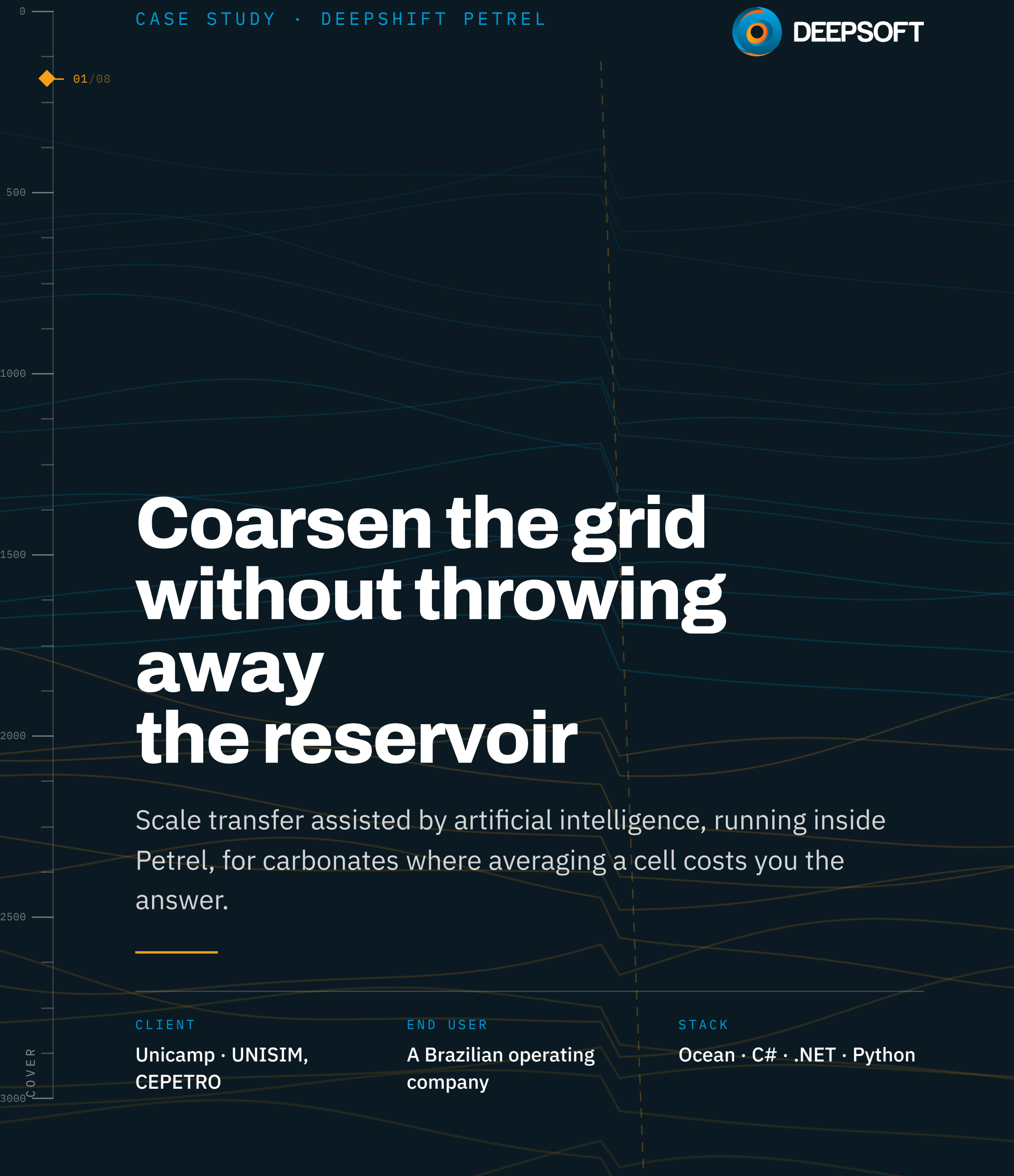
CASE STUDY · DEEPSHIFT PETREL

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Coarsen the grid without throwing away the reservoir

Scale transfer assisted by artificial intelligence, running inside Petrel, for carbonates where averaging a cell costs you the answer.

CLIENT

Unicamp · UNISIM, CEPETRO

END USER

A Brazilian operating company

STACK

Ocean · C# · .NET · Python

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Simulation lives at one scale, geology at another

02/08

The geological model carries the heterogeneity of the porous medium. The simulation grid has to be coarse enough to run inside an operational workflow. Scale transfer is what condenses many fine values of porosity and permeability into one representative value per coarse cell.

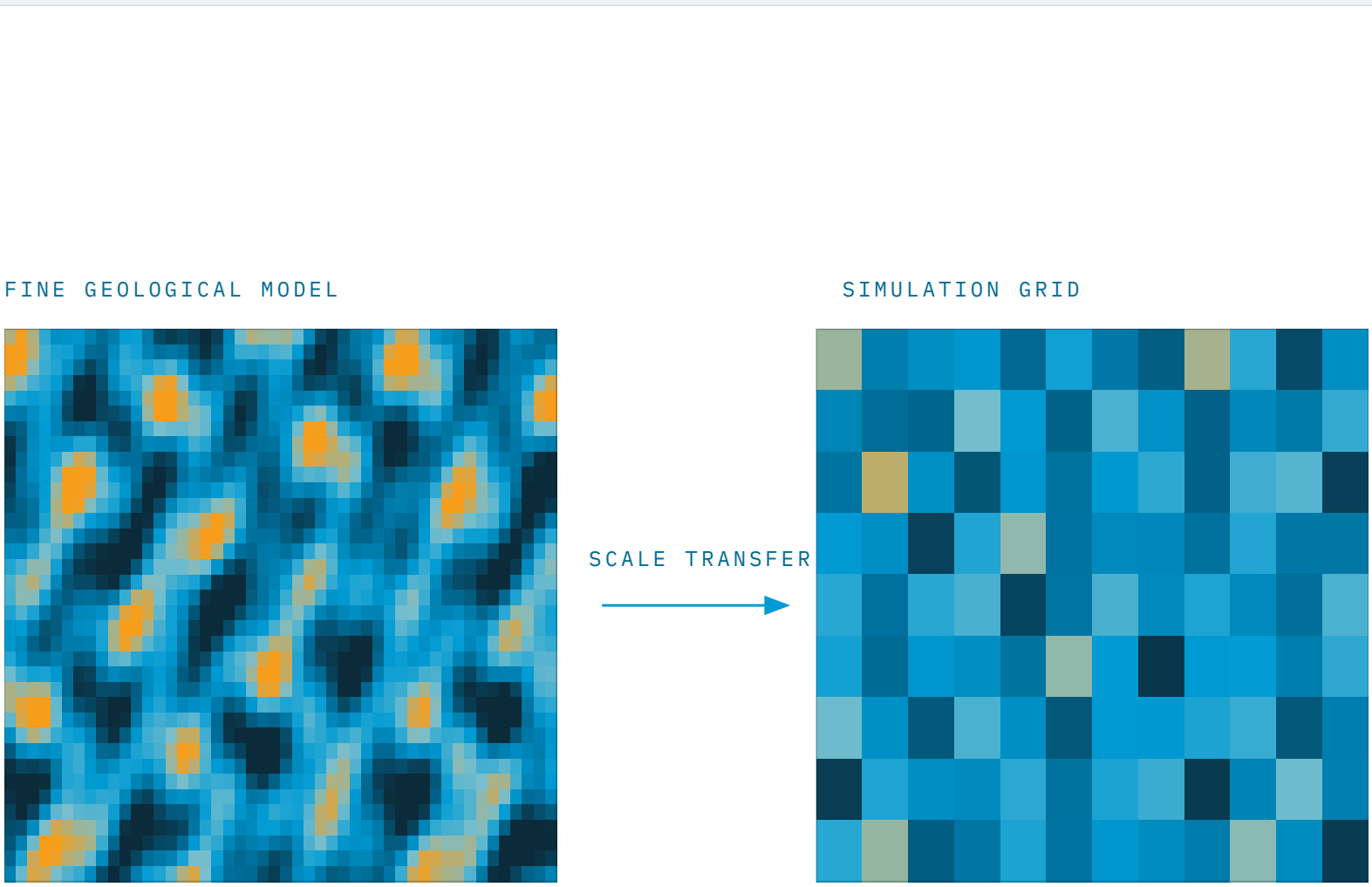


Fig. 01 · Schematic. The same property field before and after scale transfer.

In carbonates, the average is a bad summary

Heterogeneity punishes averaging

In pre-salt carbonates, dropping resolution can erase the very features that drive flow, and the production forecast becomes less reliable.

One formulation does not fit the field

UNISIM and CEPETRO answered with sectorization: different regions of the reservoir call for different scale transfer formulations.

Academic method, industrial scale

The methodology had to leave the research environment and work on real field cases, inside the platform where the models live.

Cost had to compete

The whole procedure only makes sense if it stays cheaper than simulating the high fidelity model directly.

That last constraint is what brought artificial intelligence into the workflow, not fashion.

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Cut the field into regions that behave alike

Sectorization splits the reservoir into regions, clustering groups cells with similar behavior, and each region receives the scale transfer formulation that suits it, property by property.

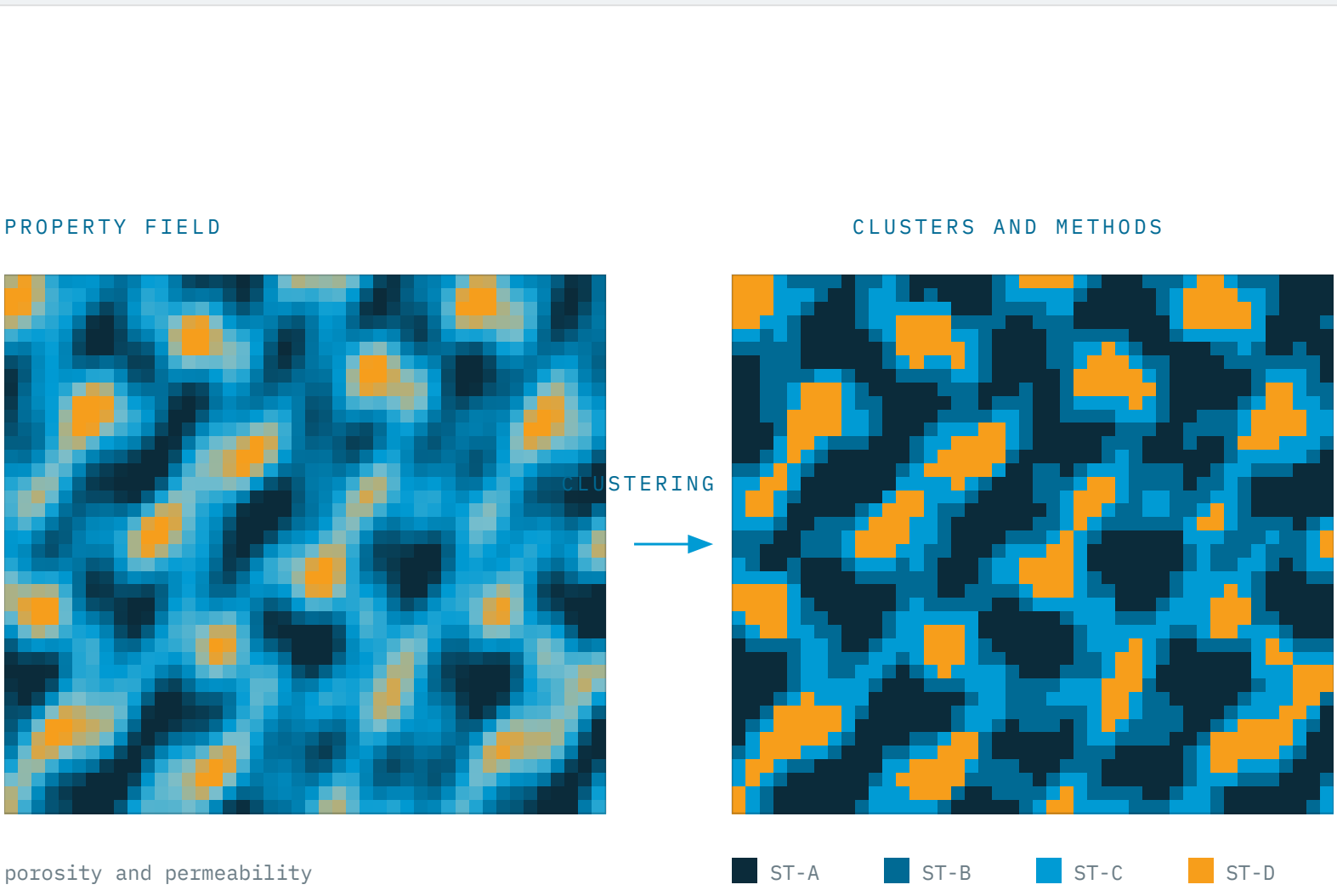


Fig. 02 · Schematic. One scale transfer formulation per sector, chosen from the clustered behavior.

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Three decisions that used to be made case by case

Finding the regions

Identifying areas of the reservoir that behave alike, instead of drawing sectors by hand for every model.

Choosing the formulation

Picking the scale transfer method that suits each cluster, per property, rather than applying one rule everywhere.

Fitting the pseudo curves

Adjusting relative permeability pseudo curves so the coarse model reproduces the flow behavior of the fine one.

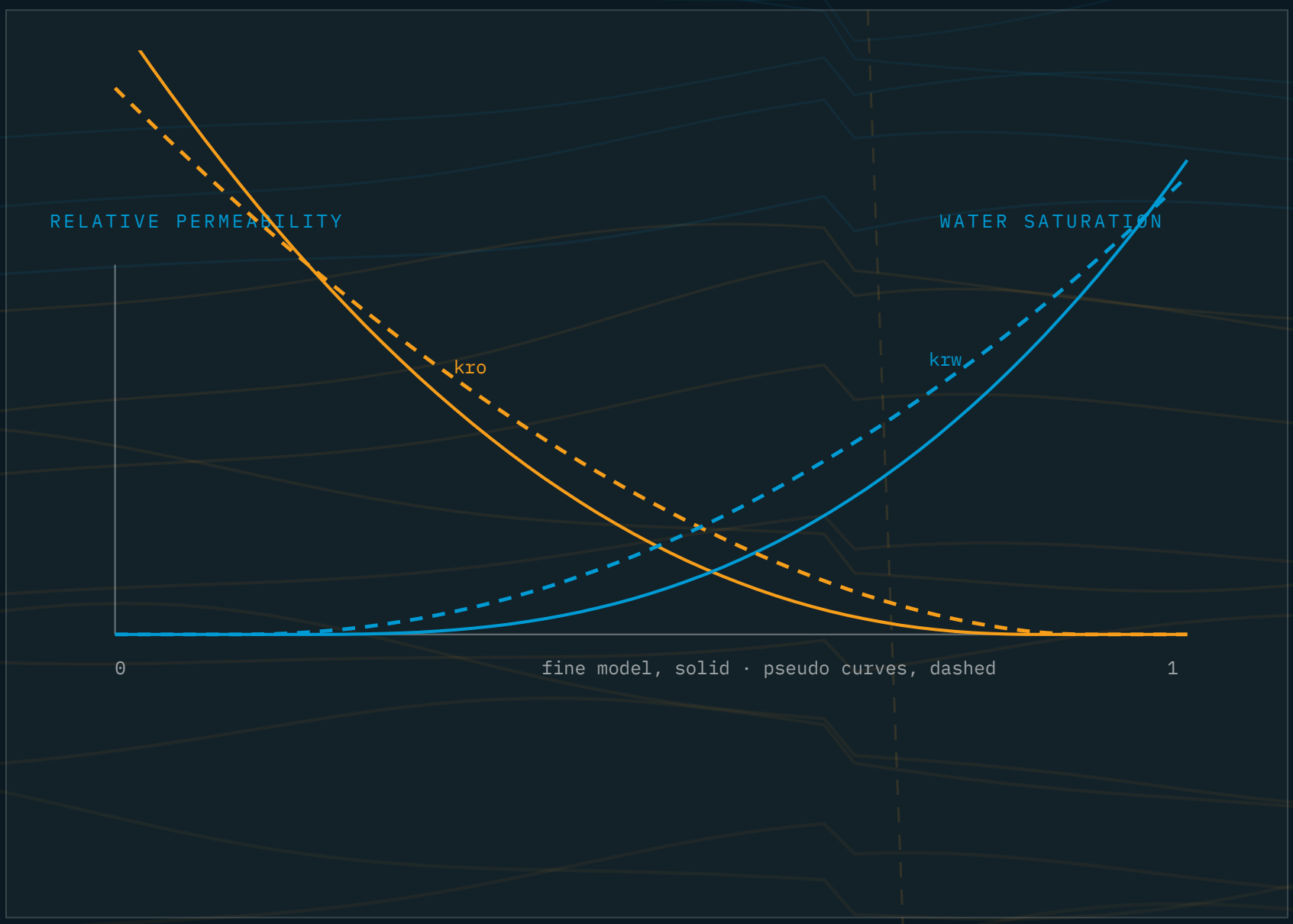


Fig. 03 · Schematic. Fine model curves in solid line, adjusted pseudo curves dashed.

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The engine stays DeepShift, the workflow becomes Petrel

The plug in built on the Ocean Framework drives the whole cycle: pick the fine model, define the target grid, configure sectorization, clustering and the methods per property, run DeepShift, and receive the results as native Petrel properties.

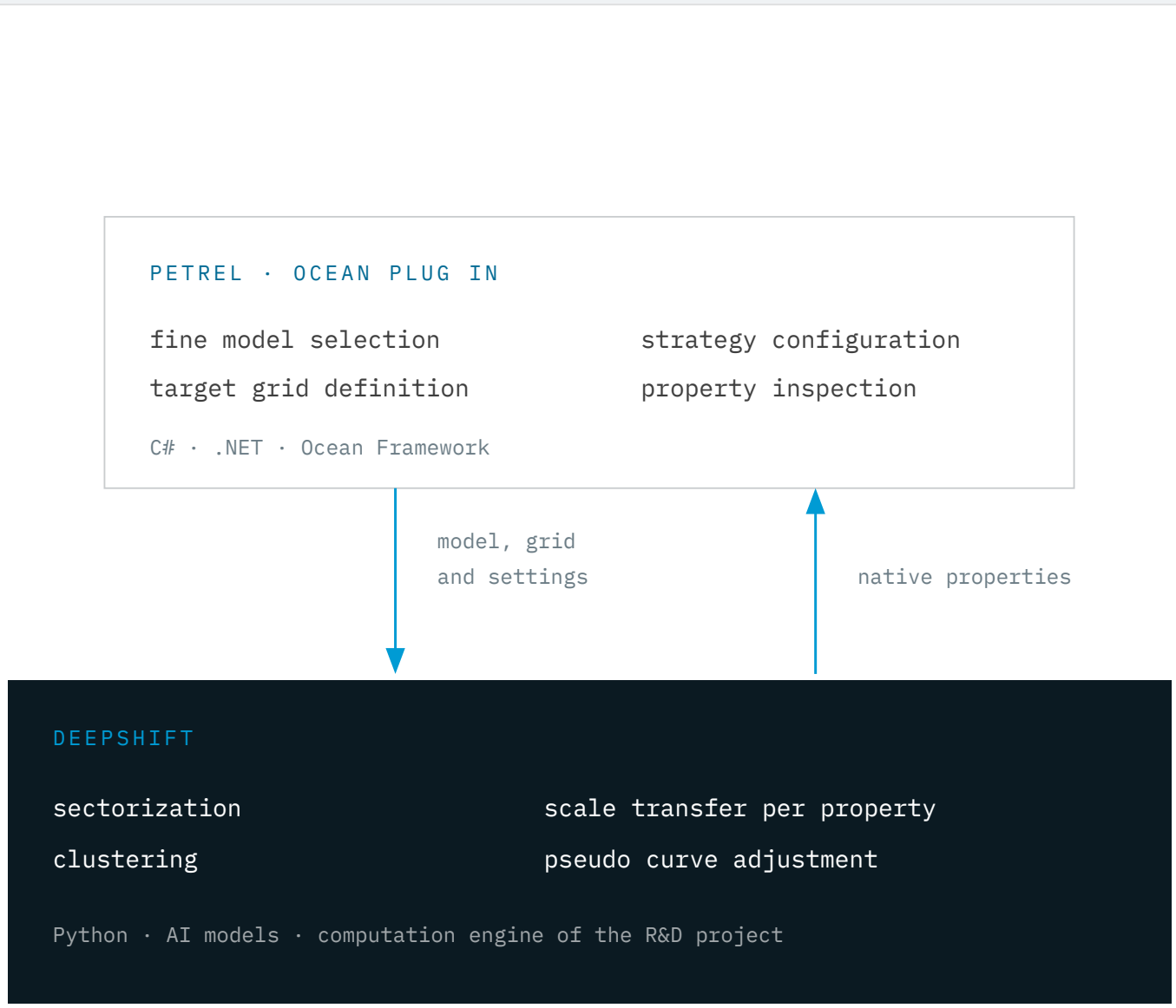


Fig. 04 · Schematic. DeepShift remains the computation engine, Petrel becomes the workflow.

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What the integration delivered

Academic method, operational tool

The scale transfer methodology from UNISIM and CEPETRO became a tool inside Petrel, usable by technical teams at operating companies in real workflows.

AI where the cost was

Sectorization, clustering and pseudo curve adjustment carry the decisions that used to be expensive, which is what lets the method reach real field cases.

Native Petrel integration

The full cycle, from picking the fine model to inspecting the coarse properties, runs inside Petrel, with traceability between geology and simulation.

An R&D project that shipped

DeepShift Petrel is the direct outcome of a research project run by Unicamp with a Brazilian operating company.

> No manual exports between the geological model and the simulation model, in either direction.

A method becomes a product when someone builds the software around it.

DeepShift Petrel was developed by DeepSoft as a software development service, connecting DeepShift, the computation engine born from a research project run by Unicamp with a Brazilian operating company, to the Petrel environment.

That is the work we do: engineering Petrel plug ins for teams that already own the science and need it to run where the decisions are made.

SERVICES

Petrel plug in development

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DeepShift is a technological result of the research project that originated it, and rights over the software belong to its holders. DeepSoft acted as the software development contractor for the Petrel plug in. Petrel is a trademark of its respective owner and its mention does not imply sponsorship or endorsement.

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