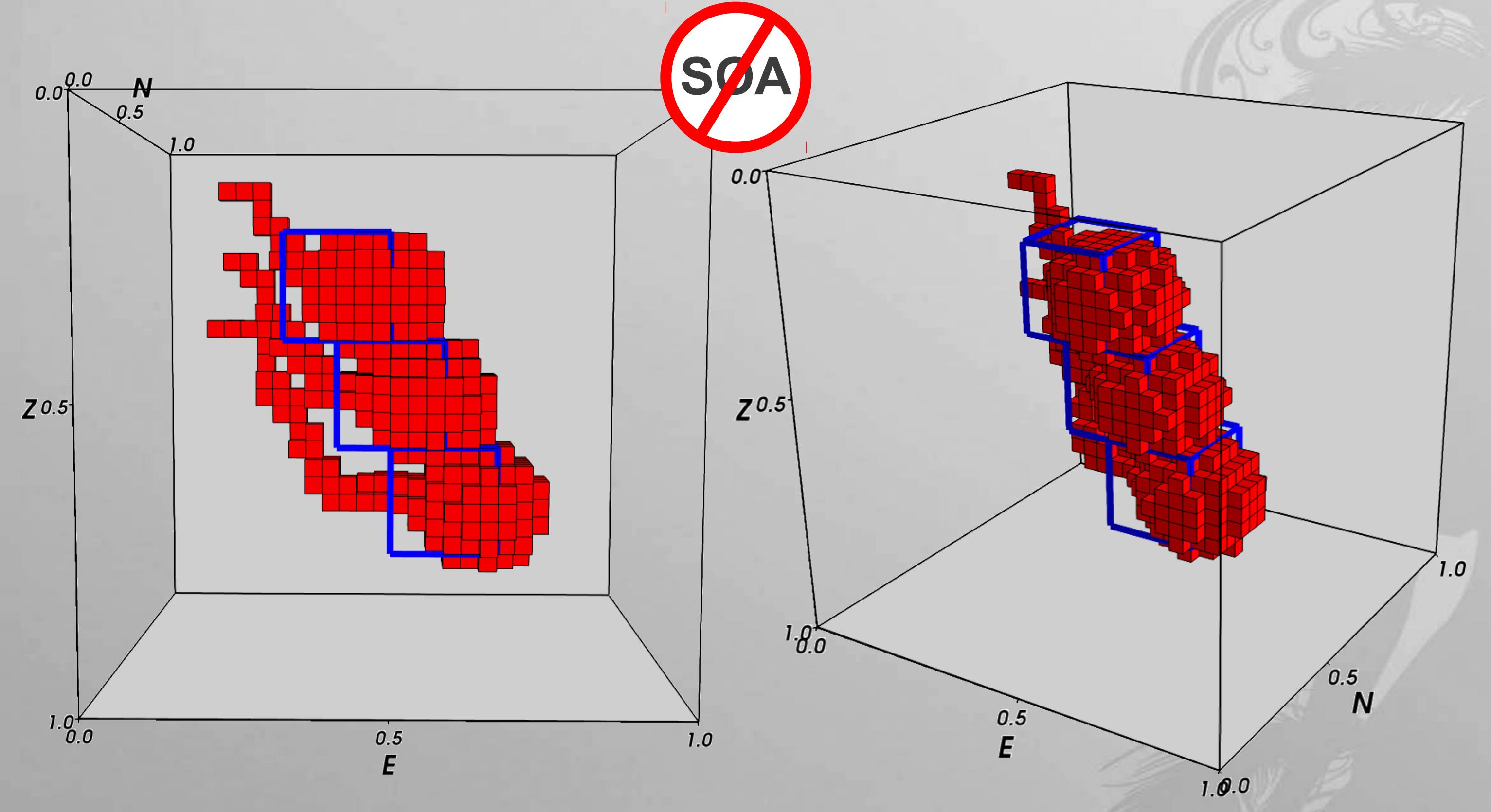
SOA



SOA

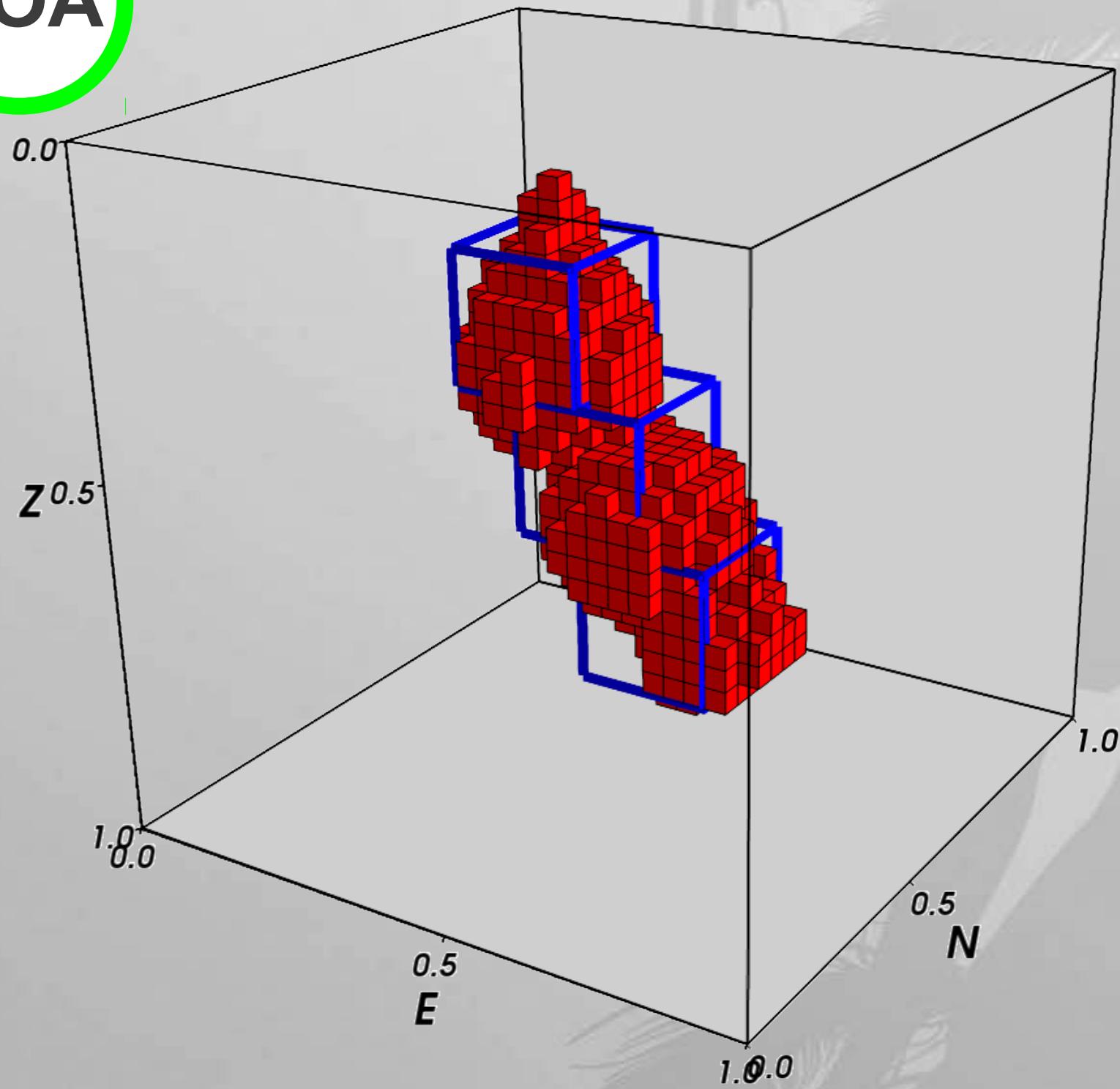
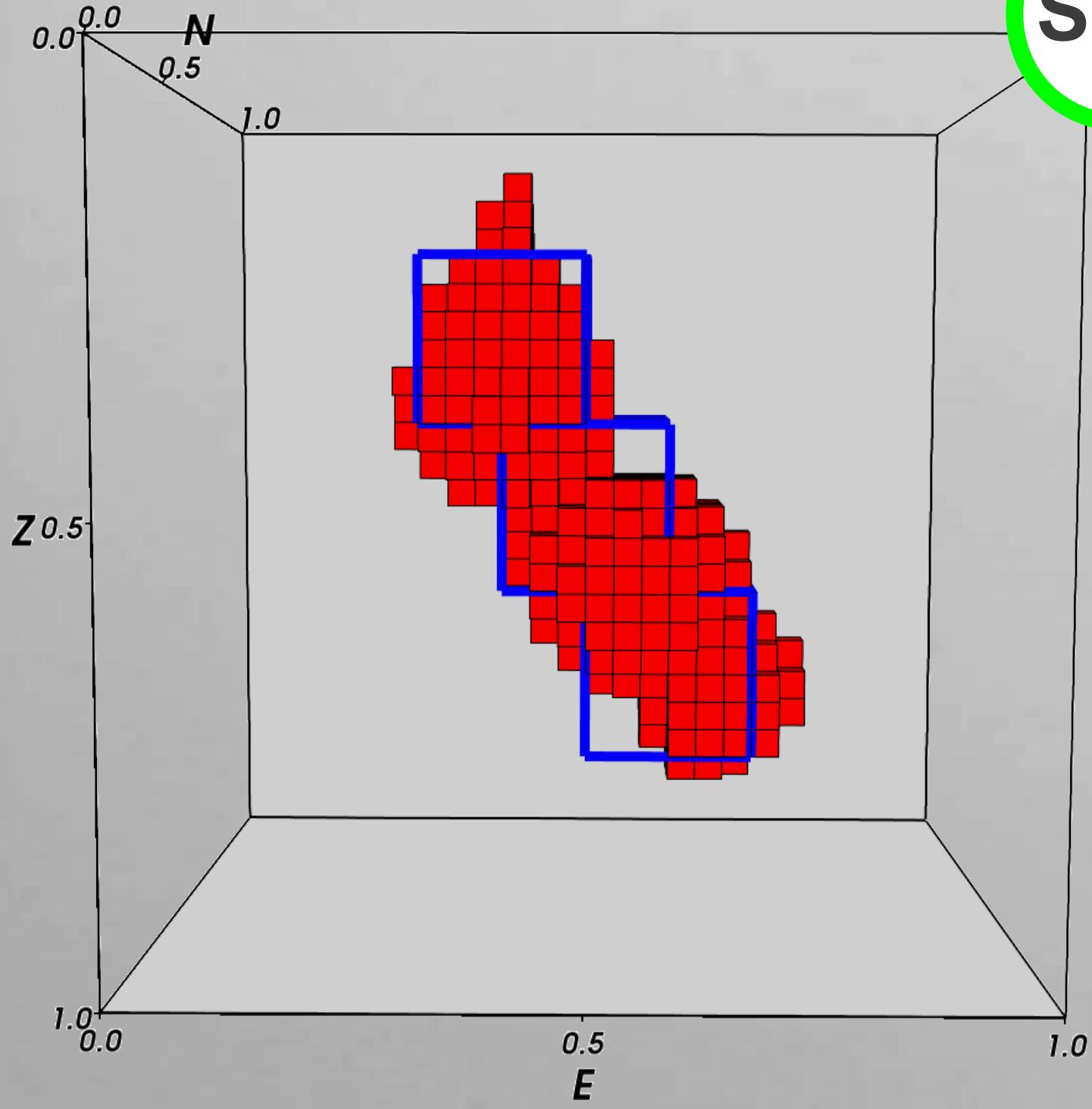


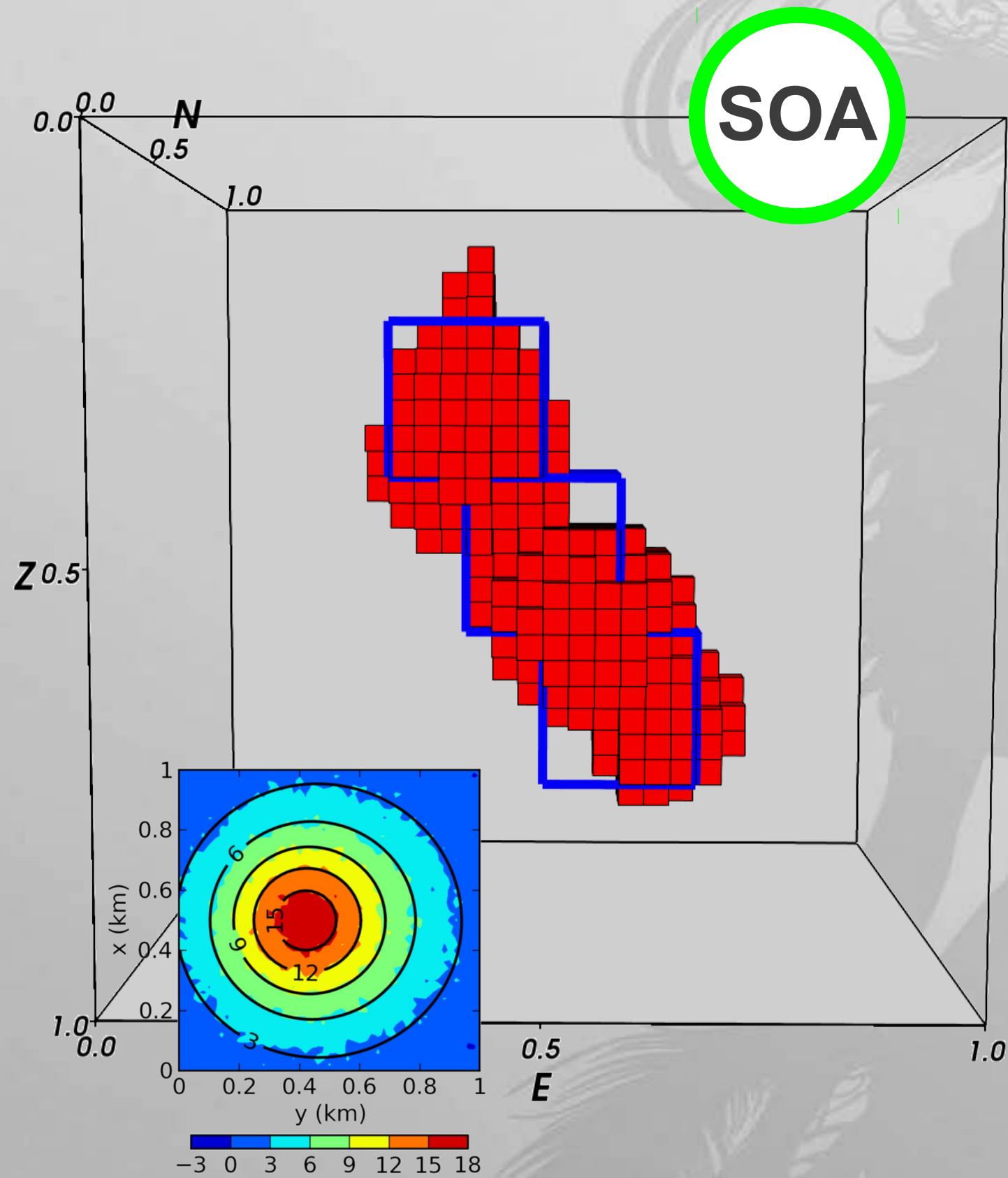
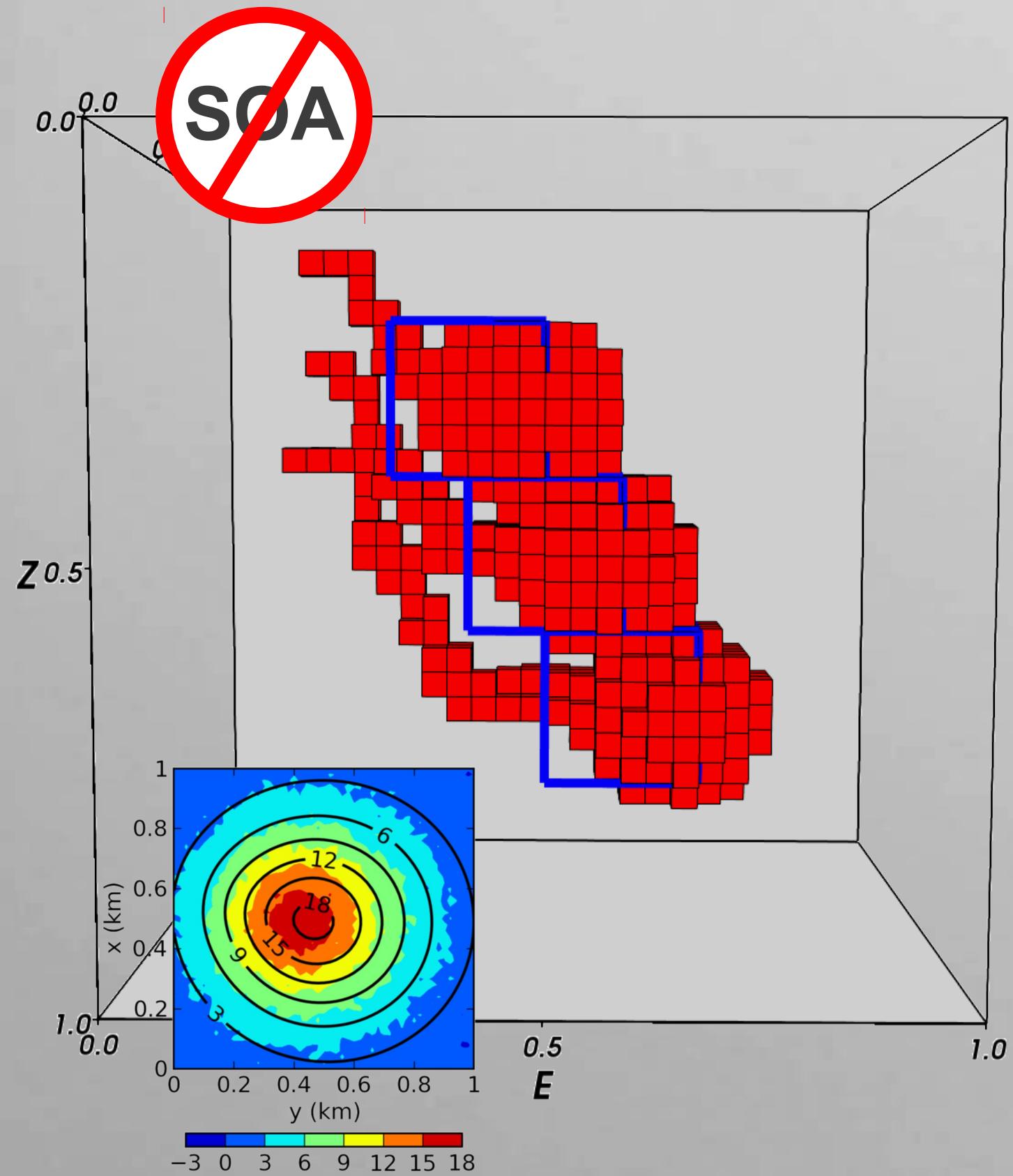






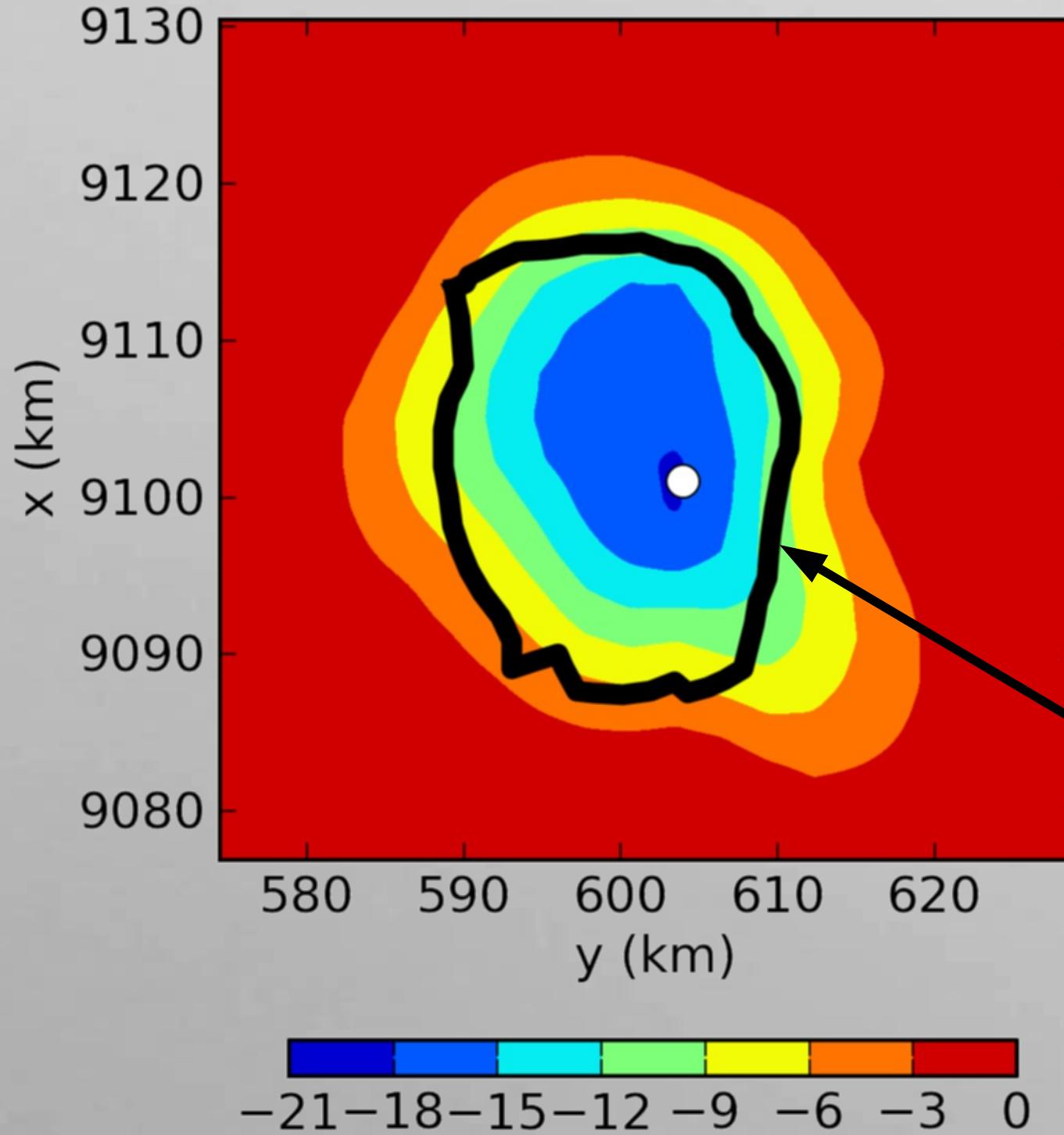
SOA





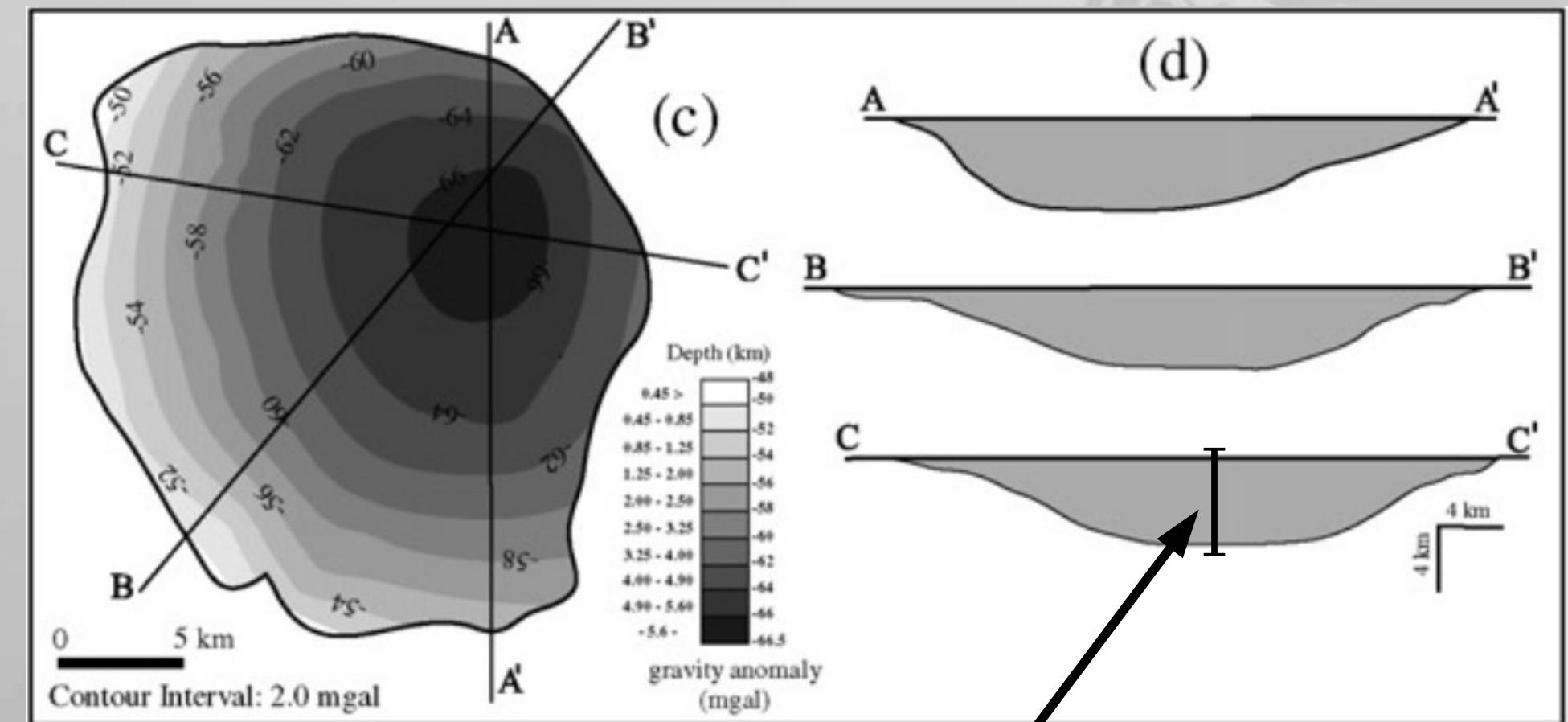
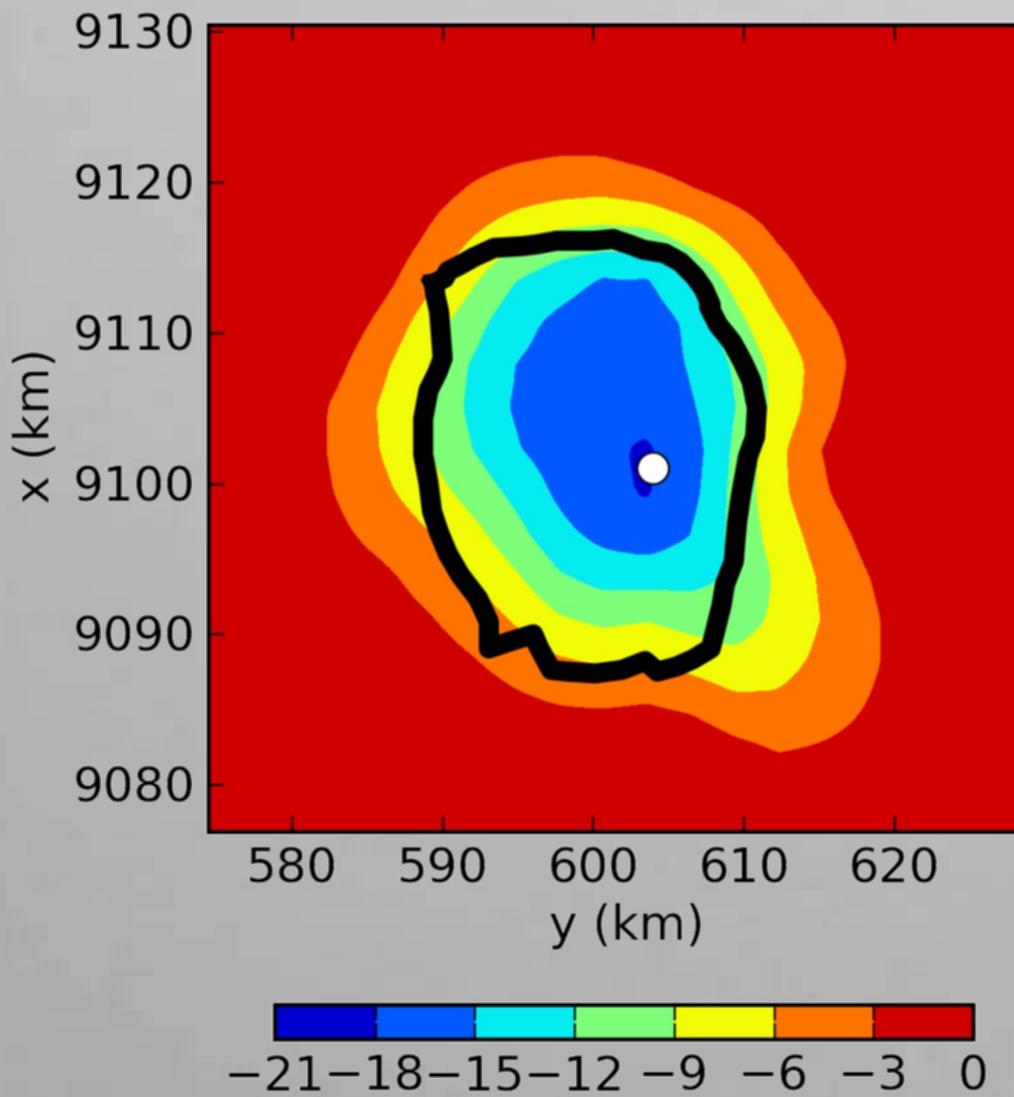
Redenção granite

Bouguer anomaly



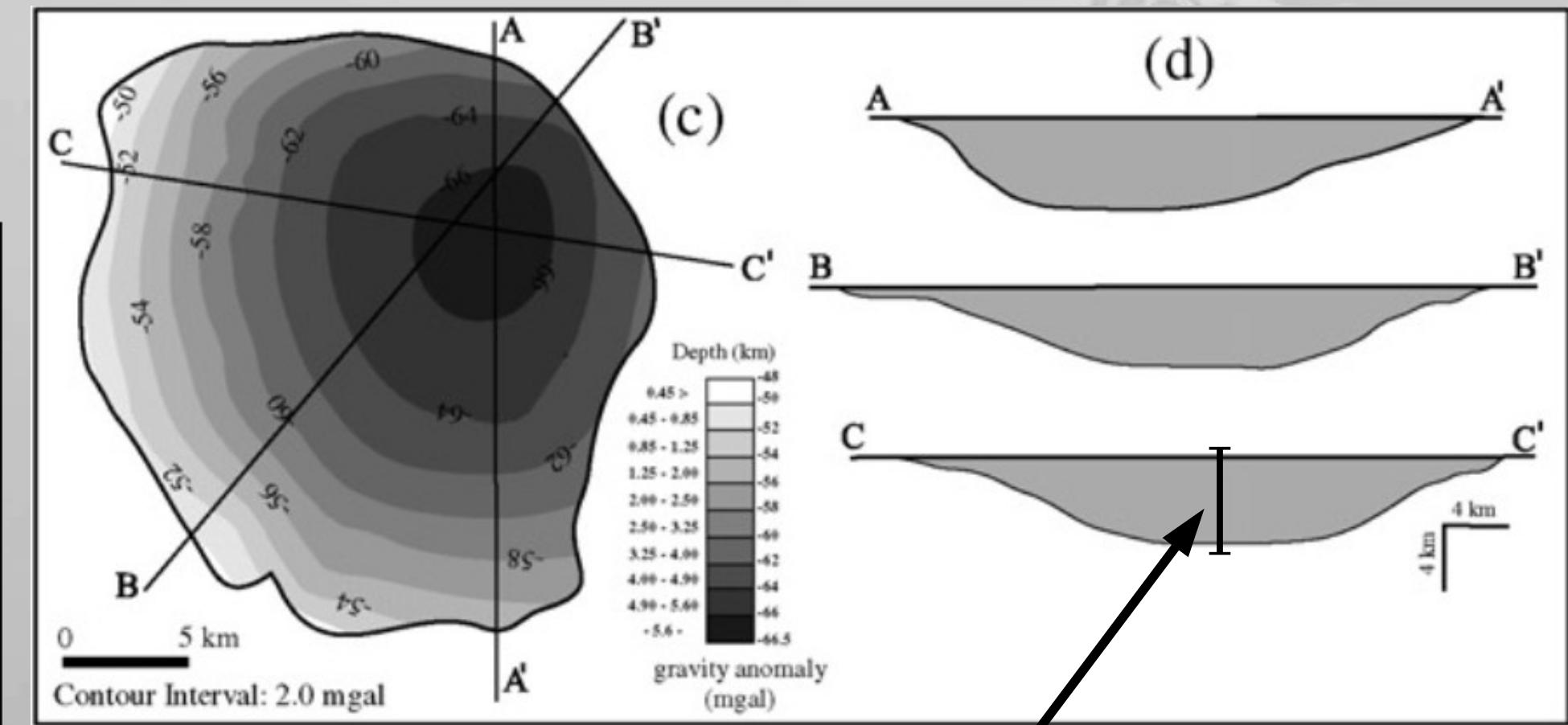
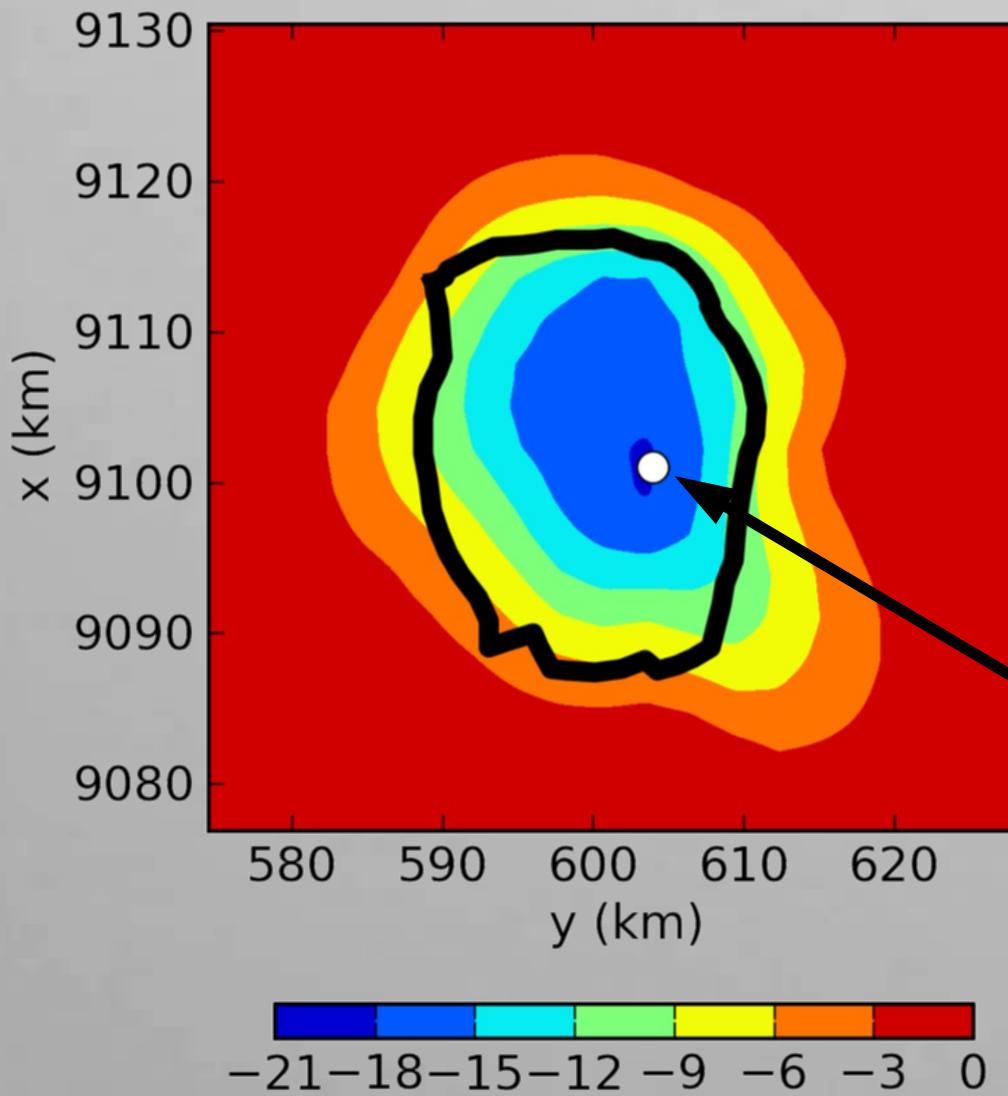
Outcrop

Bouguer anomaly



~ 6 km

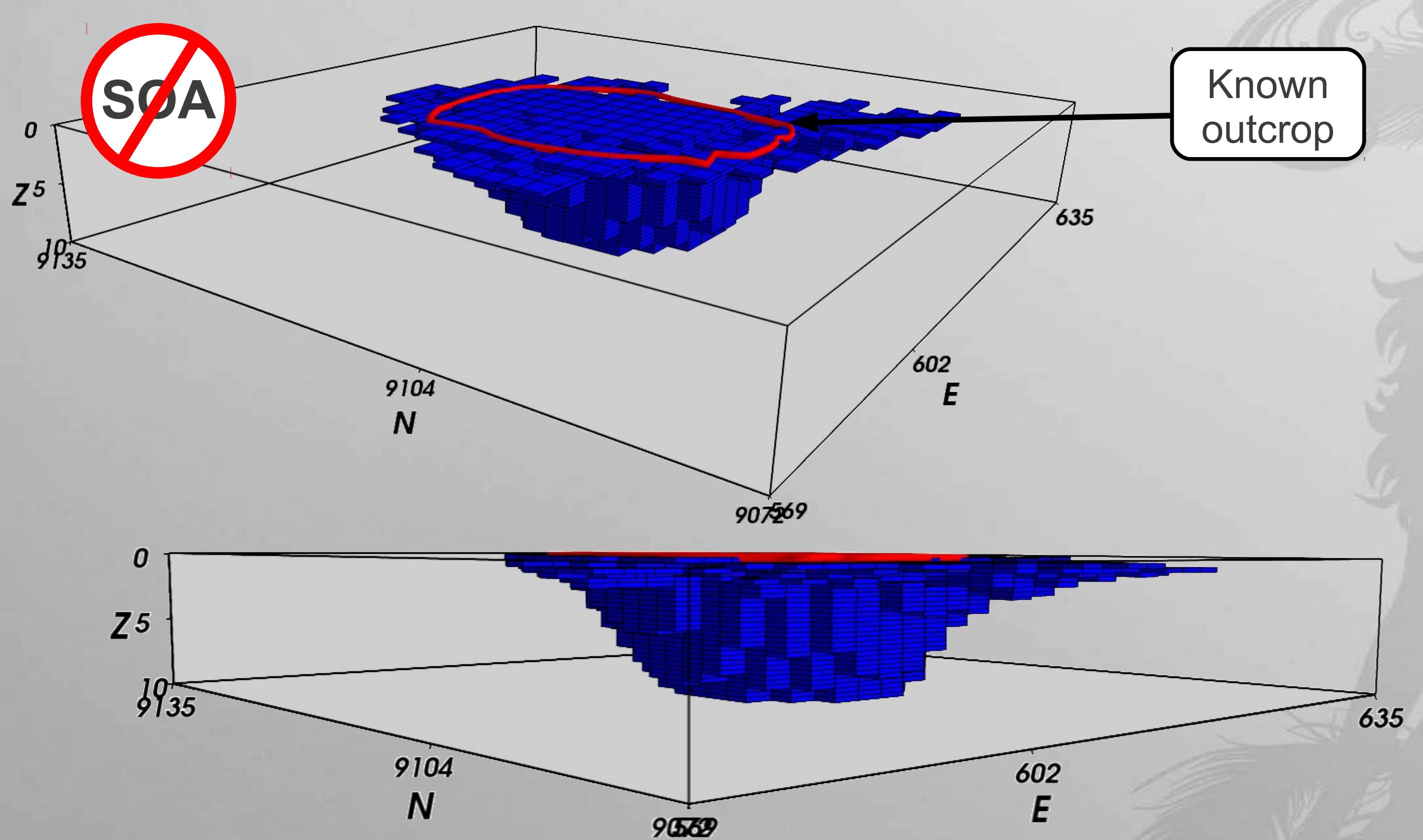
Bouguer anomaly

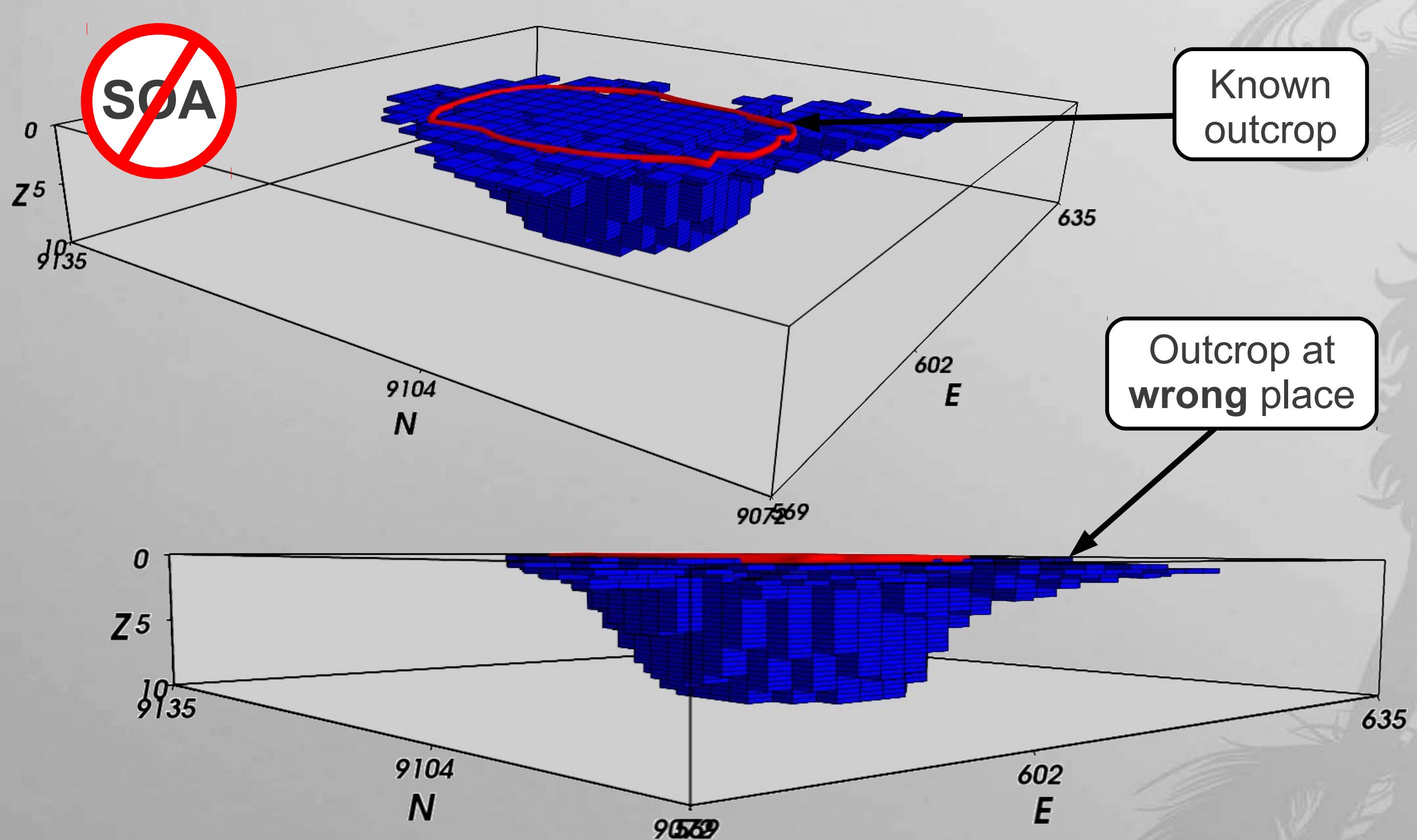


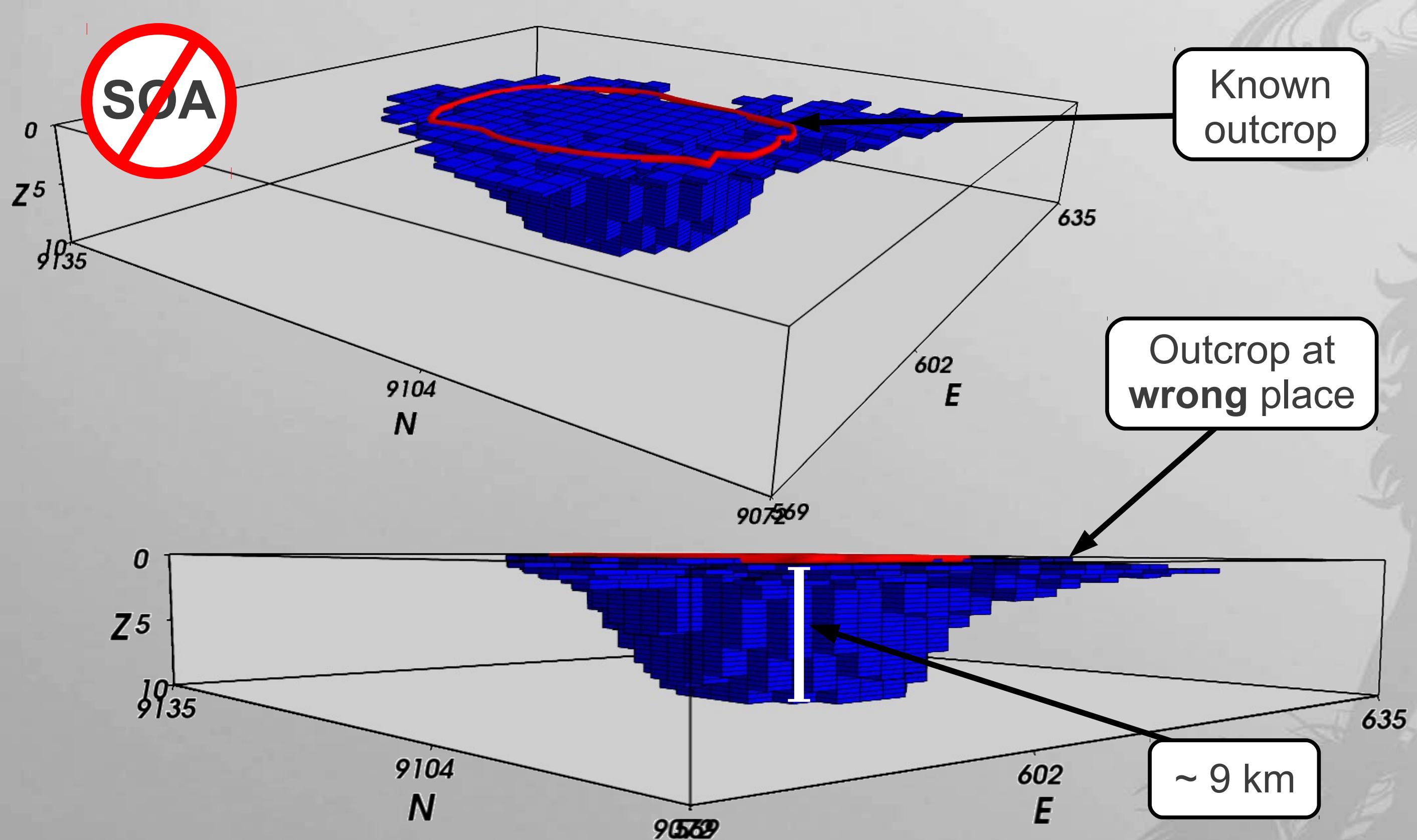
Oliveira et al.(2008)

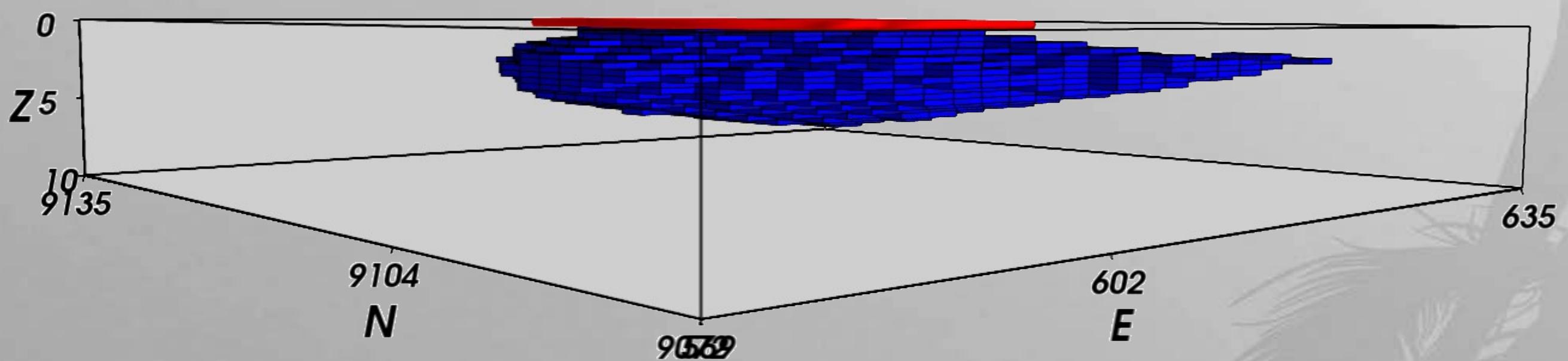
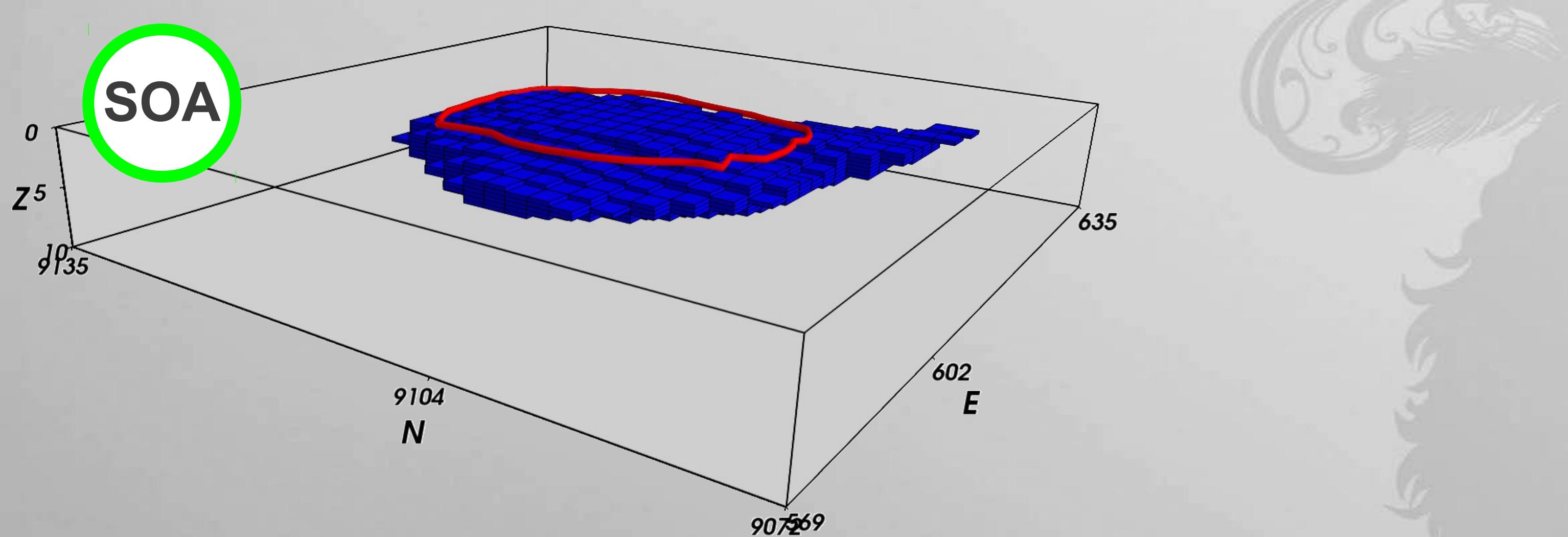
Seed at 3km

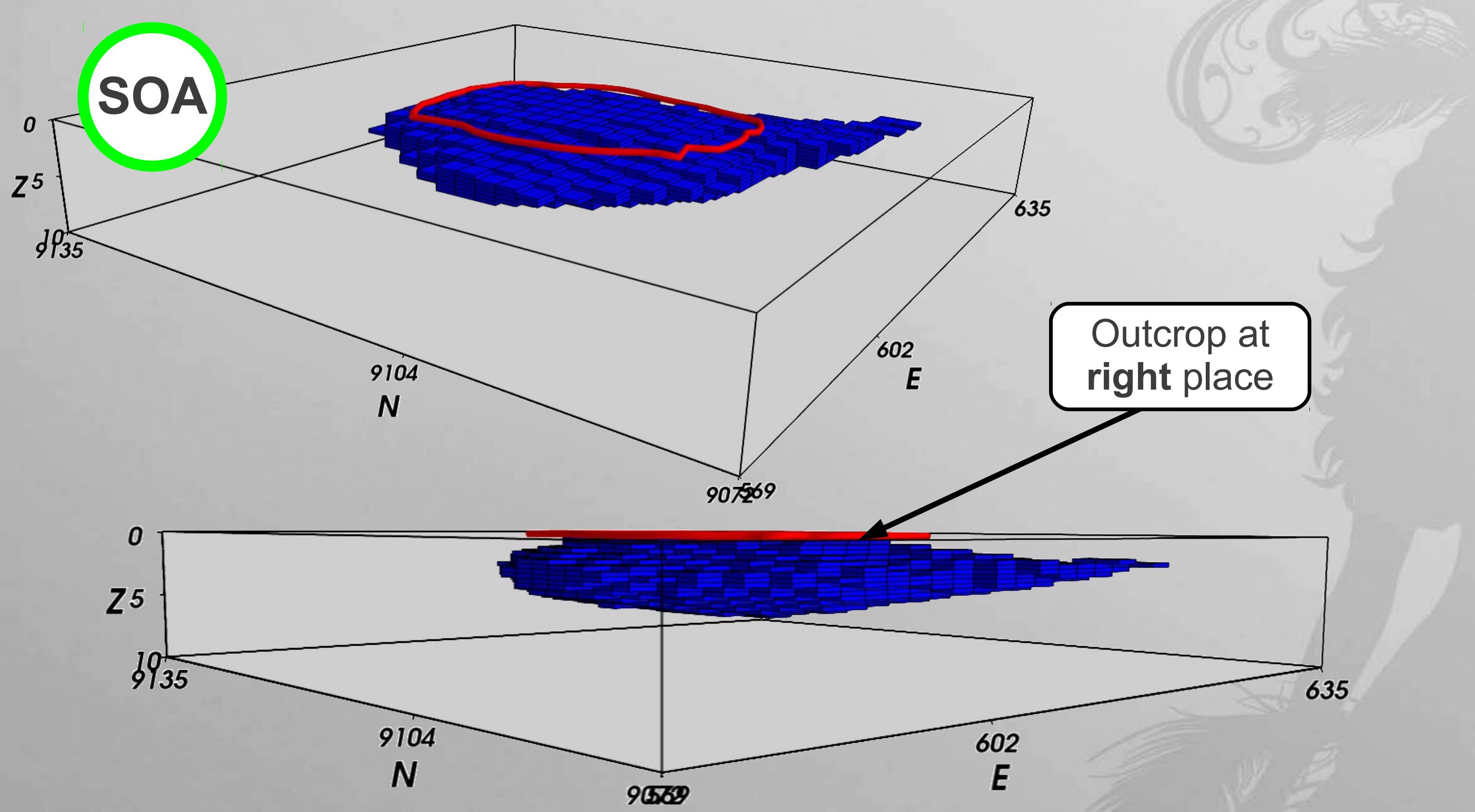
~ 6 km

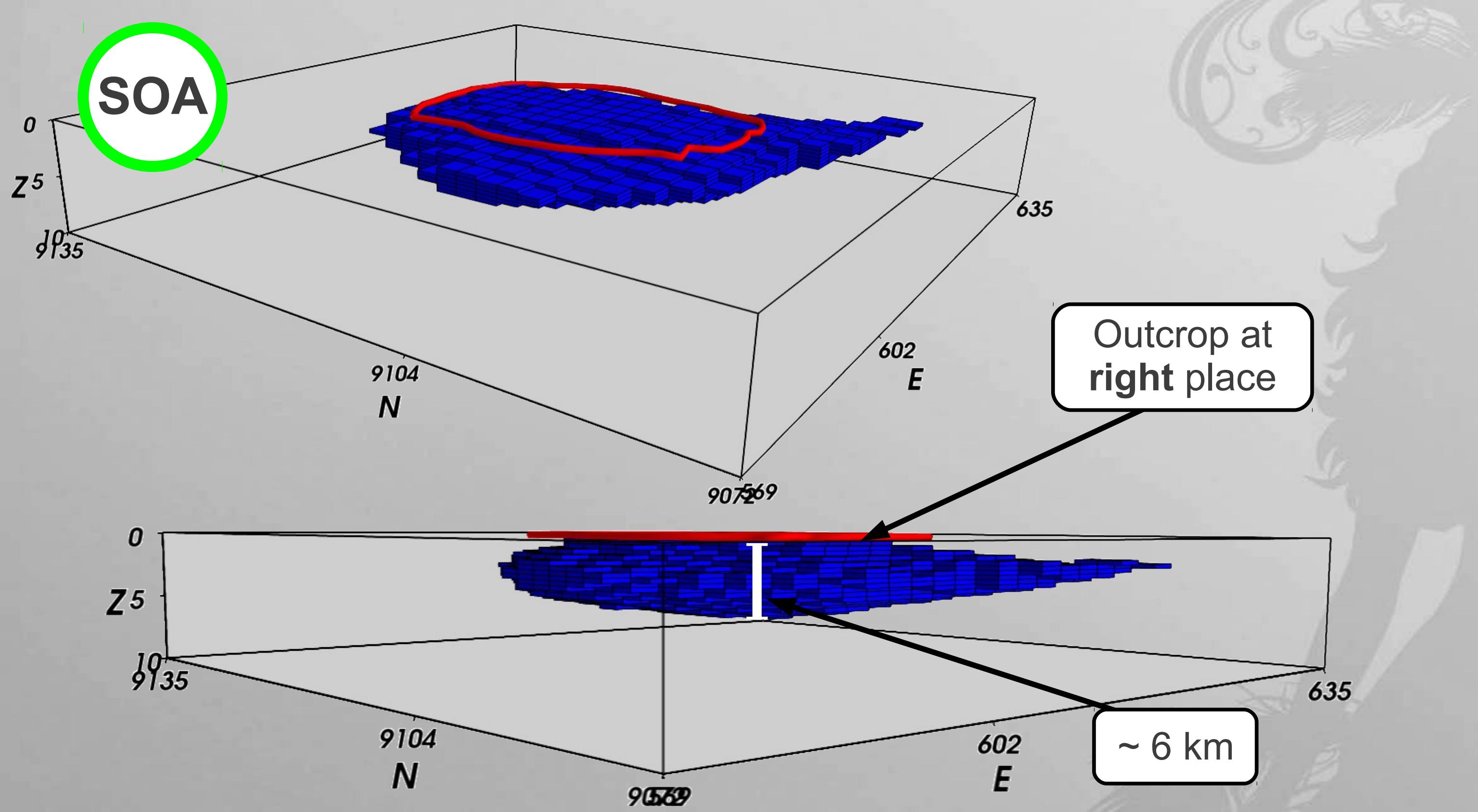


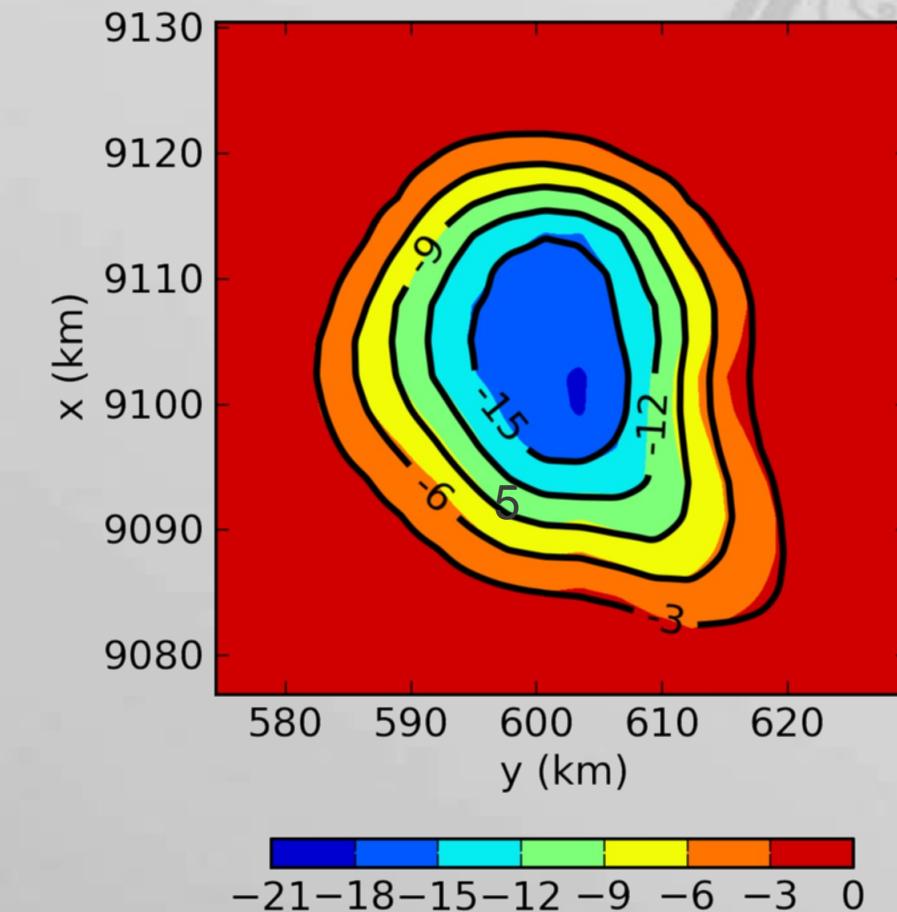
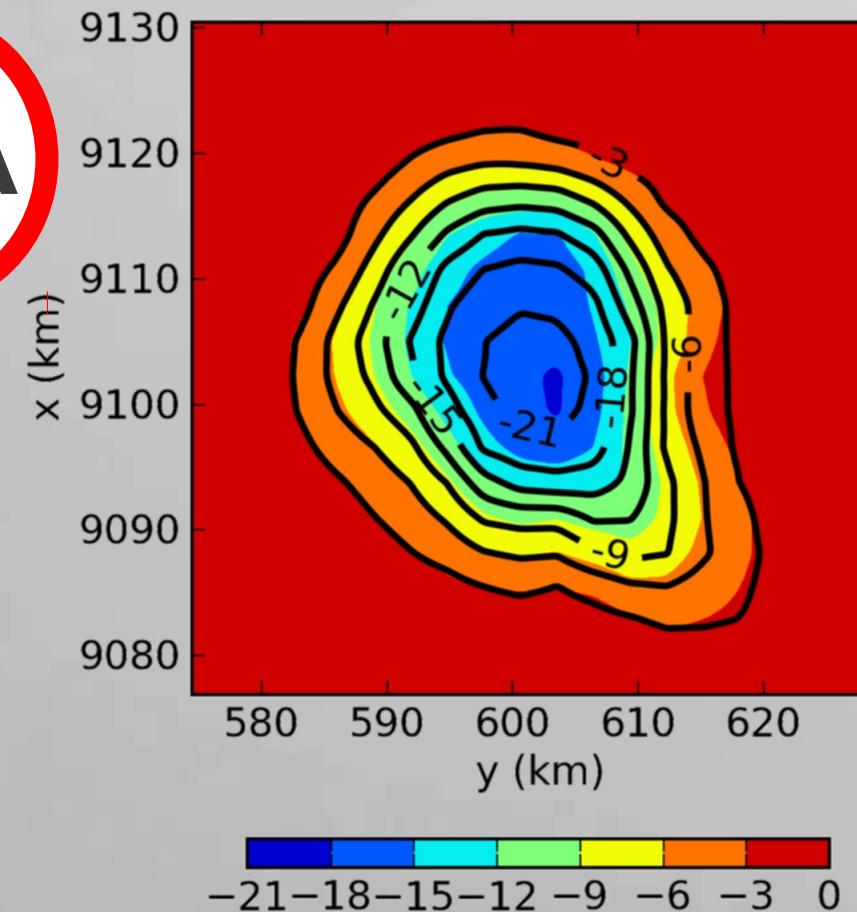


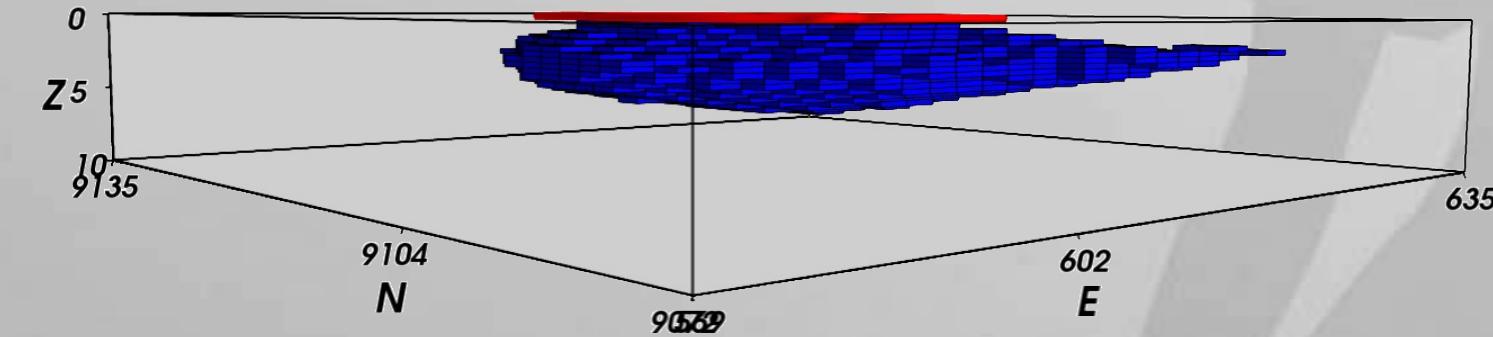
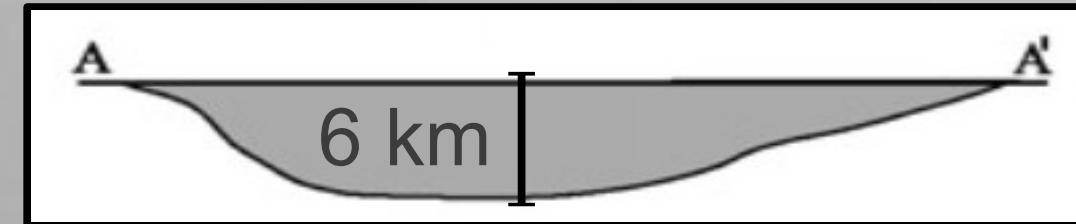
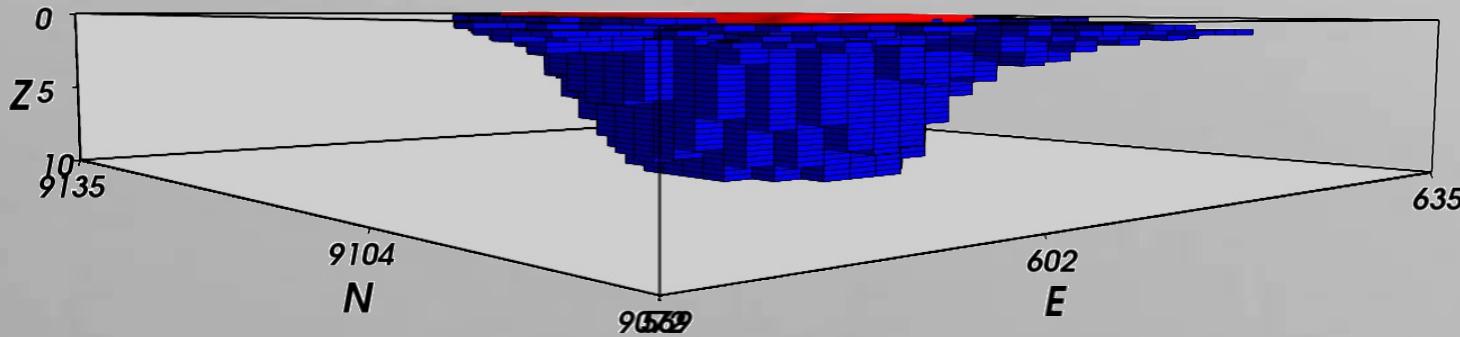
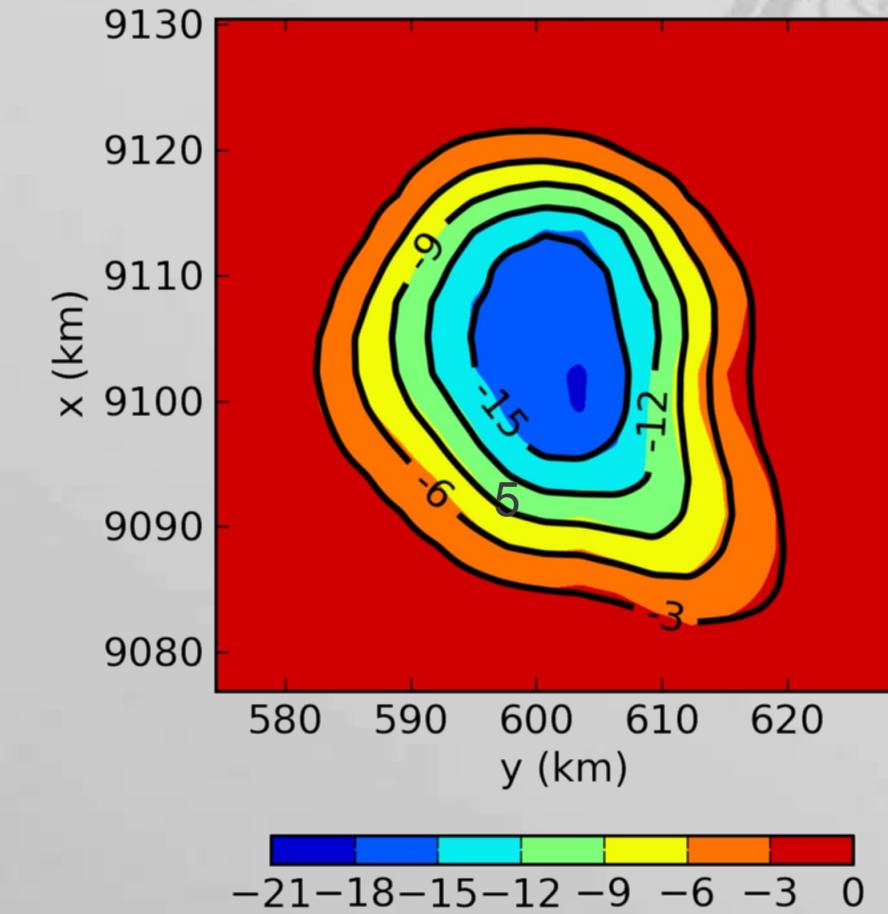
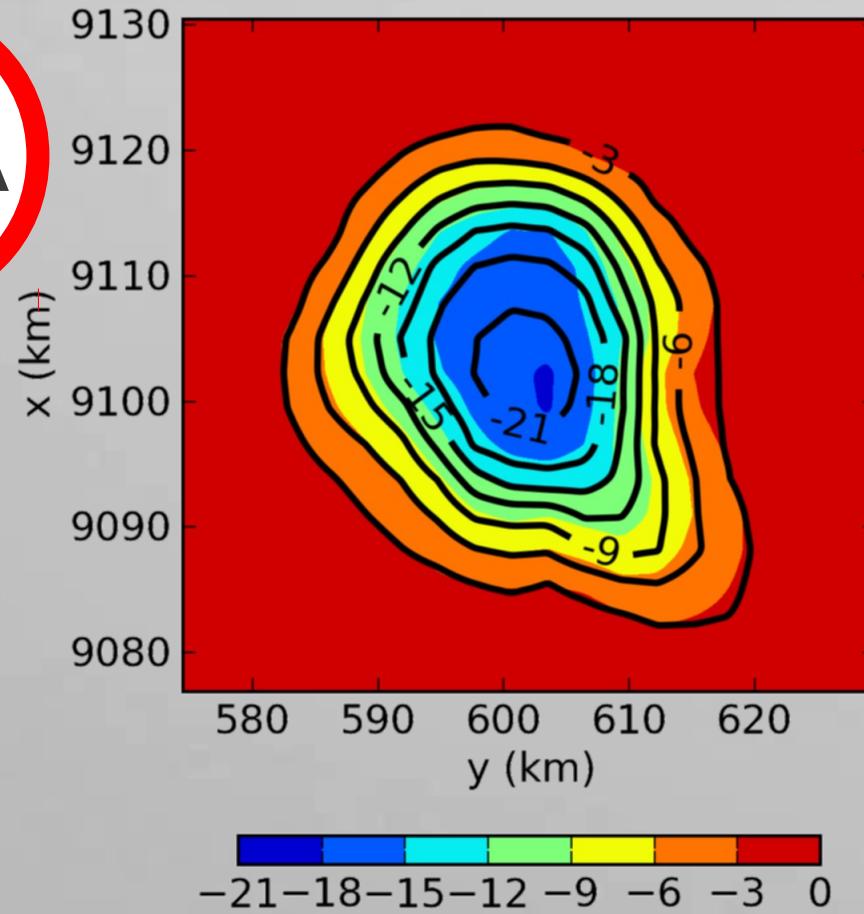












In conclusion

