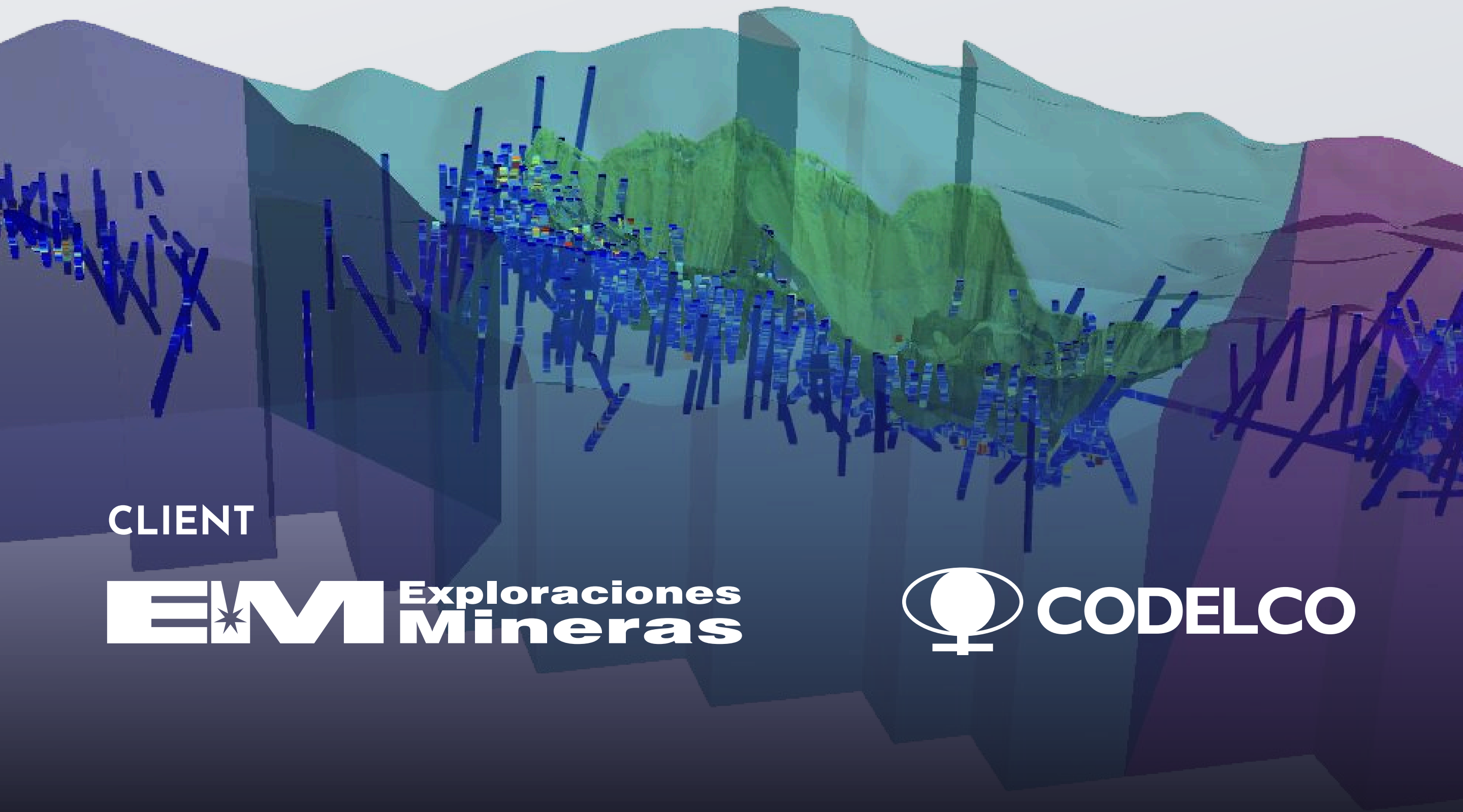


ANNA PURNA CHALLENGE

Modeling a large polymetallic copper deposit in
northern Chile.



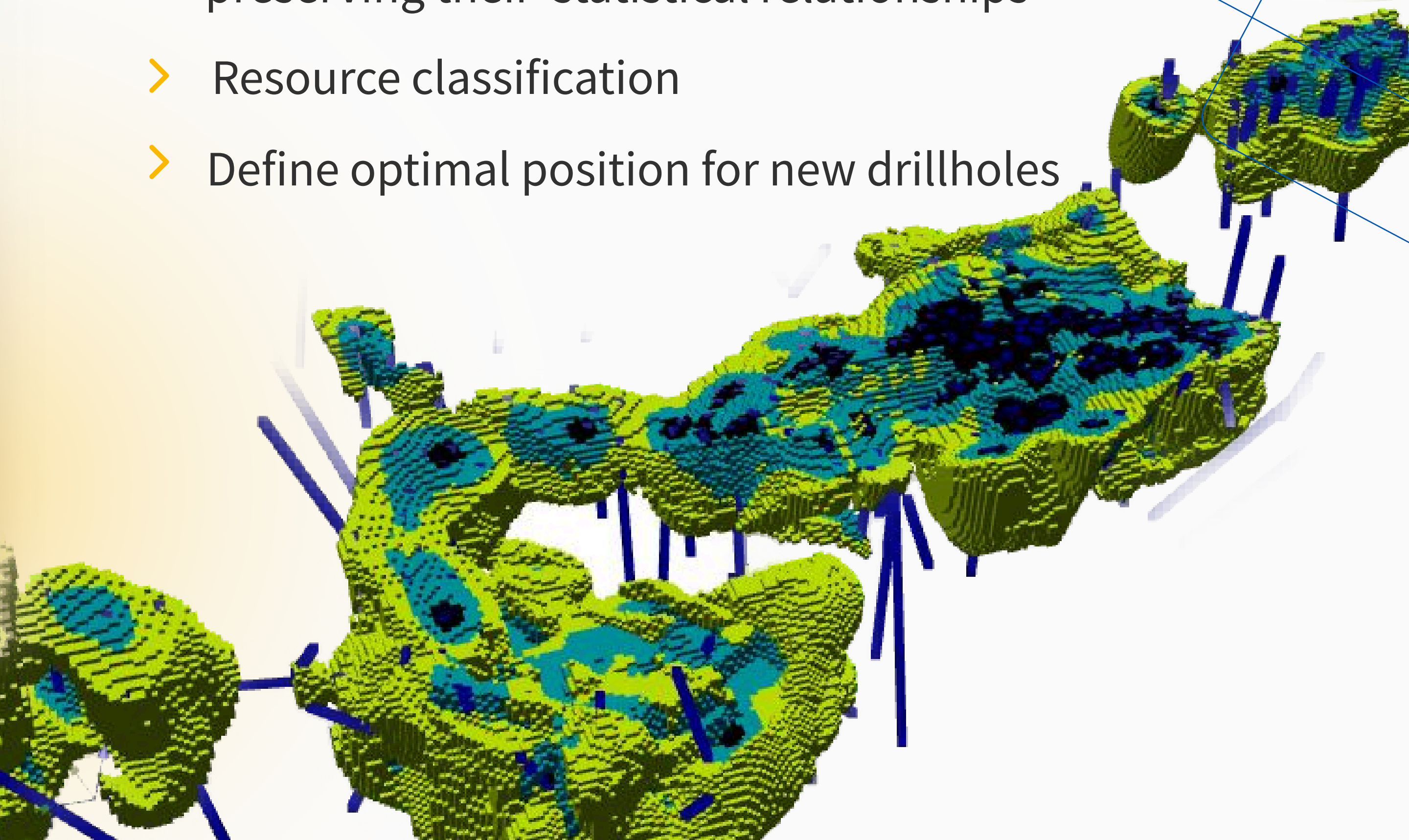
CLIENT

EM Exploraciones
Mineras

 **CODELCO**

WHAT WAS THE CHALLENGE?

- Propose an alternative geological model using Indicator Kriging
- Model 5 elements of interest while preserving their statistical relationships
- Resource classification
- Define optimal position for new drillholes



WHAT IS THE “ANNAPURNA CHALLENGE”?

To rapidly implement a resource modeling workflow that solves a customer's problem

SPEED

ADVANCED ALGORITHMS

MULTIPLE ITERATIONS

RESULTS

- 20 univariate models for all elements: 40M blocks each, 250 simulations
- 50 multivariate simulations with imputation of incomplete data
- Evaluation of 3 capping strategies for Au
- Recommendation of optimal positioning for new drillholes
- Change-of-support analysis: 5 models with 160M blocks each, 250 simulations in total
- Resource classification
- Geological modeling using indicator kriging and variable direction fields

TIMELINE

 **8 Weeks**

A FEW NUMBERS

> 60 billion

TOTAL BLOCKS ESTIMATED
AND SIMULATED DURING
THE PROJECT

> Consolidated Model

40M BLOCKS
59K COMPOSITES
21 DOMAINS

COMPUTATION TIMES

> 13 minutes ESTIMATION TIME

> Univariate Simulation

40M BLOCKS, 21 DOMAINS,
50 REALIZATIONS **1:49H**

> Multivariate Simulation

160M BLOCKS, 21 DOMAINS,
50 REALIZATIONS **2:40H**

CLIENT FEEDBACK

“

This new and promising tool provides modelers and estimators with the ability to obtain results quickly and efficiently. Its powerful data processing capacity allowed us to quickly and flexibly perform analyses, therefore optimizing our workflows .

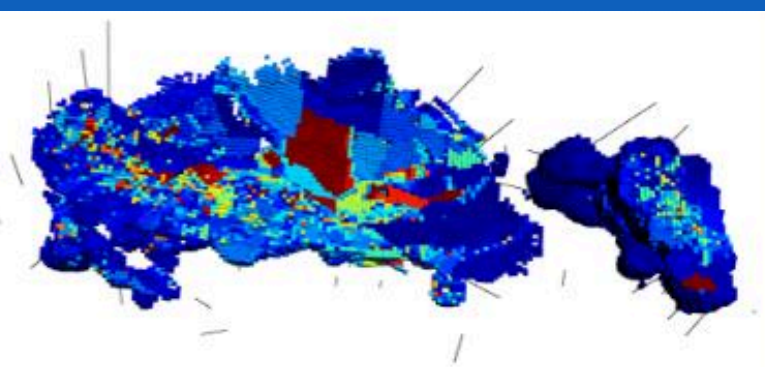
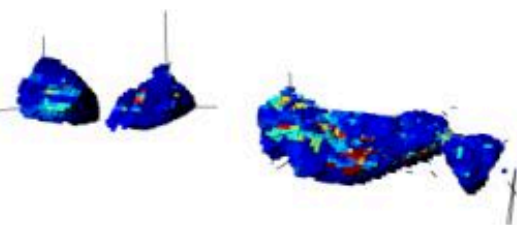
—— Codelco

”

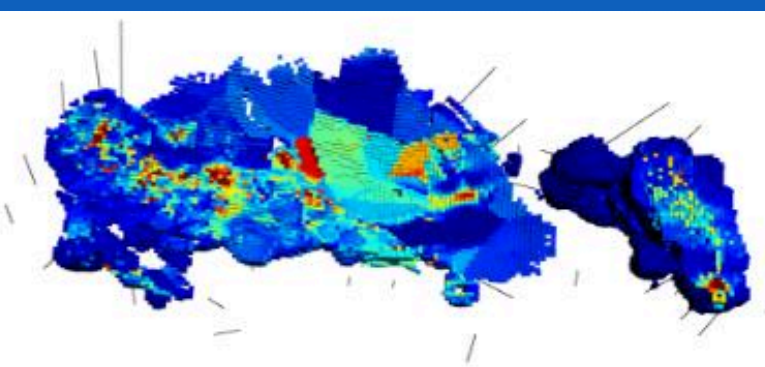
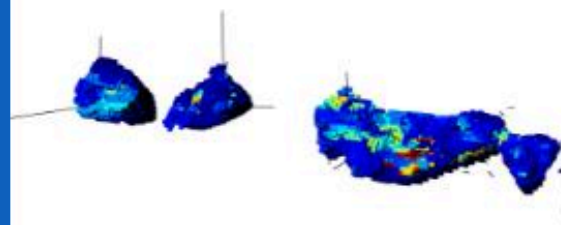
ESTIMATION

Comparison of different estimation methods

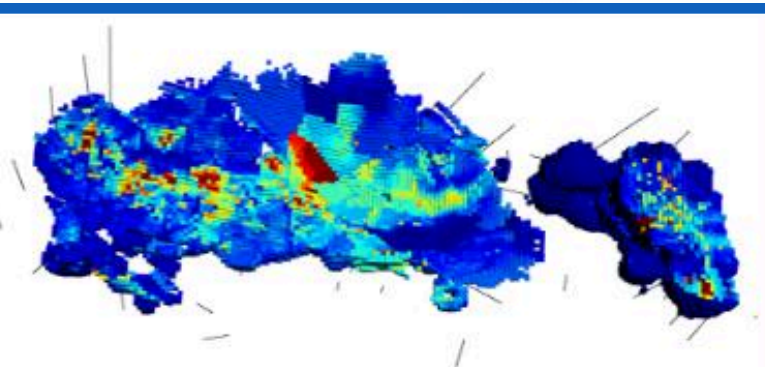
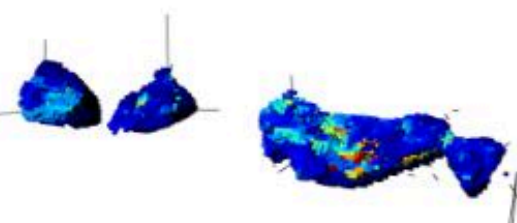
NN



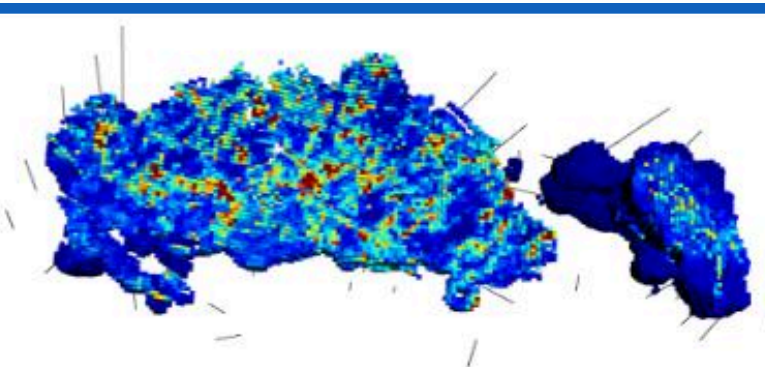
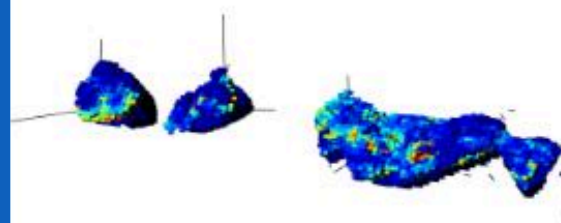
IDW-3



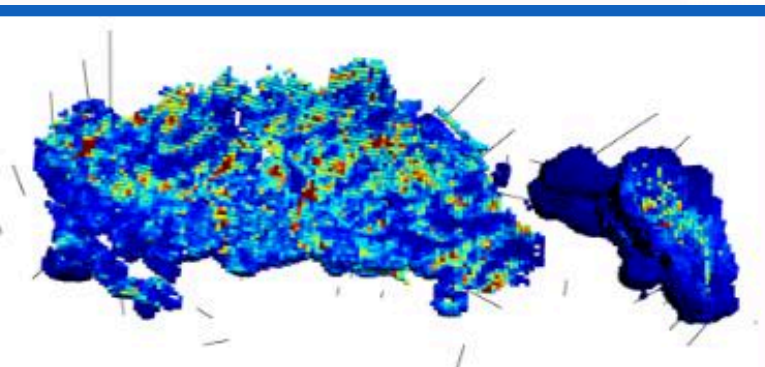
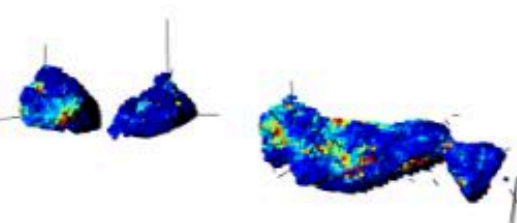
KRIGING



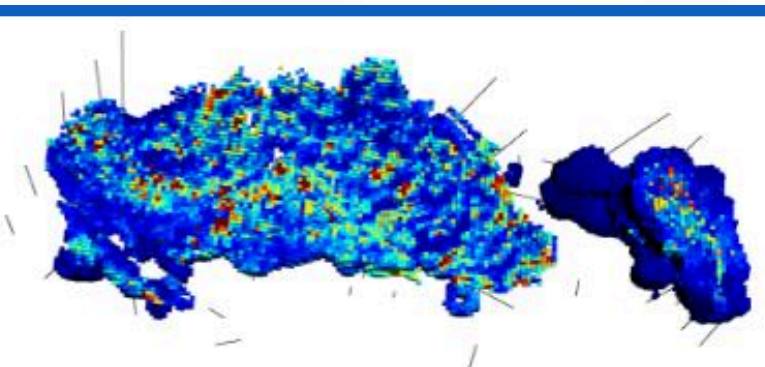
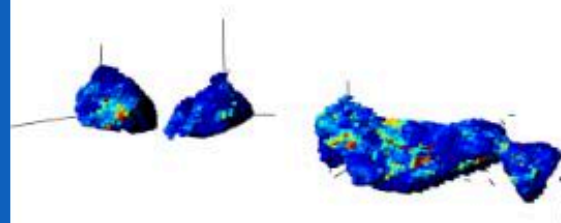
SGS #1



SGS #2



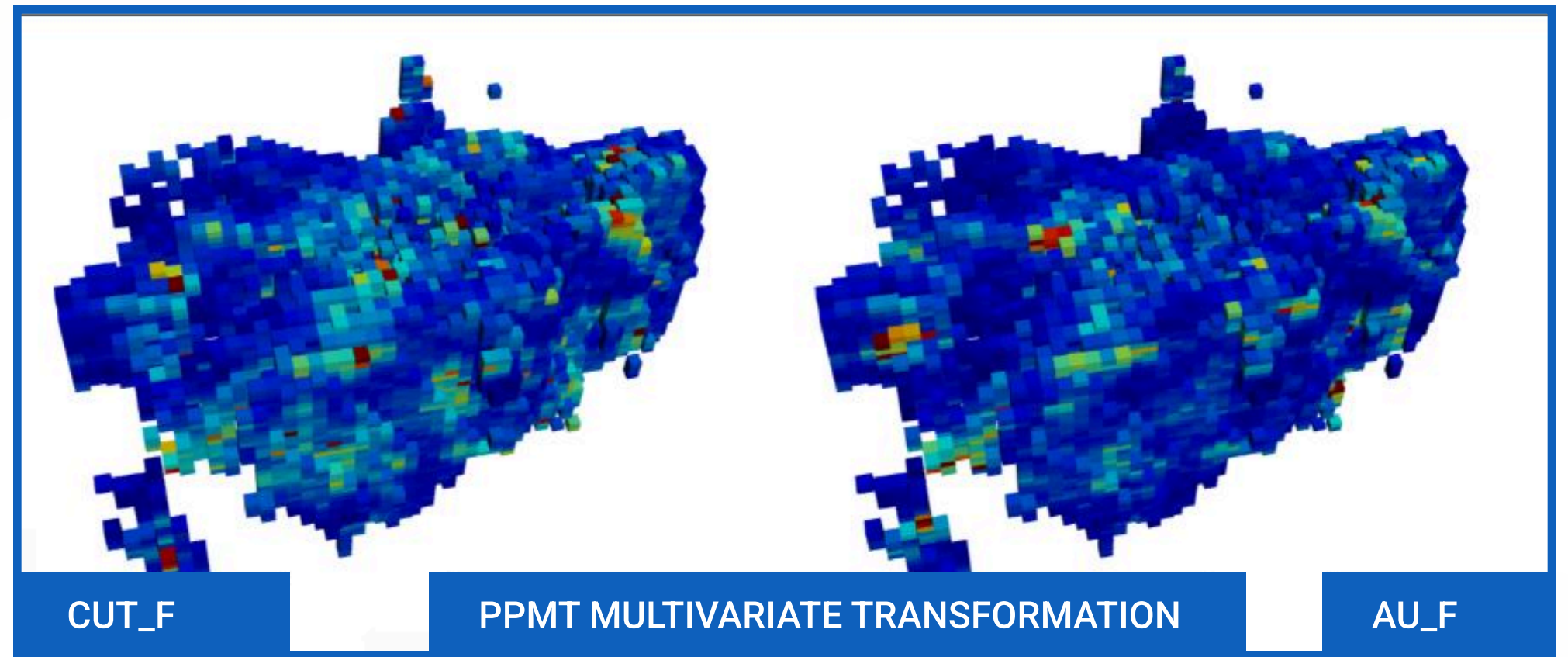
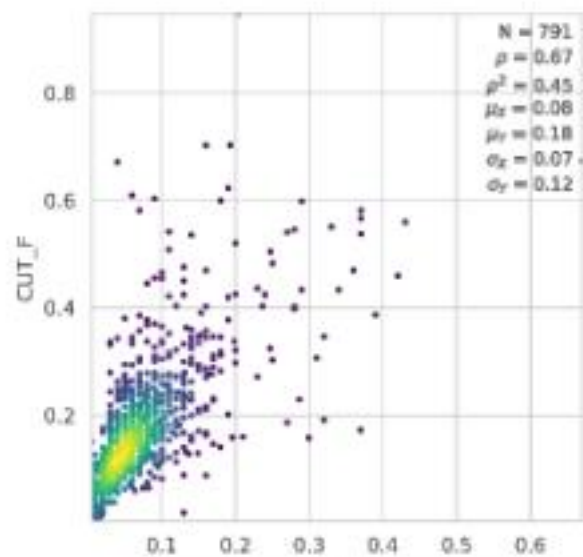
SGS #3



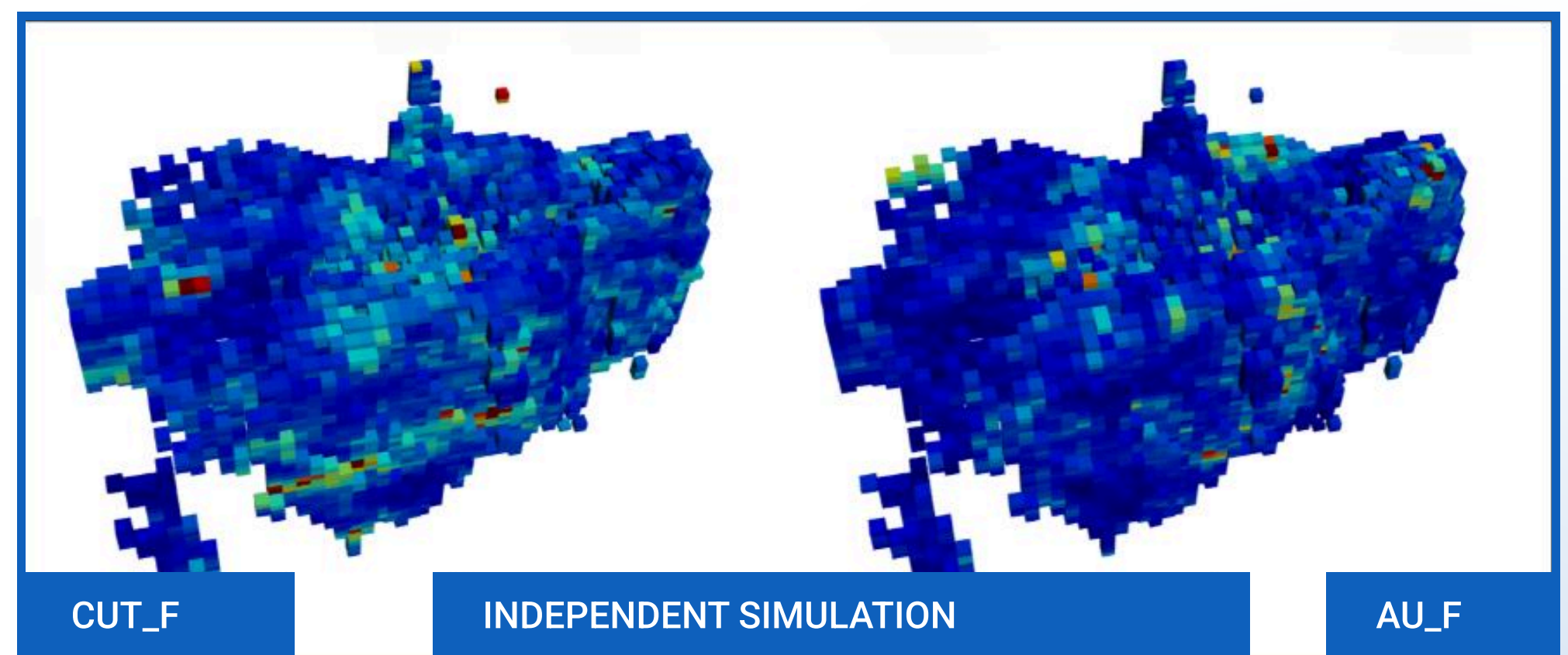
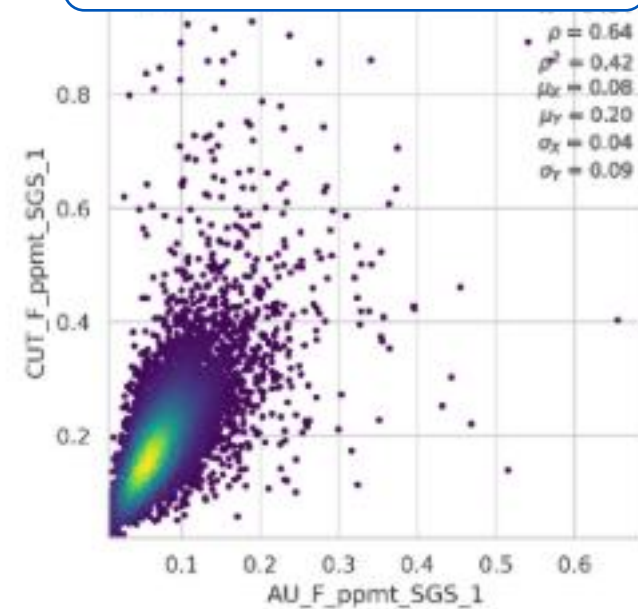
MULTIVARIATE SIMULATION

Preserving statistical relationships

Composites

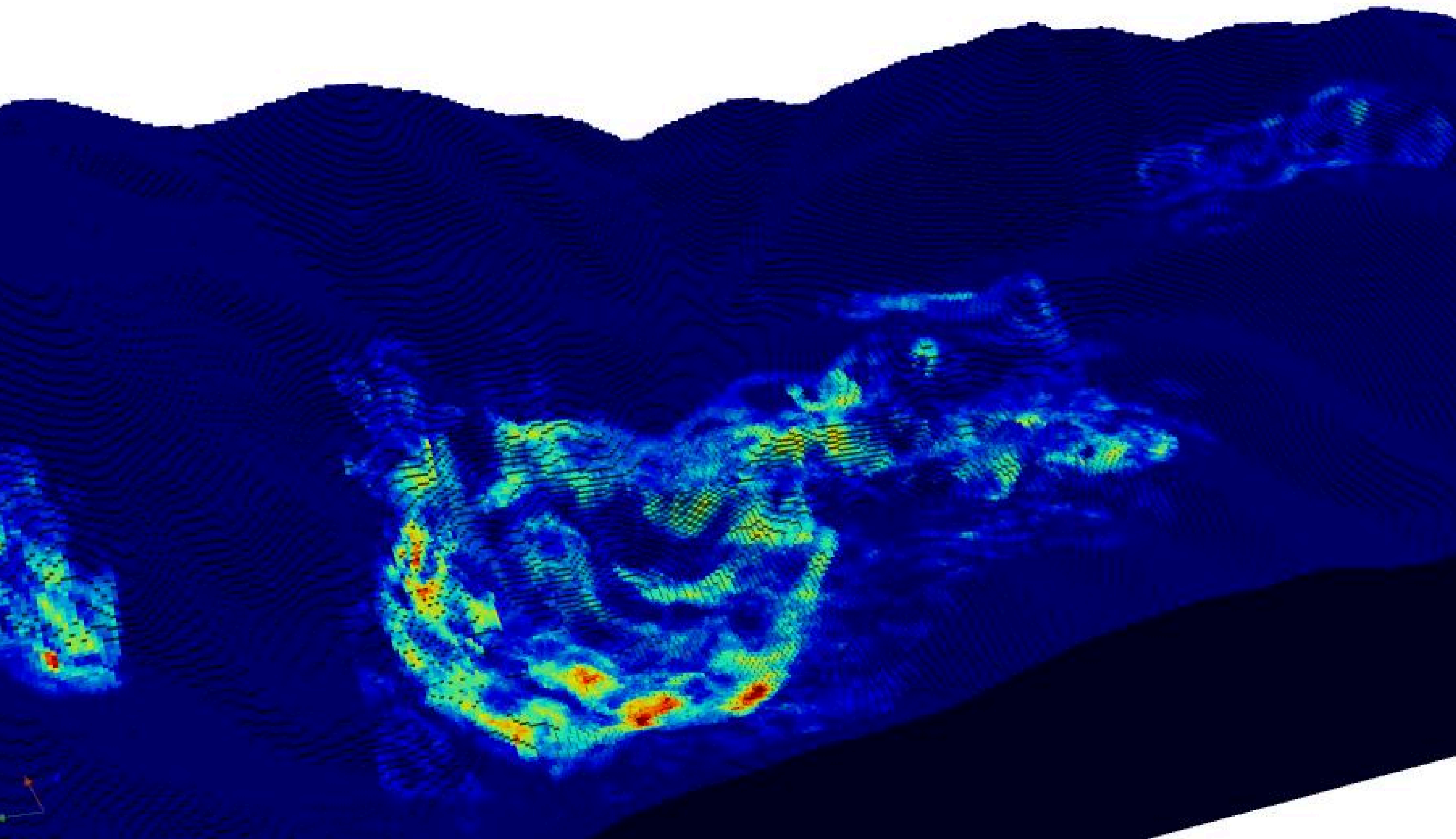


Simulation



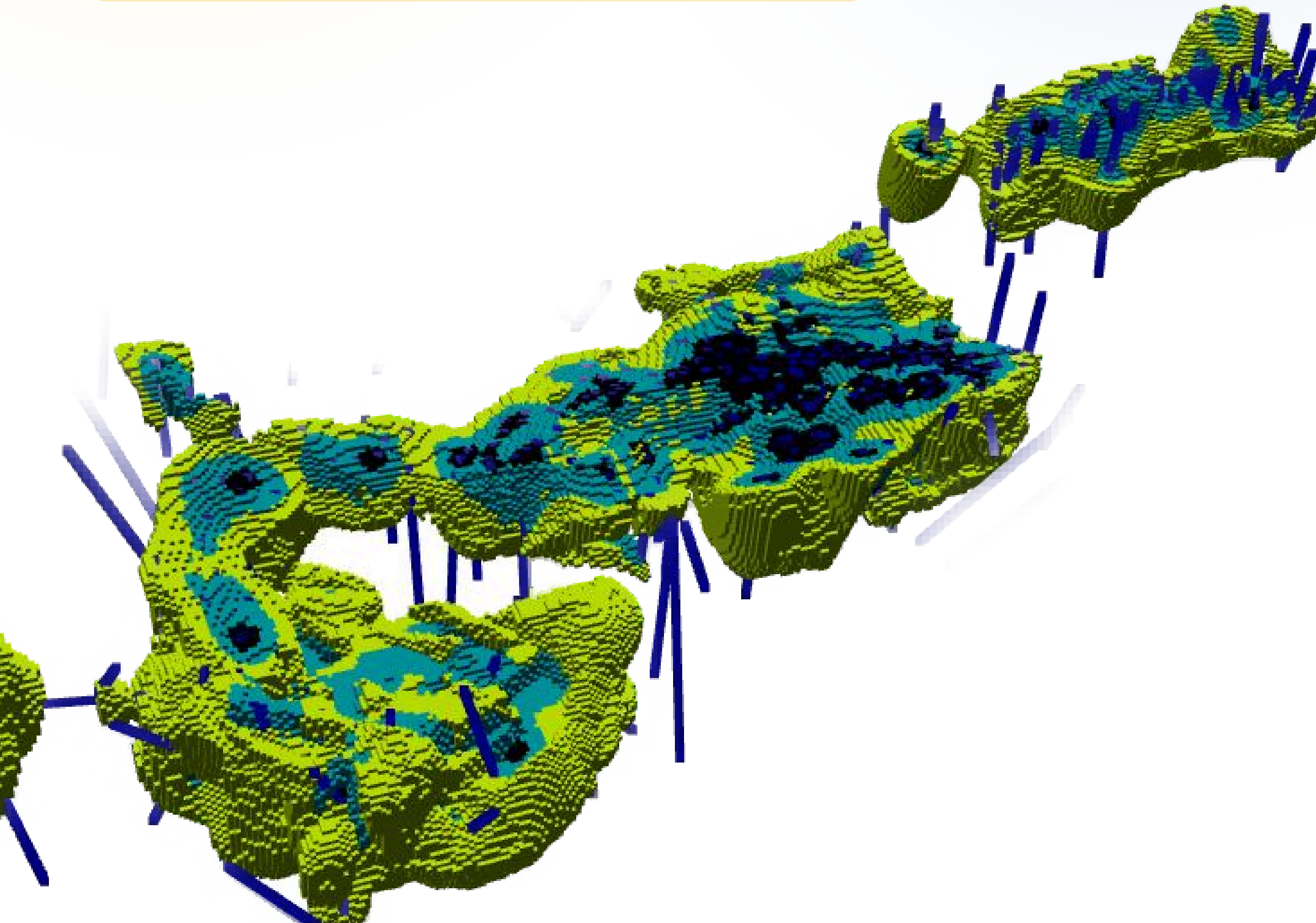
OPTIMAL DRILLHOLE POSITIONING RECOMMENDATION

Prioritizing high-grade and high-uncertainty zones



RESOURCE CLASSIFICATION

Using Drillhole Spacing Analysis



INDICATOR KRIGING + LVA

Probability of encountering geological units in space

