## Modeling Uncertainty in the Earth Sciences

**SGEMS on modeling spatial uncertainty**

**Exercise 1**

Exercise on variogram-based models with **s**equential **G**aussian **sim**ulation *sGsim*

Load the project 3DSGSIM.prj. Load the parameter file sgsim3D.par, it already contains some parameters pre-set for you (please don’t alter these).

1. Create 20 unconditional Earth models with *sGsim*, the variogram has vertical range of 5, horizontal isotropy with range equal to 35, the nugget = 0.0, the histogram is the histogram of the property in the 5 wells (plot this histogram first)
2. For one such Earth model, calculate the variogram and check if this experimental corresponds to the input variogram values in 1. Do the values of this Earth model have the same histogram as the 10 wells? Is this expected?
3. Create 20 conditional Earth models with *sGsim*, the data are the 10 wells

**Exercise 2**

Exercise on training-image based models with *snesim* (**s**ingle **n**ormal **e**quation **sim**ulation)

Load the project 3DSNESIM.prj. Load the parameter file snesim3D.par, it already contains some parameters pre-set for you (please don’t alter these).

1. Create 20 unconditional Earth models with *snesim* with the training image in the projects: the proportion of channel = 30%.
2. Create 20 conditional simulations, the data are the 5 wells
3. Calculate for each case the ensemble average. What does this ensemble average represent? What can you observe by comparing the two ensemble average cubes that you generated?

**Exercise 3**

Take one of the 3D Boolean training images that you created in the previous homework and create a few unconditional Earth models (you can re-use snesim3D.par).