

Thomas Höllt♣

Ahmed Magdy♣

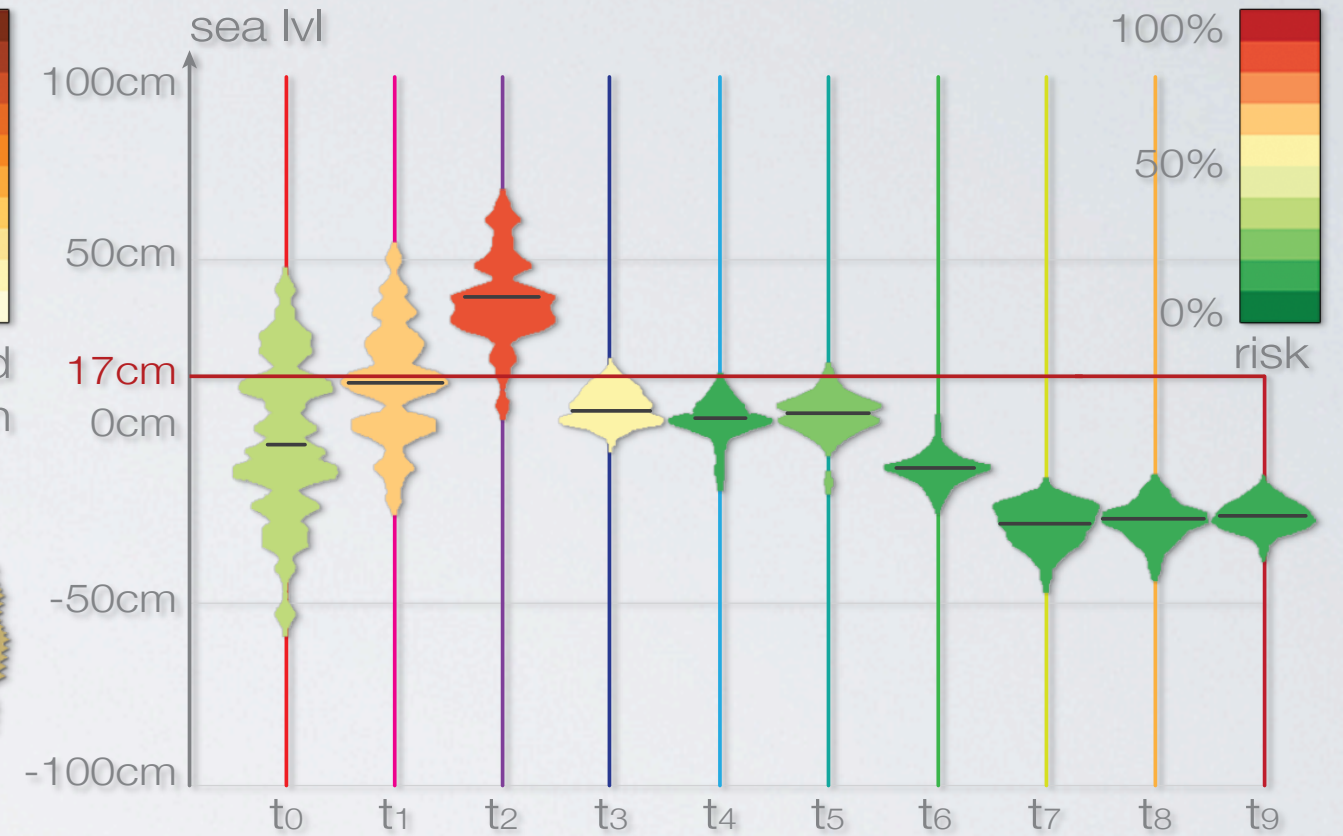
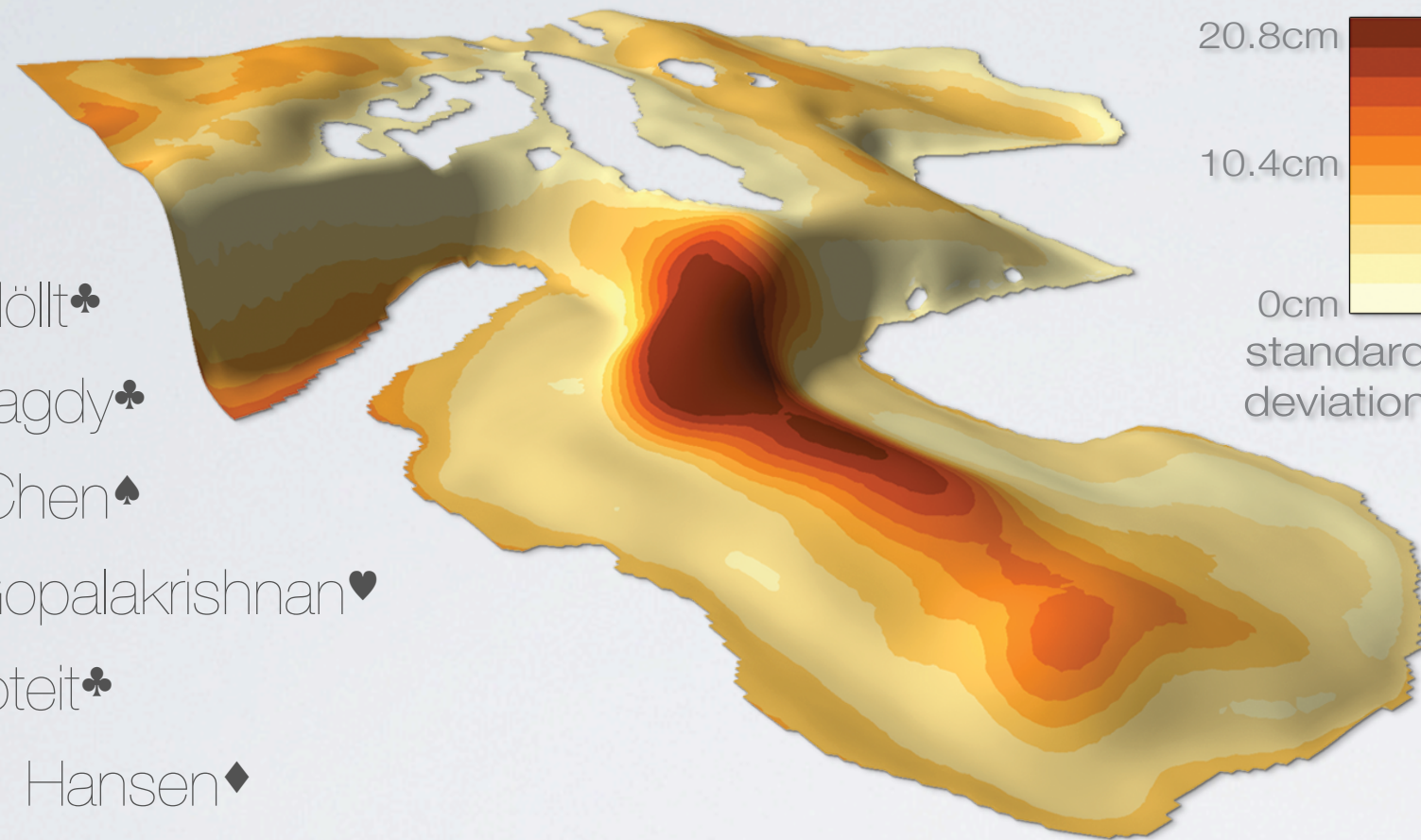
Guoning Chen♠

Ganesh Gopalakrishnan♥

Ibrahim Hoteit♣

Charles D. Hansen♦

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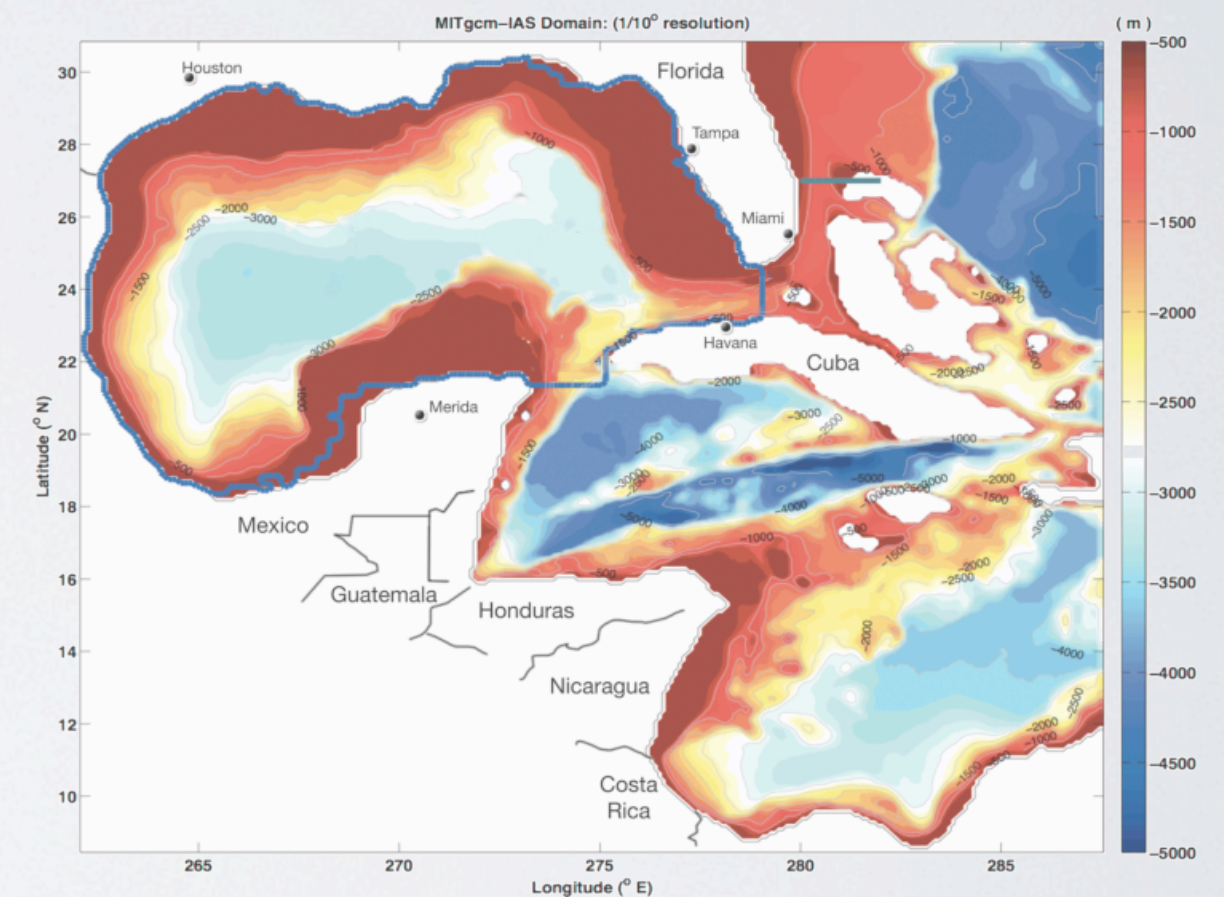


Visual Analysis of Uncertainties in Ocean Forecasts for Planning and Operation of Off-Shore Structures

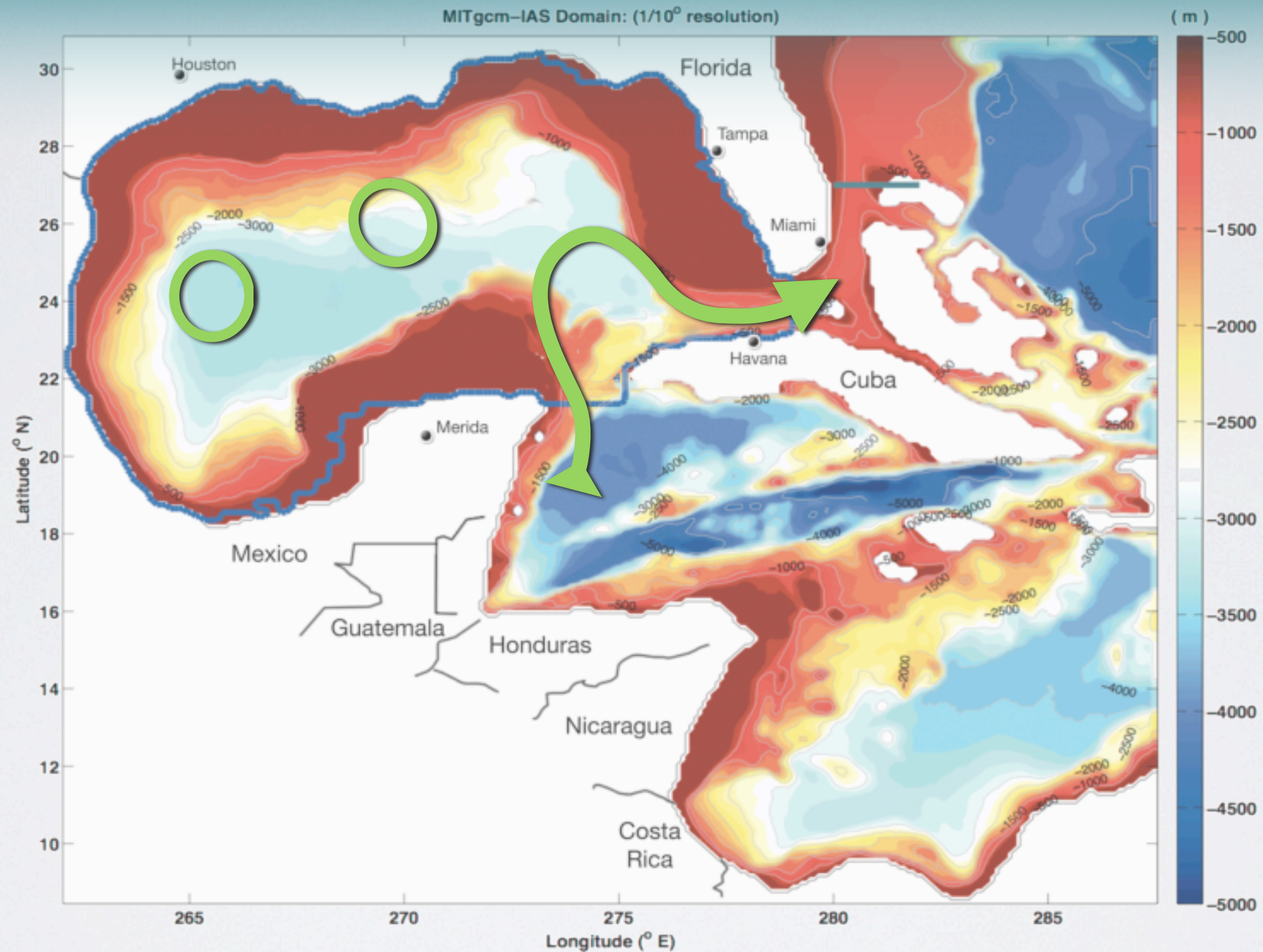
Motivation



- Planning off-shore rig operation
- off-shore oil exploration vulnerable to hazards



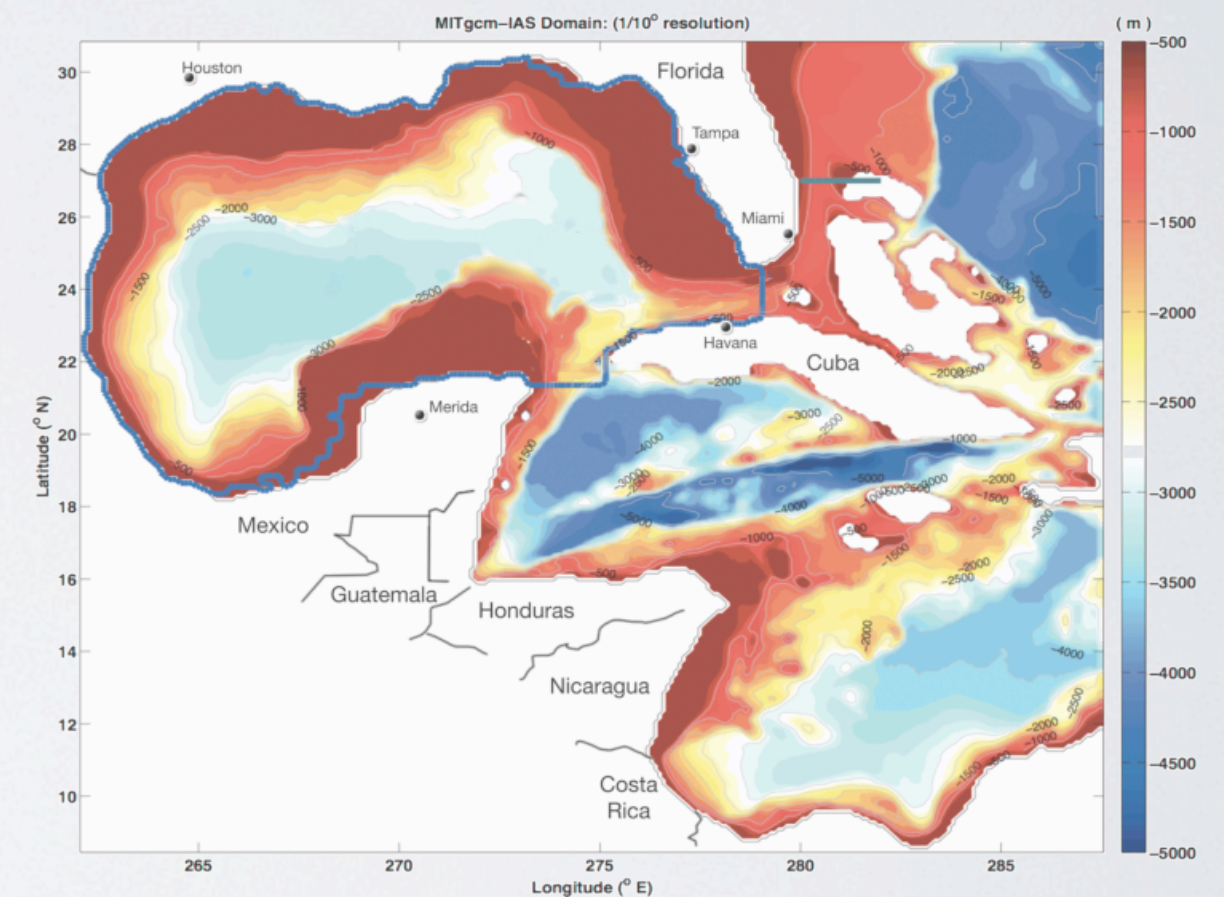
Motivation // GoM Eddy Shedding



Motivation



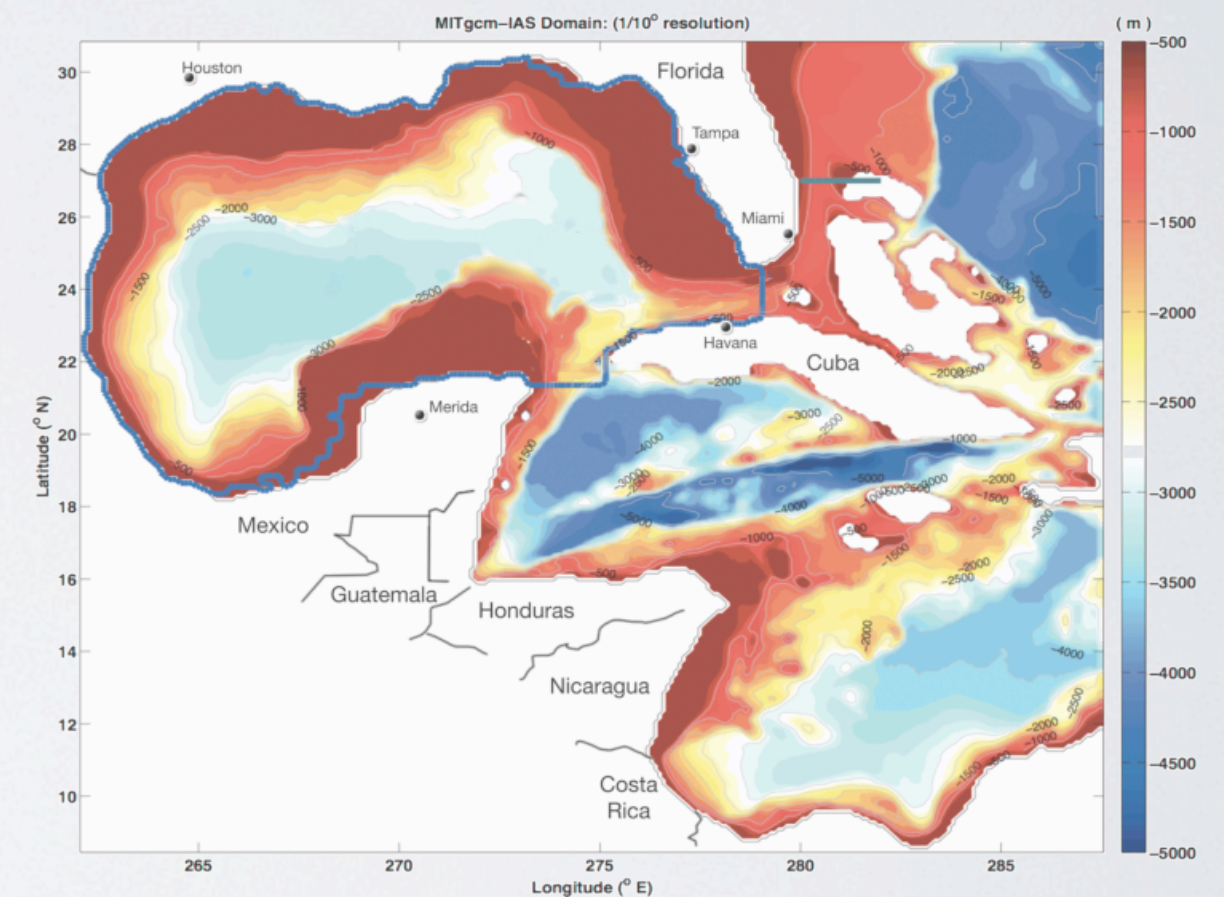
- Planning off-shore rig operation
 - off-shore oil exploration vulnerable to hazards
 - ocean forecasts allow planning operation
 - forecasts based on ensemble simulation



Input Data



- Sea surface simulation of the GoM
 - height fields
 - $1/10^\circ$ grid of the GoM \Rightarrow 275 x 325 samples
 - 10 time steps
 - 100 simulation runs each





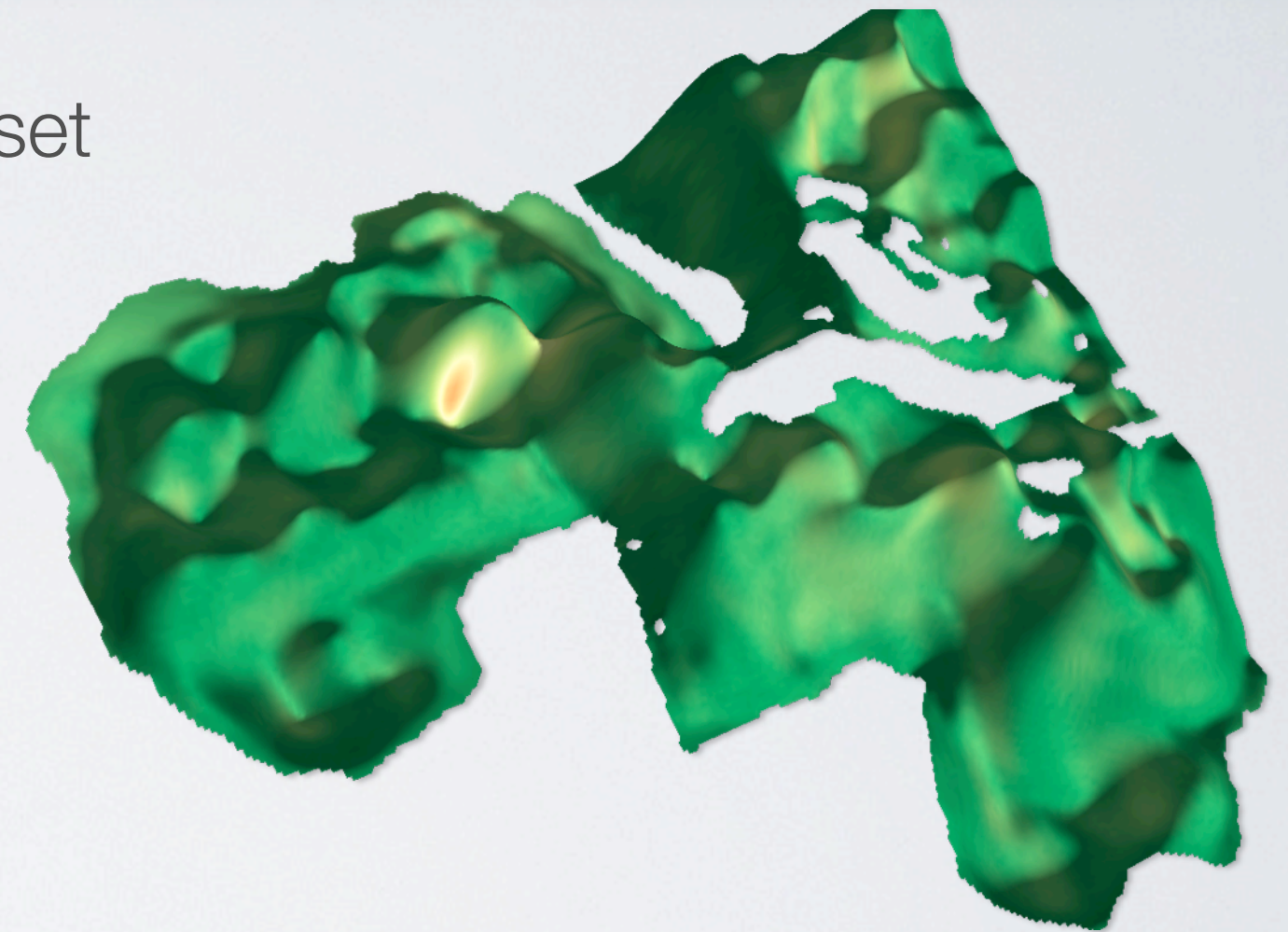
- Statistical analysis
- Overview first
 - representative surface + statistics
- Details on demand
 - interactive probing
 - live parameter-space exploration



On the Fly Analysis

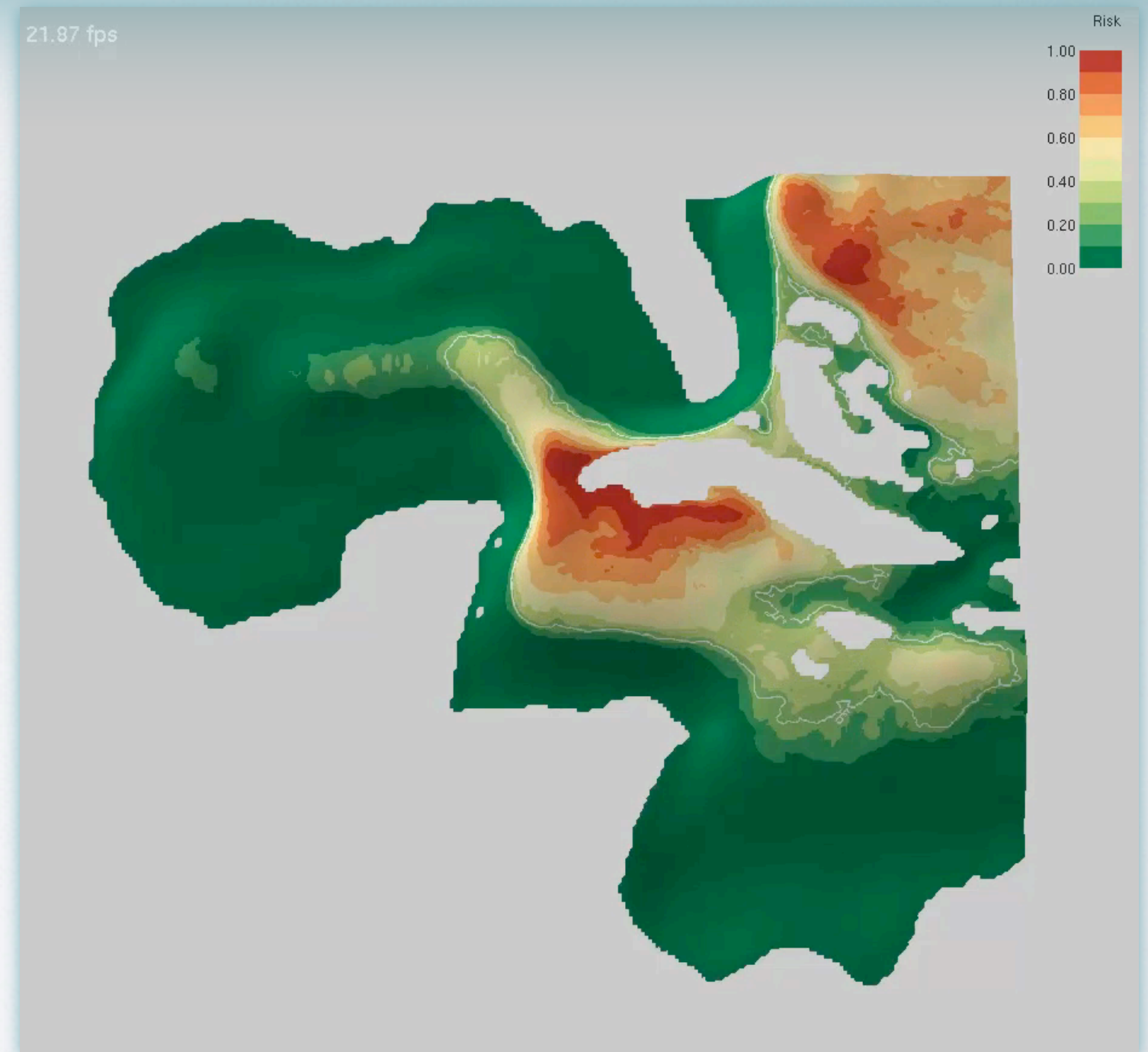


- Interactive parameter space exploration
 - statistics based on user defined ensemble subset
 - GPU-based computation
- Statistical analysis
 - histogram, pdf
 - mean, median, maximum mode \Leftrightarrow surfaces
 - variance, kurtosis, risk estimate ... \Leftrightarrow textures
- iso contouring



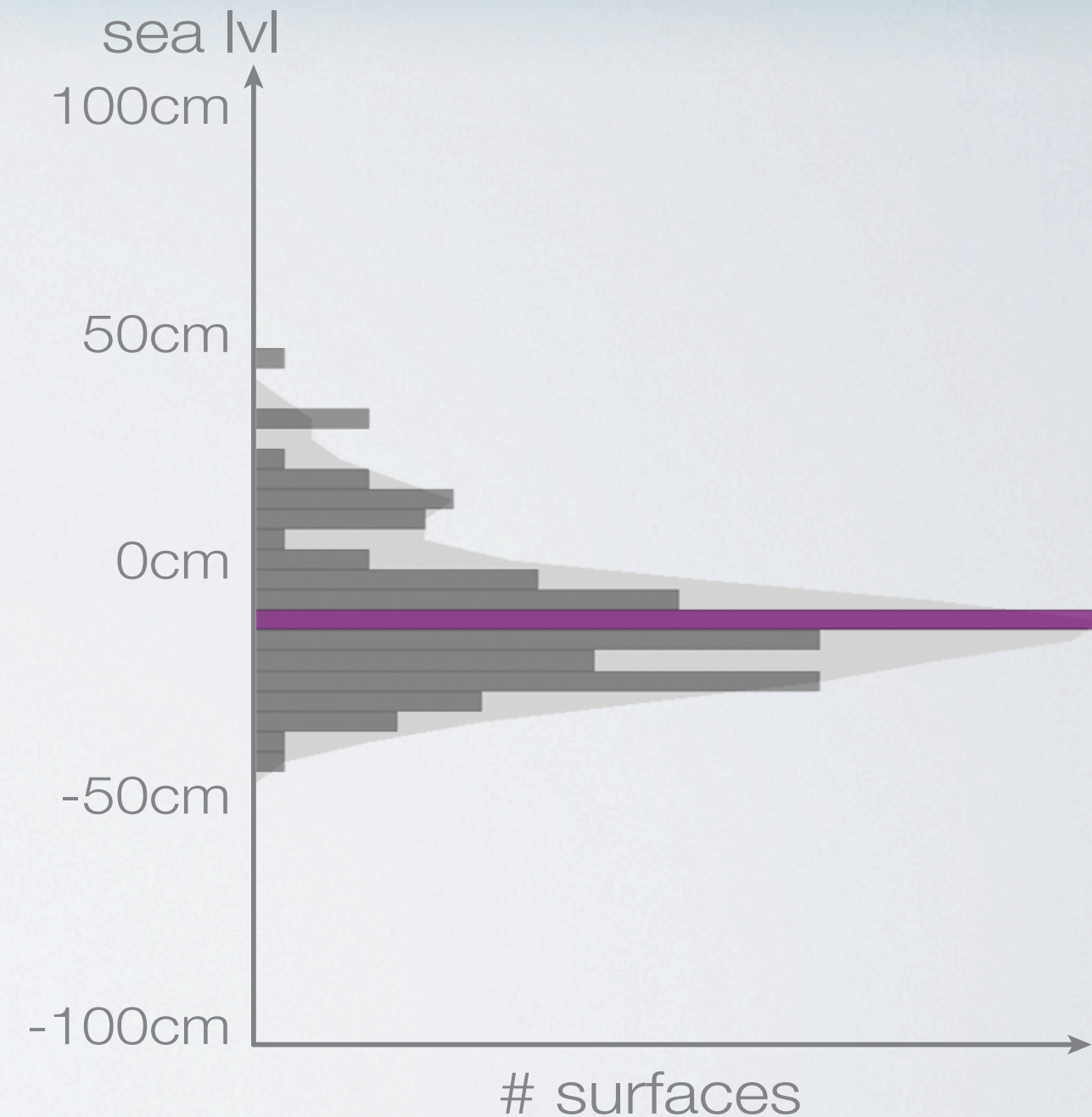


- Based on user defined critical sea-level
 - portion of surfaces above critical value
- On the fly adjustment of sea-level
- Live parameter space exploration
- Iso contouring for precise area definition



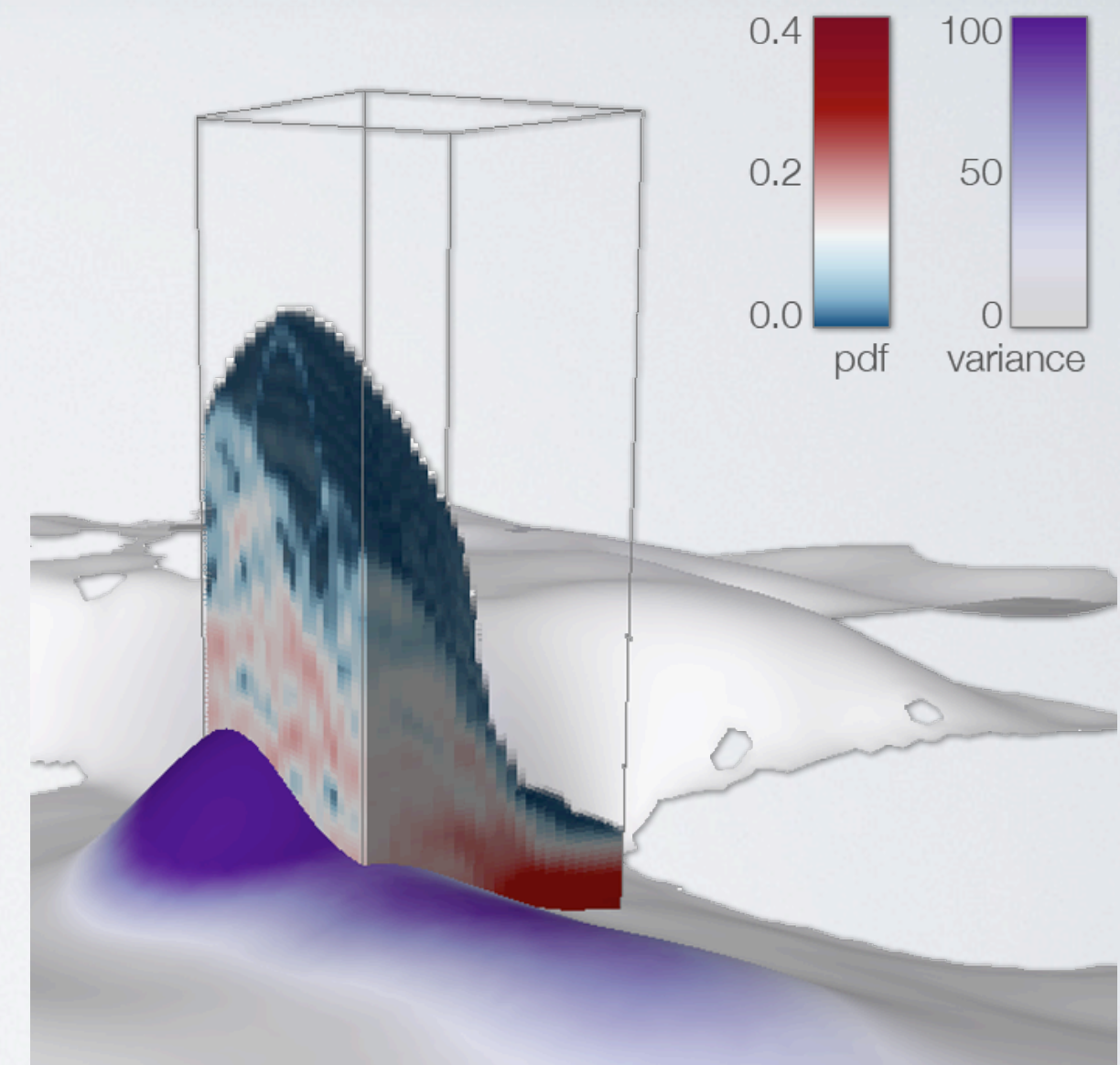


- Complete distribution for each x,y position
 - histogram + pdf
- 3D volumetric cursor
 - user adjustable size
- avoids clutter of rendering complete volume





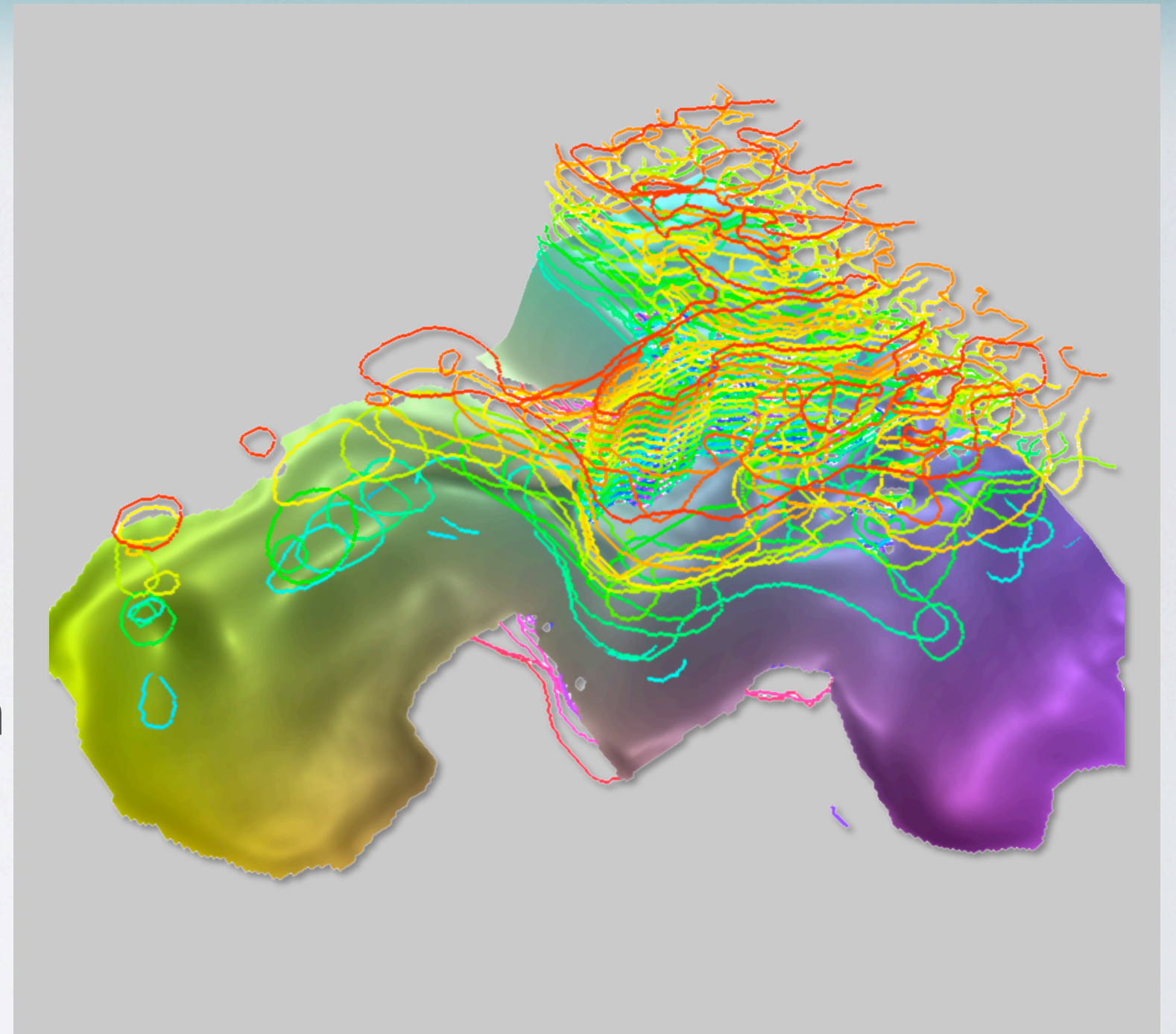
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Iso Contouring



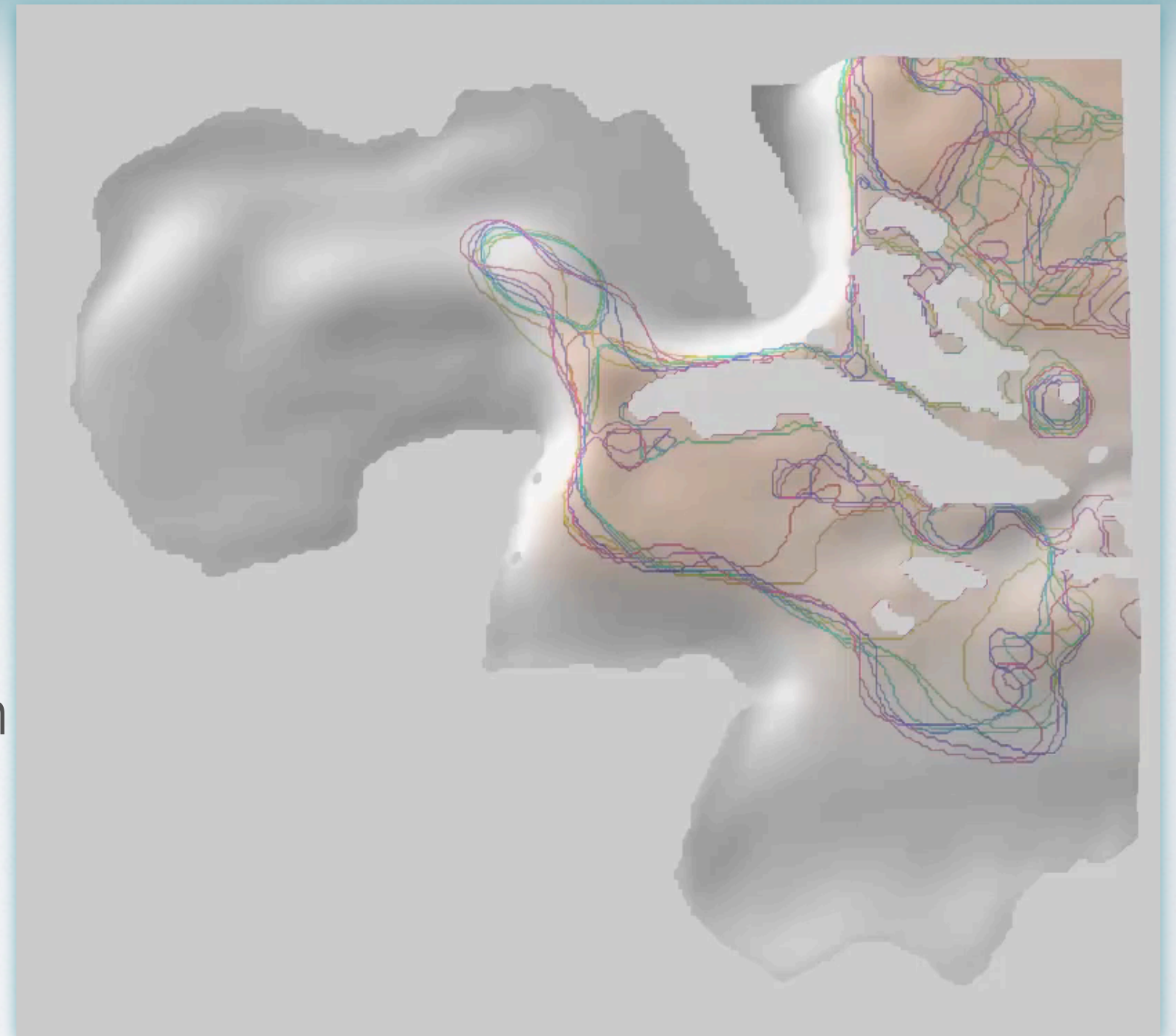
- From any surface or scalar field
- As geometry, or for texturing
- Live parameter space exploration
- Area of interest definition
- Standard marching squares implementation



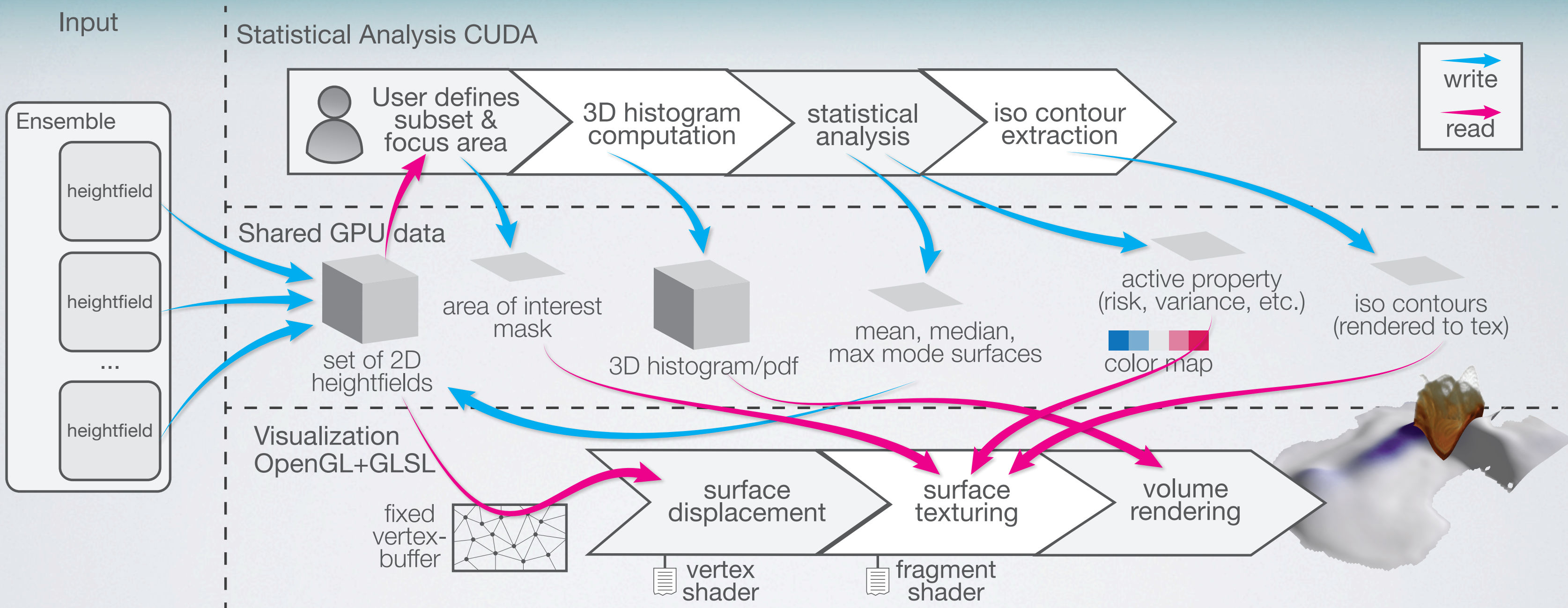
Iso Contouring



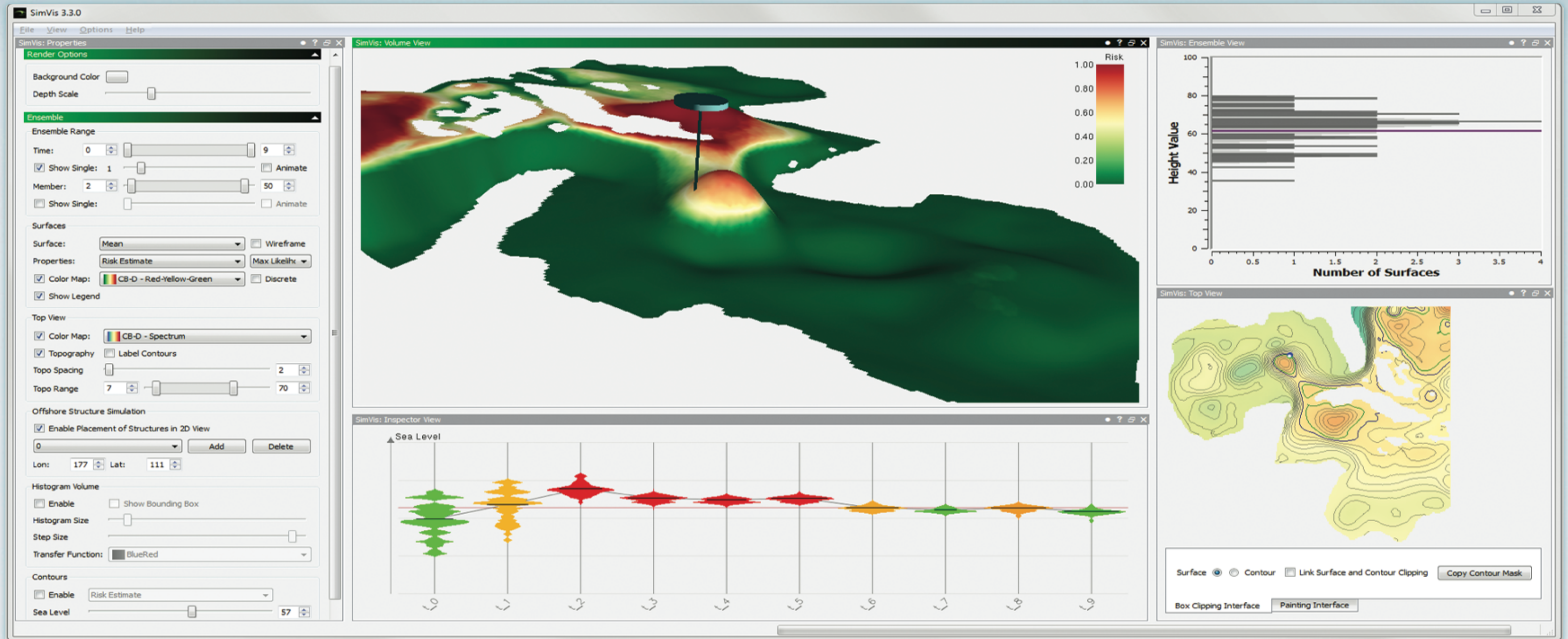
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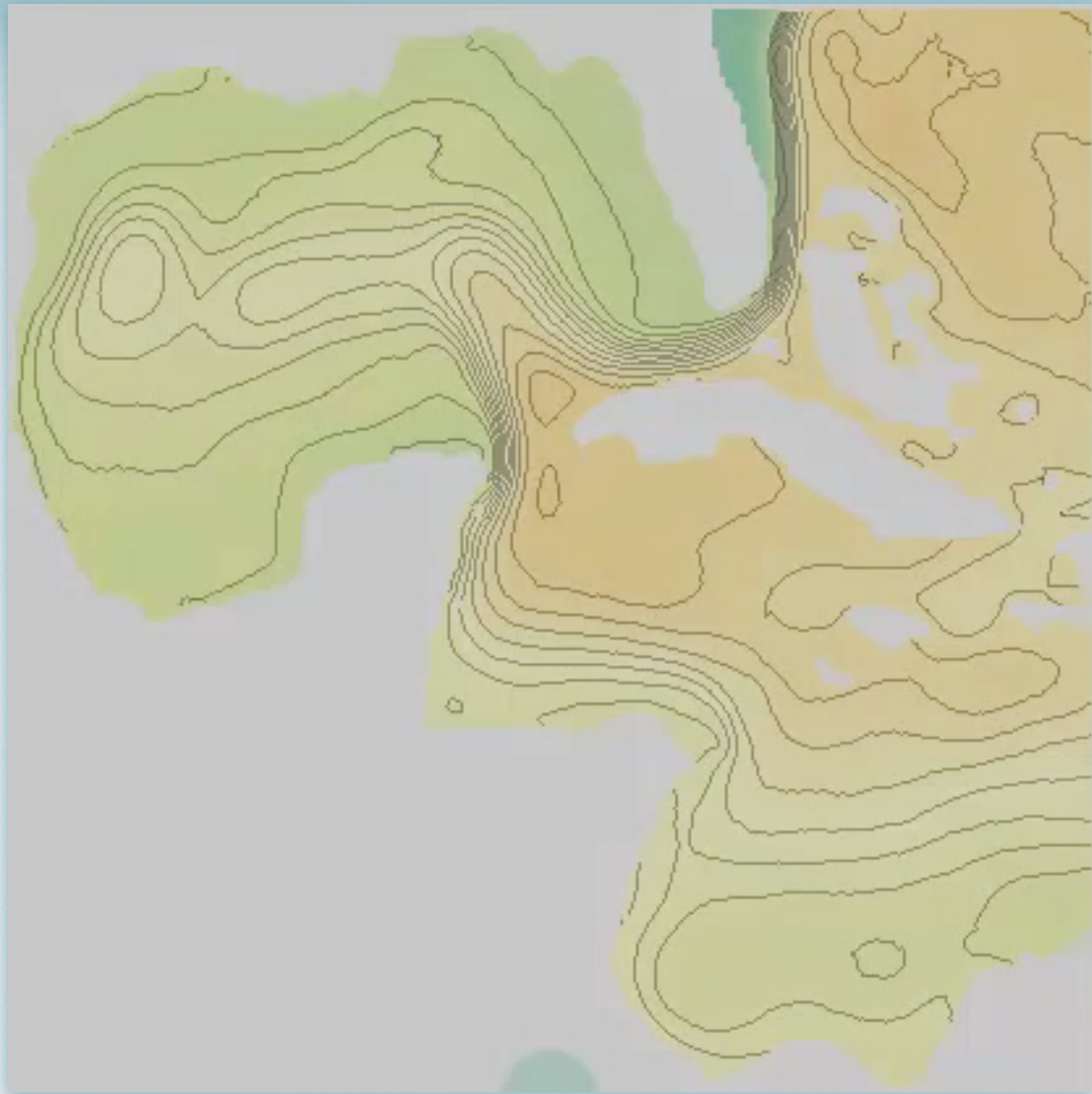
Analysis & Visualization Pipeline



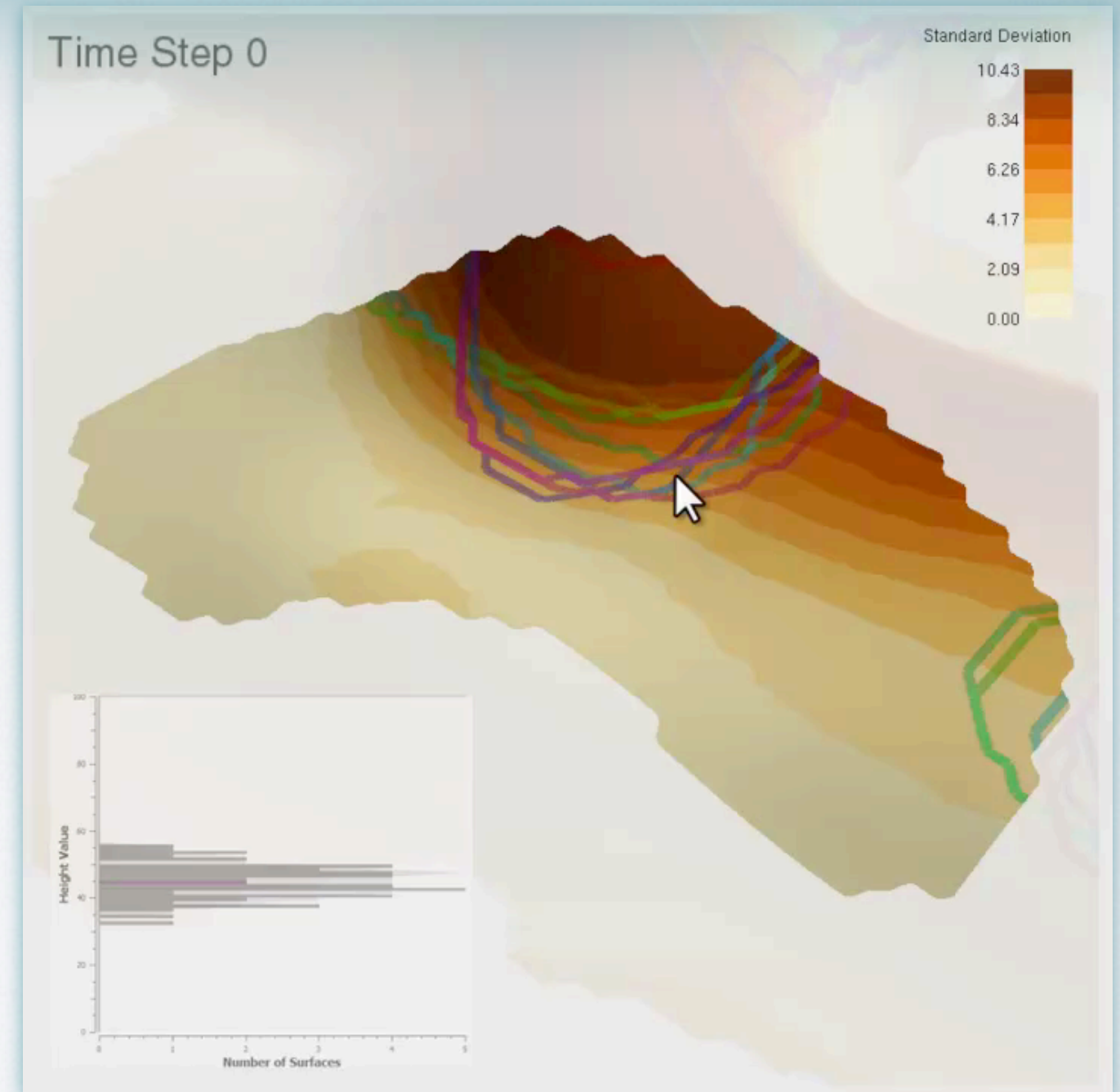
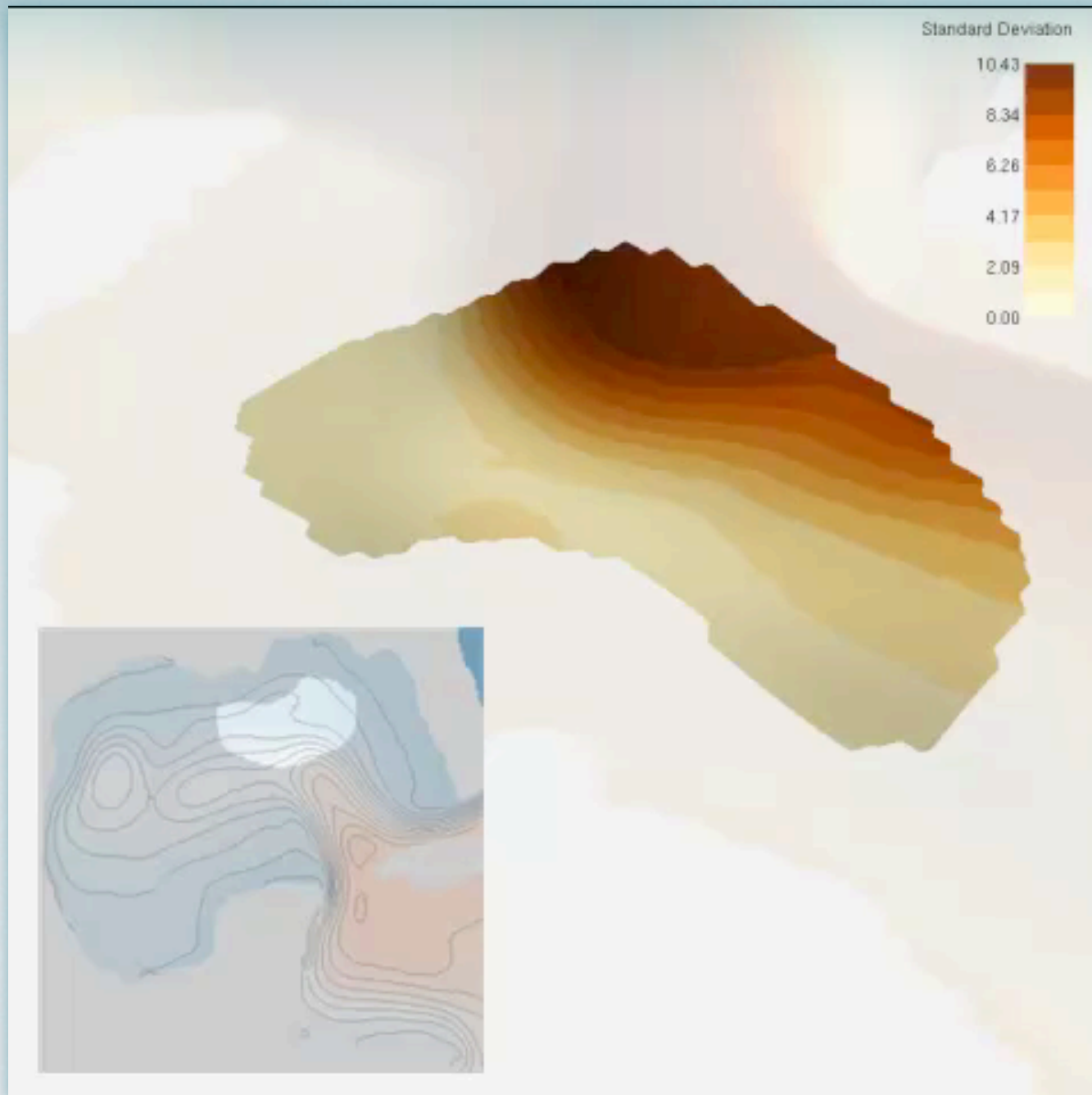
System



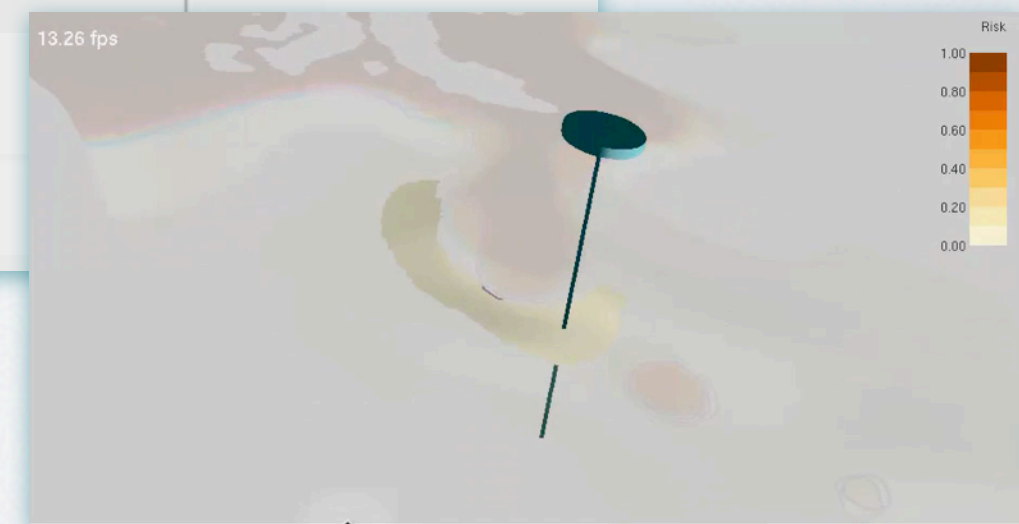
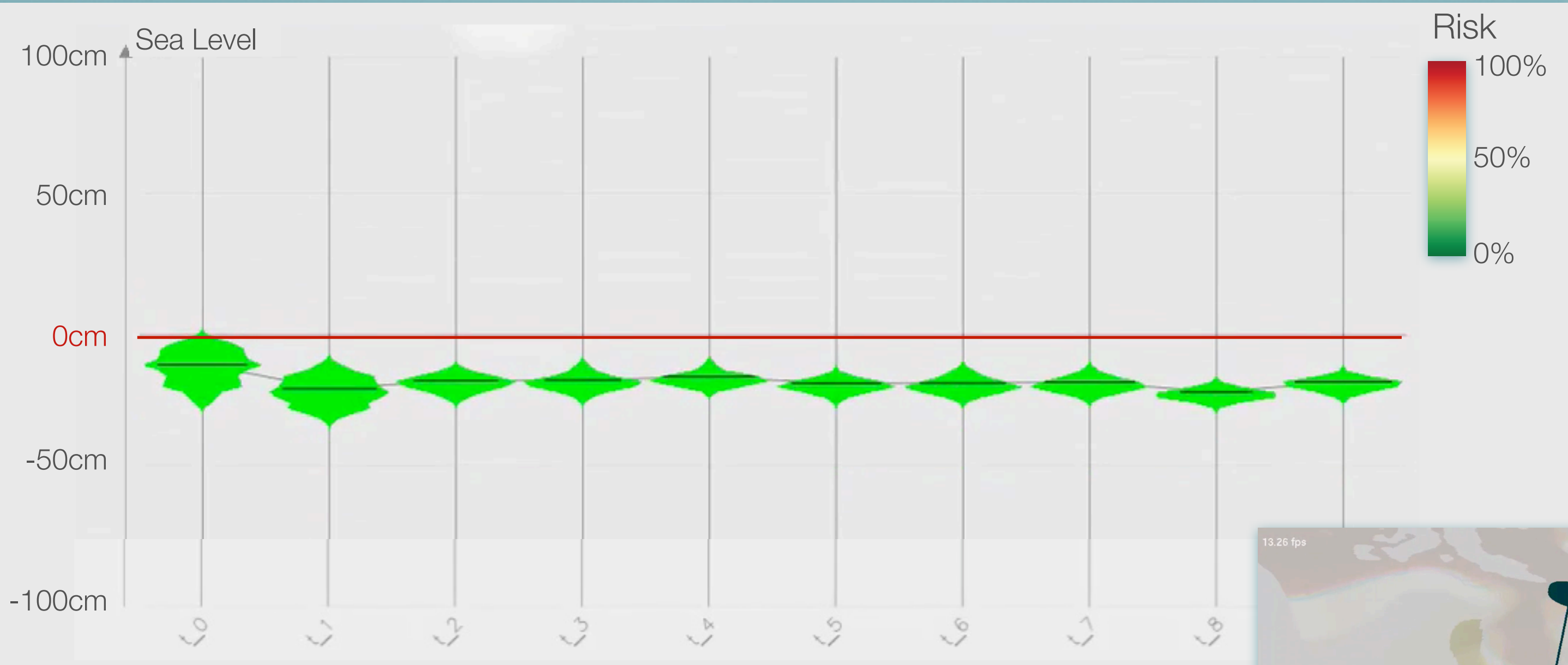
Results // Placement Planning



Results // Placement Planning



Results // Operation



Summary



- Framework for visual exploration of uncertain ocean forecasts
 - allows efficient planning of operations and placement of off-shore rigs
 - developed in close collaboration with domain experts

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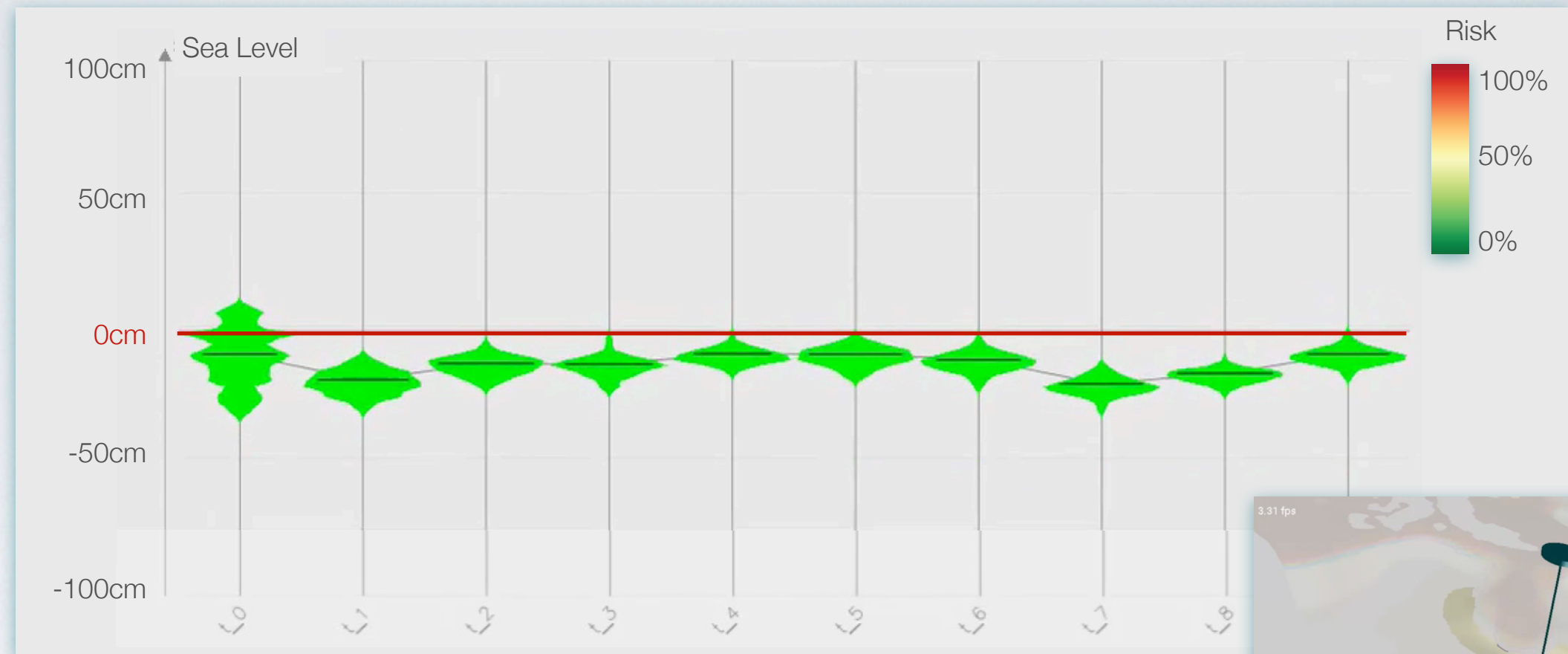
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Questions?