Scientific Visualization: Melding Computer Science, Data and Artistic Practice

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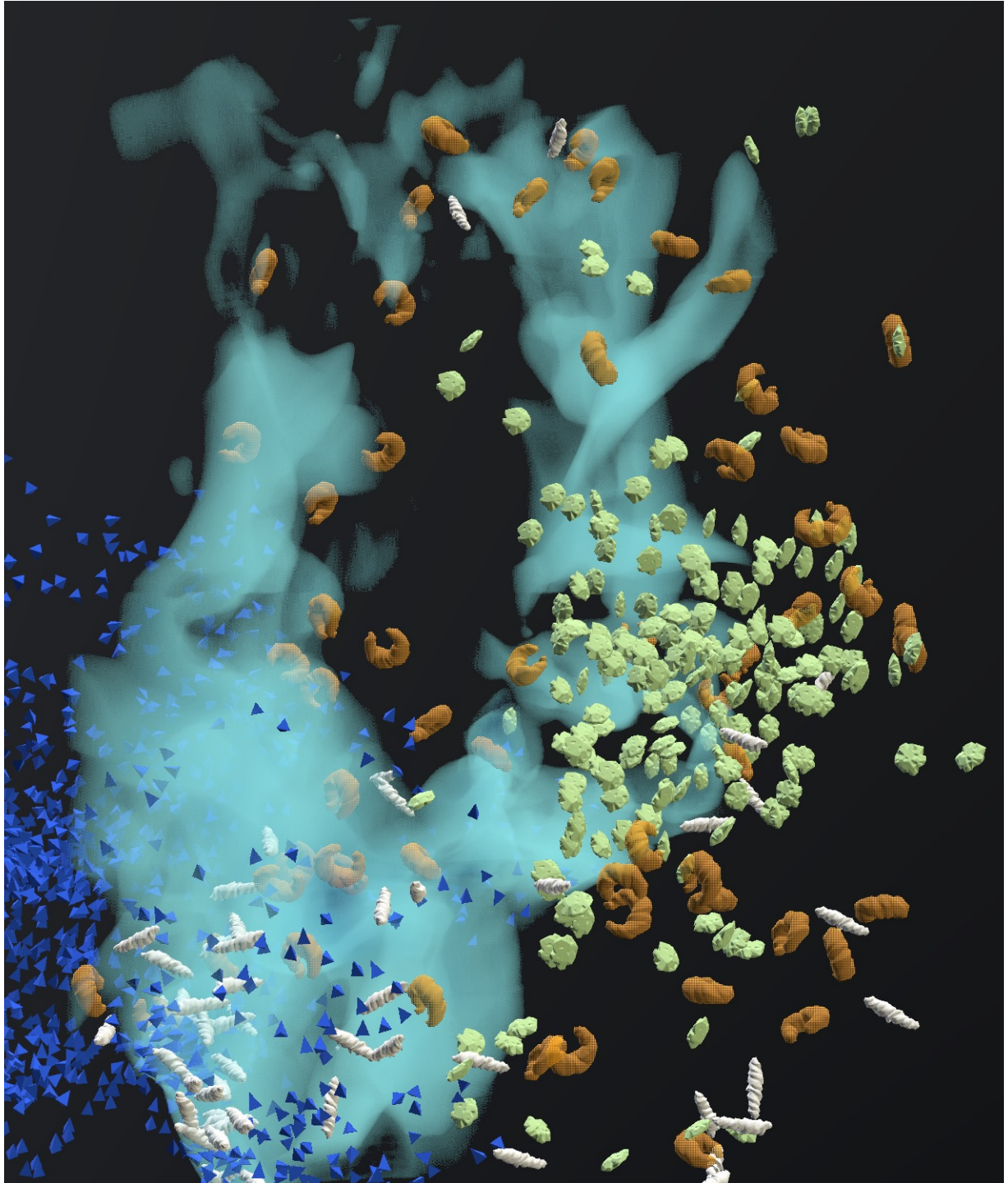


native habitat

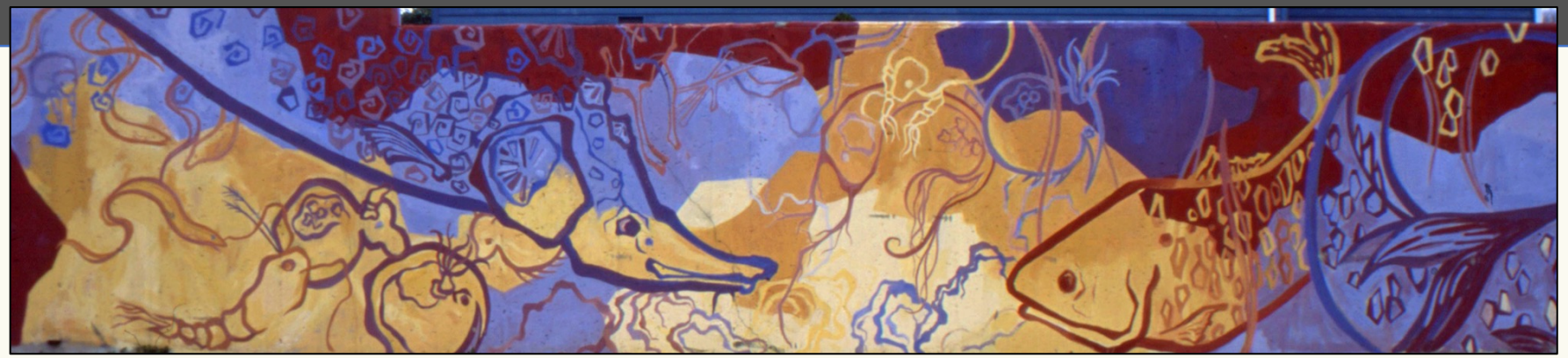
Images based on interviews of local residence speaking of memories of their heritage

- music from Central and South America
-sugar cane
-Portugal map
-Emily Dickenson
-mangos
-and a weaver bird

Woven Gifts

Yonkers, NY
Samsel

Sponsored by the Westchester Arts Council
Broadway Business Improvement District



Season's of the Estuary

(detail) Croton-Harmon Train Station, NY

Info Vis under your feet

Season's Walk

Croton – Harmon Metro-North train station
Croton-on-Hudson, NY
Samse

Pandemic Flu Modeling, Visualization Research, and a Visual Artist

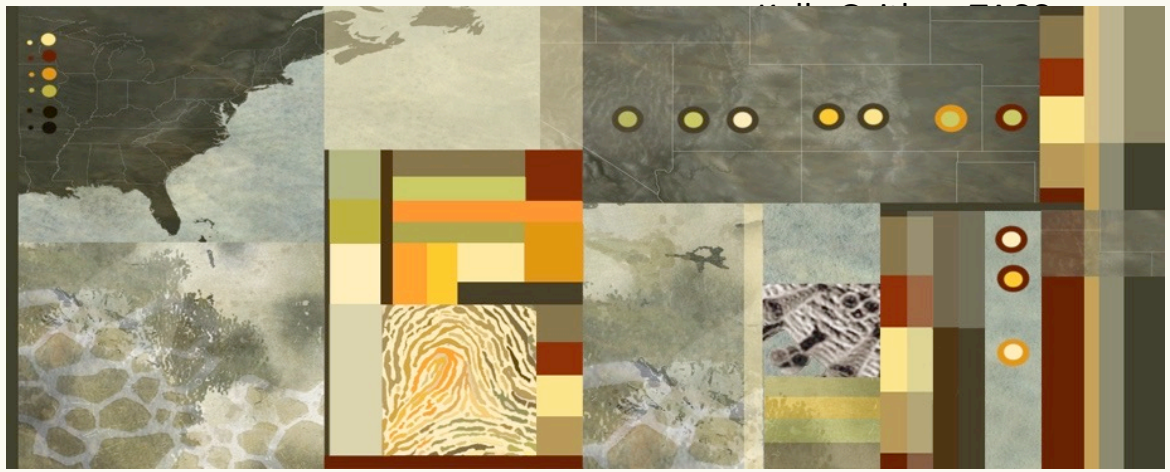
Based on the pandemic flu transmission research of

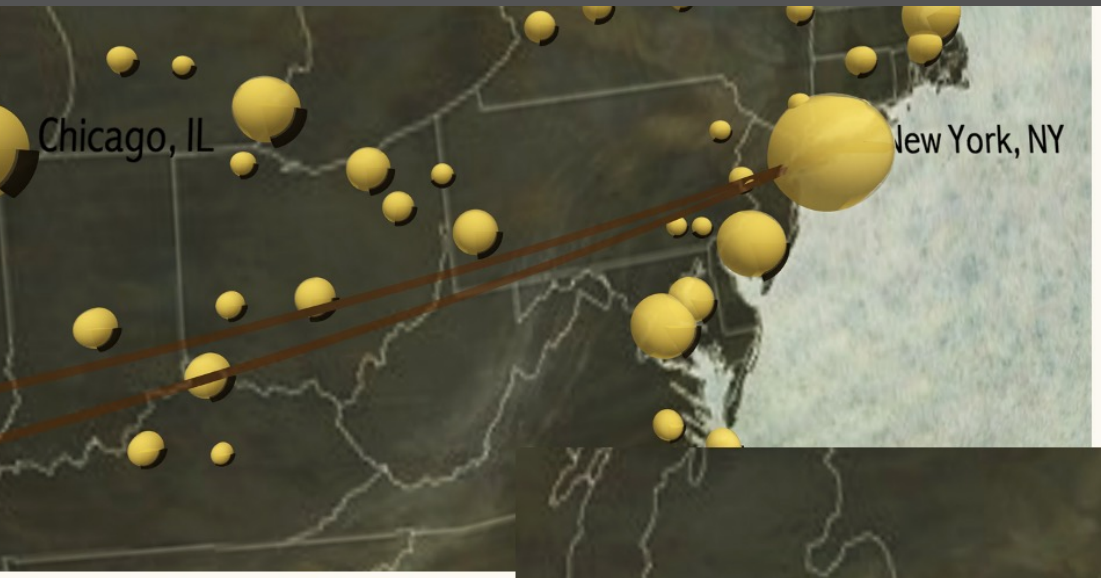
Dr. Lauren Meyers

ACES Visualization Lab

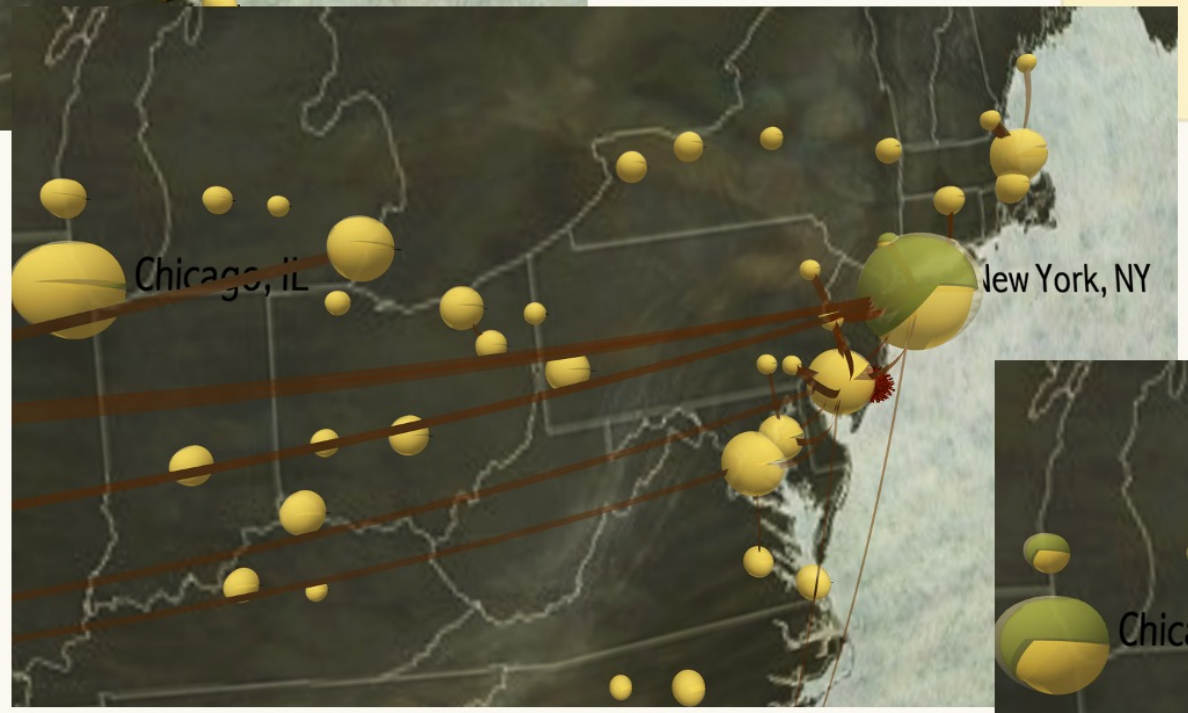
Texas Advanced Computing Center

University of Texas





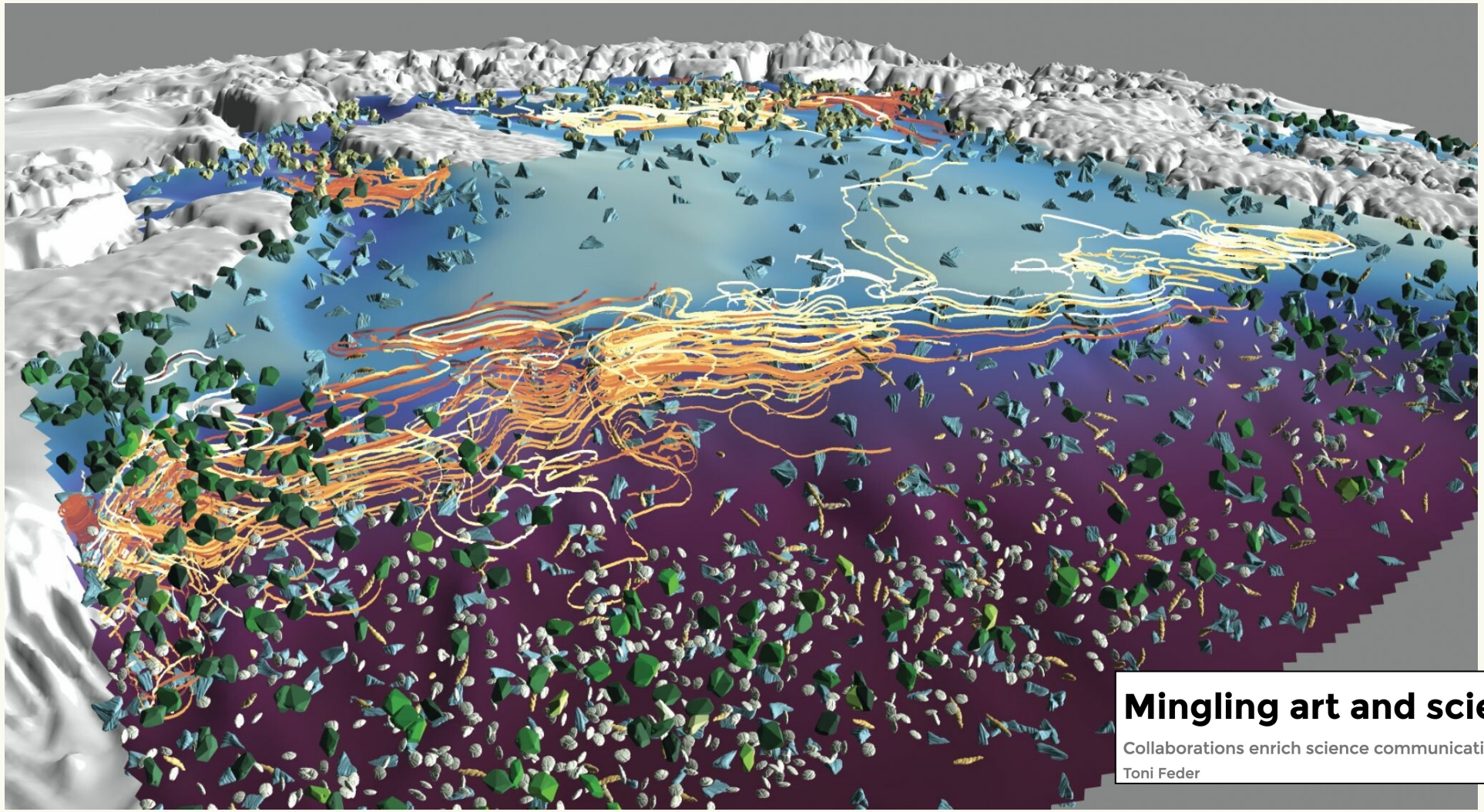
Pandemic Flu Modeling



Glyphs showing the types, stages and levels of transmission

Dr. Lauren Meyers, UT Austin

PHYSICS TODAY



Mingling art and science opens minds

Collaborations enrich science communication, visualization, and inspiration.

Toni Feder

Simulating ocean circulation *gives clues about climate change. This view toward the South Pole is a snapshot of the Antarctic ice sheet. The yellow and orange squiggles are currents, and light blue to purple represents increasing water depth, with the transition to purple indicating the continental slope. The tracers indicate parameters such as salinity and ice shelf water. The US Department of Energy's Energy Exascale Earth System Model incorporates hundreds of variables and has a resolution of 10 km. (Courtesy of the Sculpting Vis Collaborative, Daniel Keefe, and Francesca Samsel, funded by NSF #IIS 1704604 and 1704904.)*

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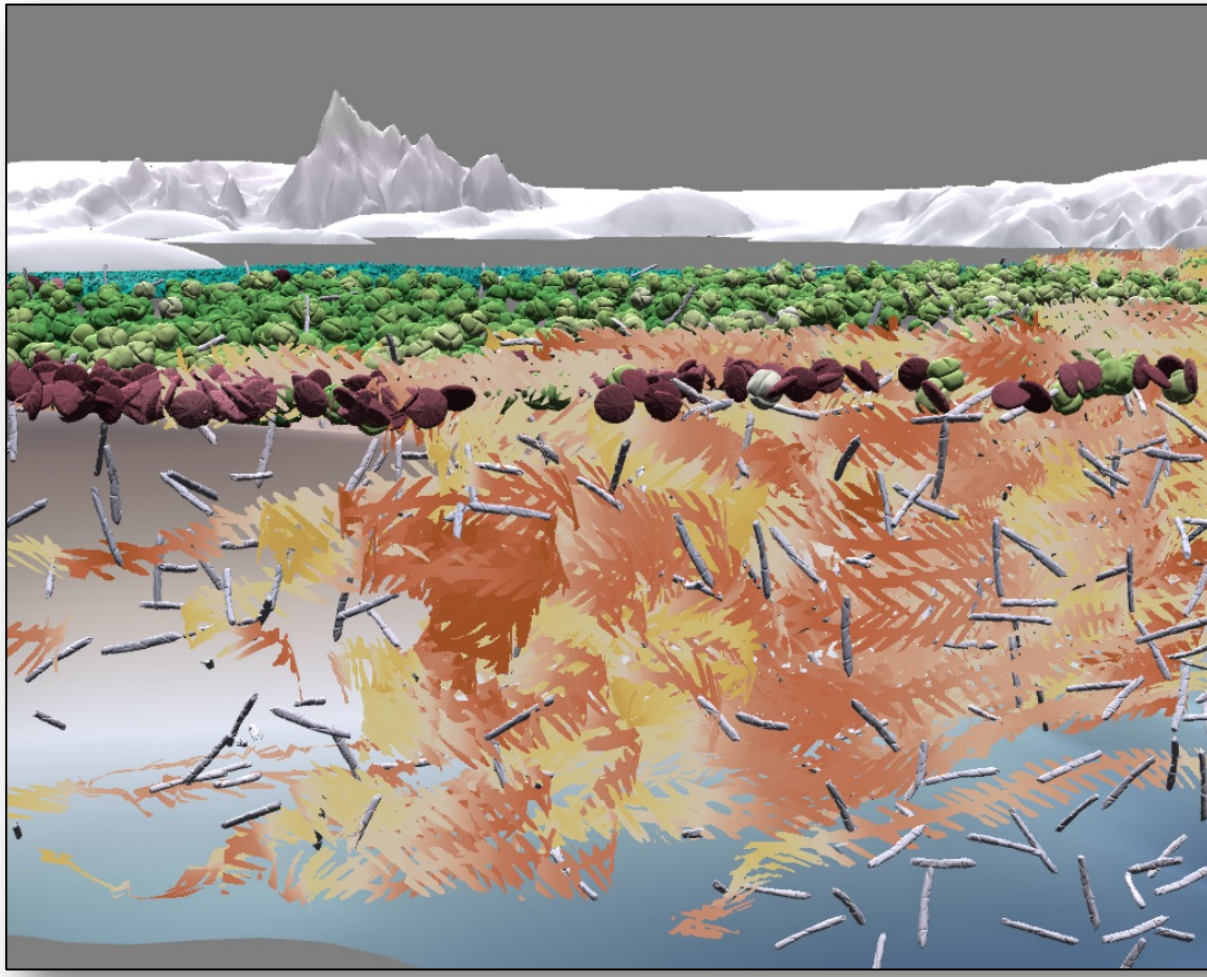
Sculpting Visualizations

Expanding the Vocabulary



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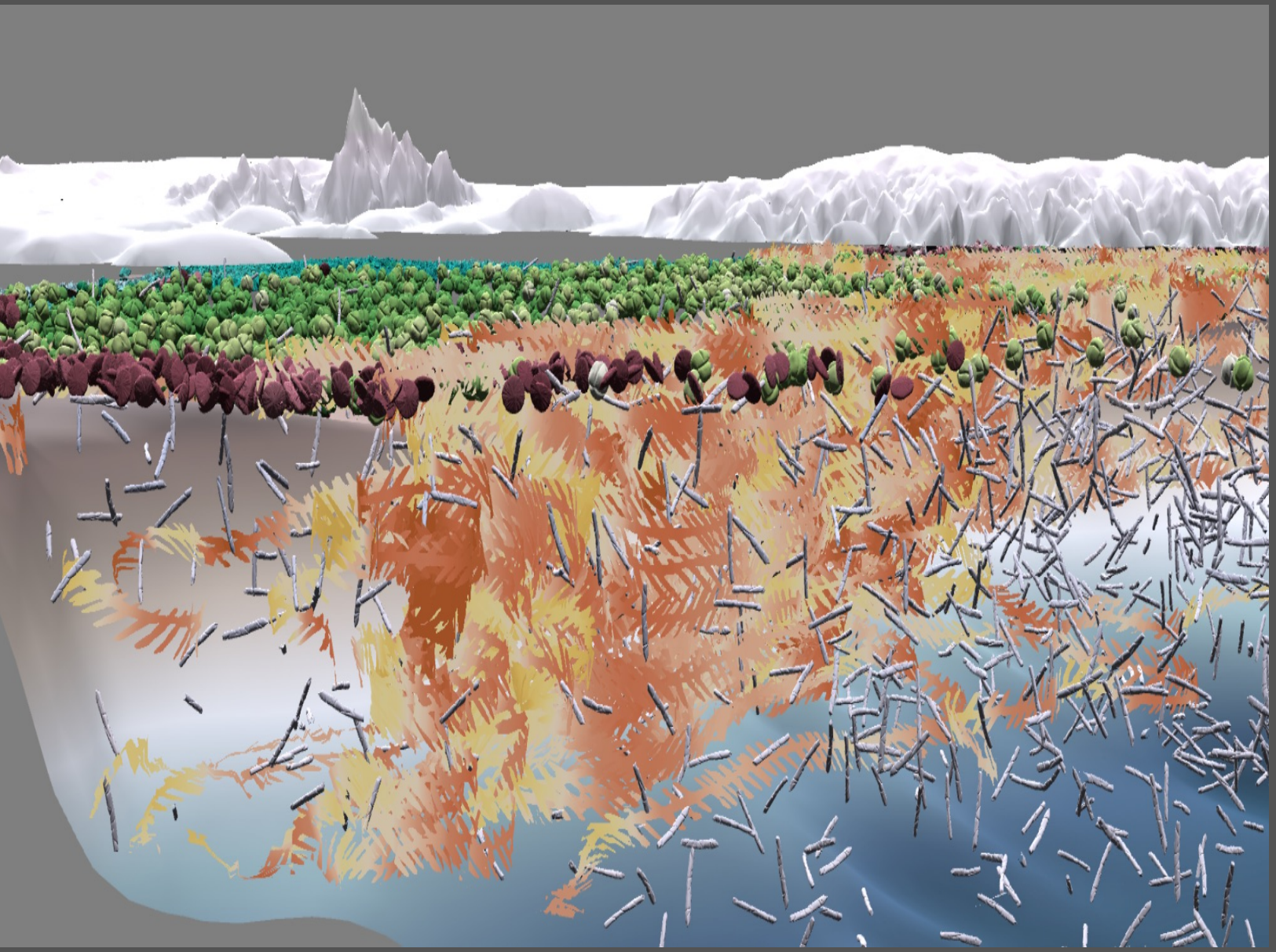
Sculpting Vis



Why

engagement
scientific clarity
depth of understanding
affective communication

What

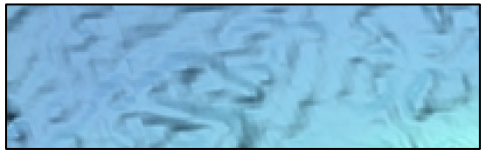
A system for creating compelling immersive scientific visualization created from one's own vocabulary.

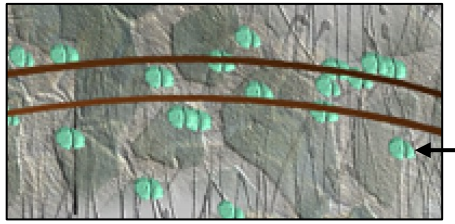
How

tapping artistic design and vocabulary
lay-person designed user interface
sampling algorithms
a multidisciplinary team

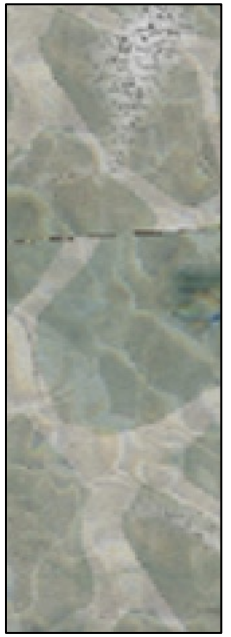
Artifacts from the Studio, into the Vis

Surface texture



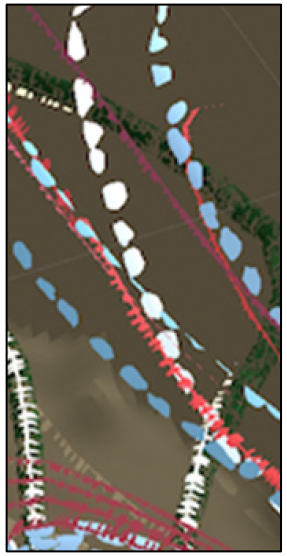


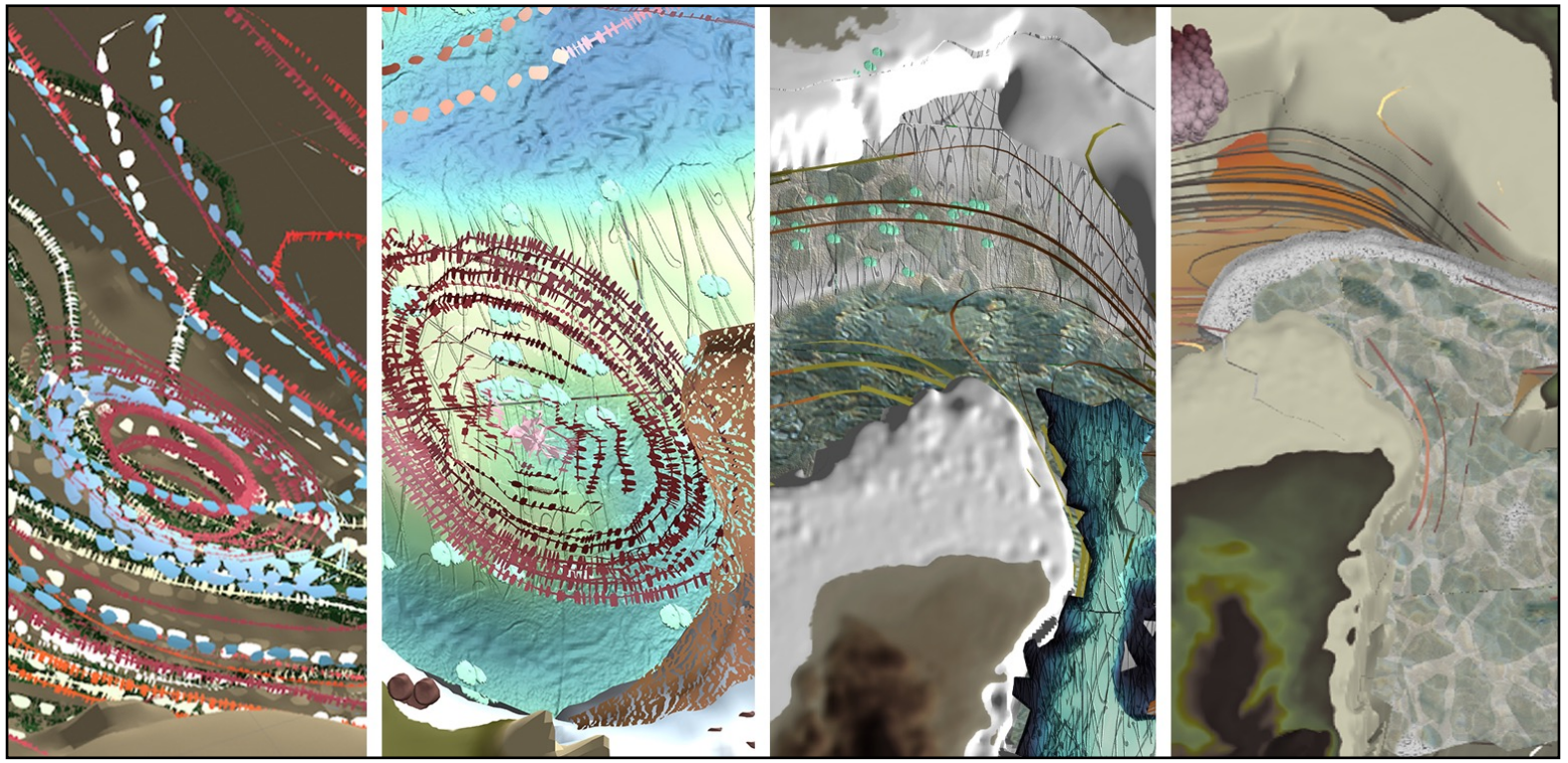
Glyphs



Surface Texture

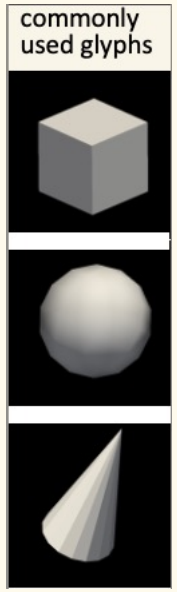
Lines





Surface Cut-out

Enriching & Structuring the Vocabulary



- encode greater number of variables
- intuitive associative properties
- categorial sets
- human connection

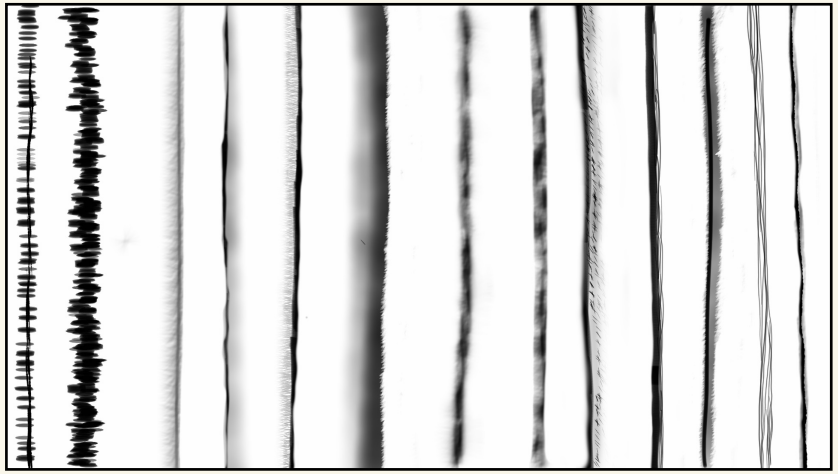
The Library

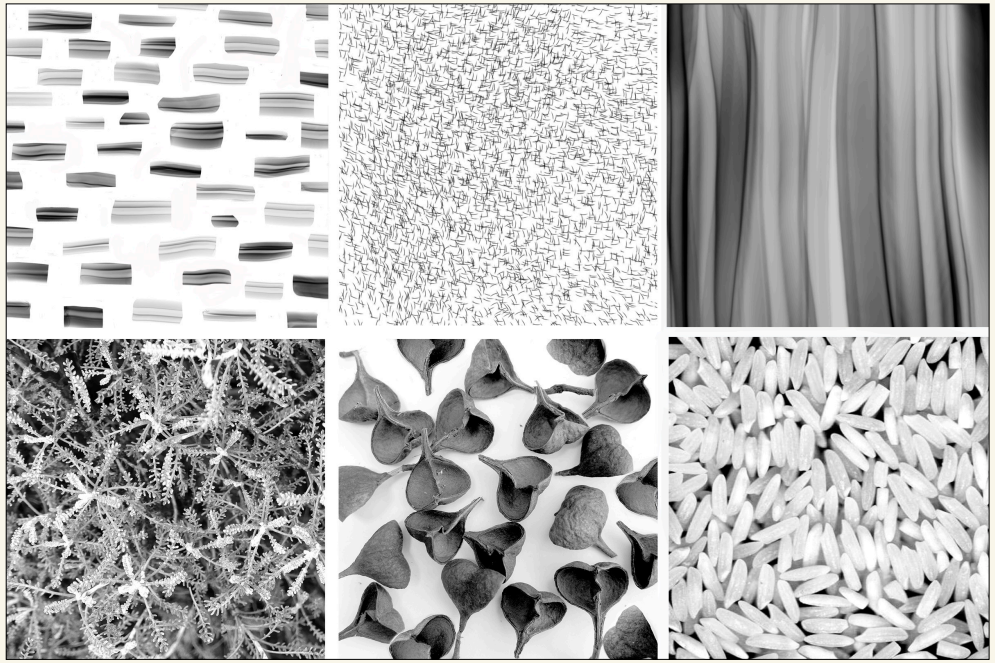
lines
glyphs
textures
color

Lines

Glyphs

Textures

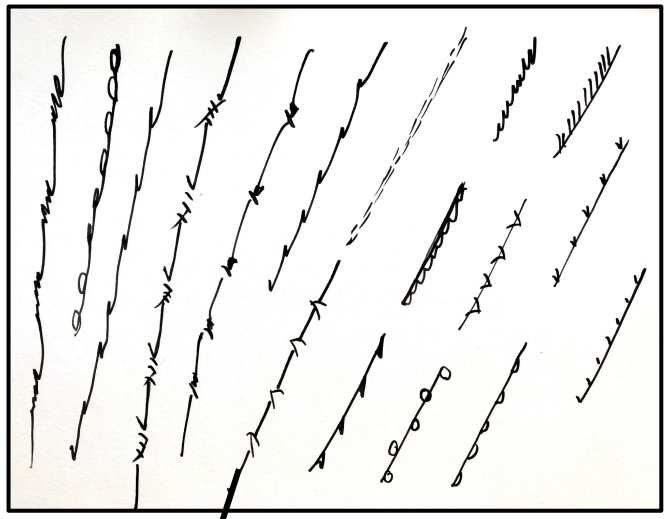


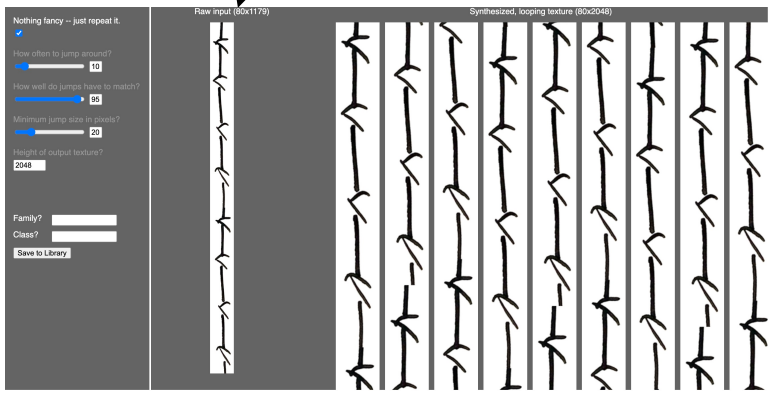


2D Artifacts

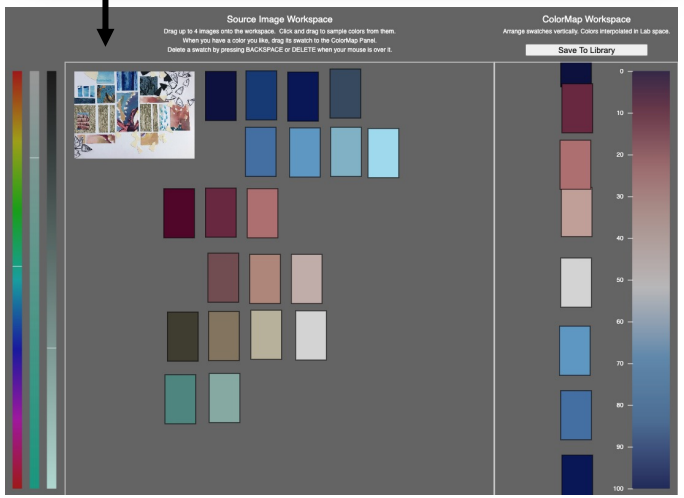
Importing assets to the library

Lines.

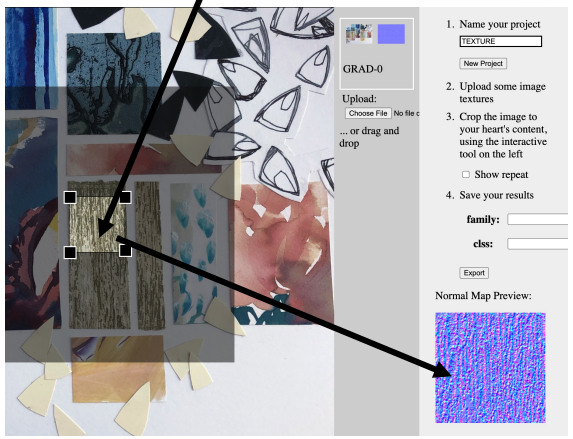




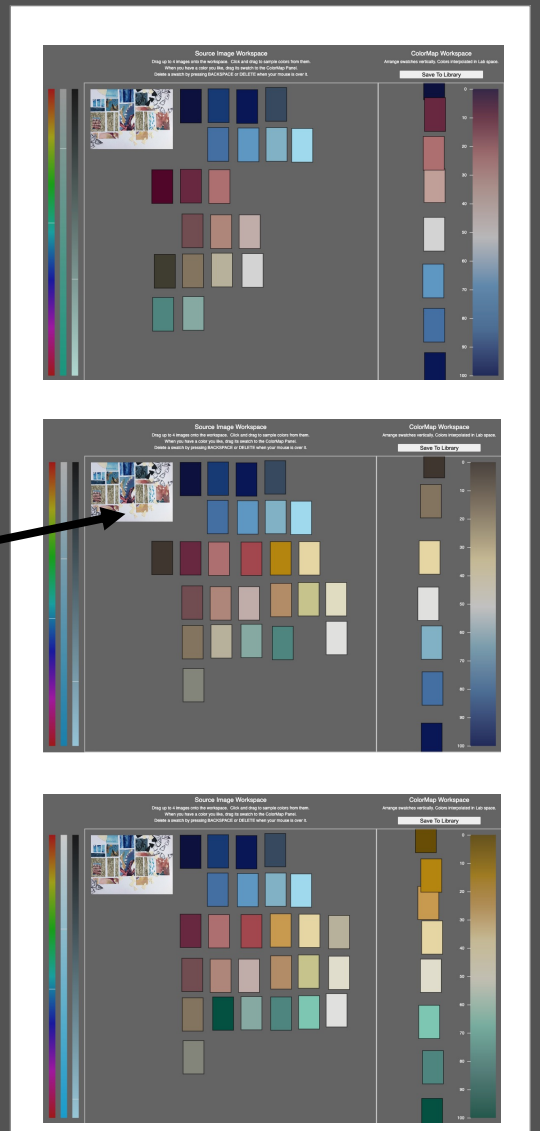
Colormaps.

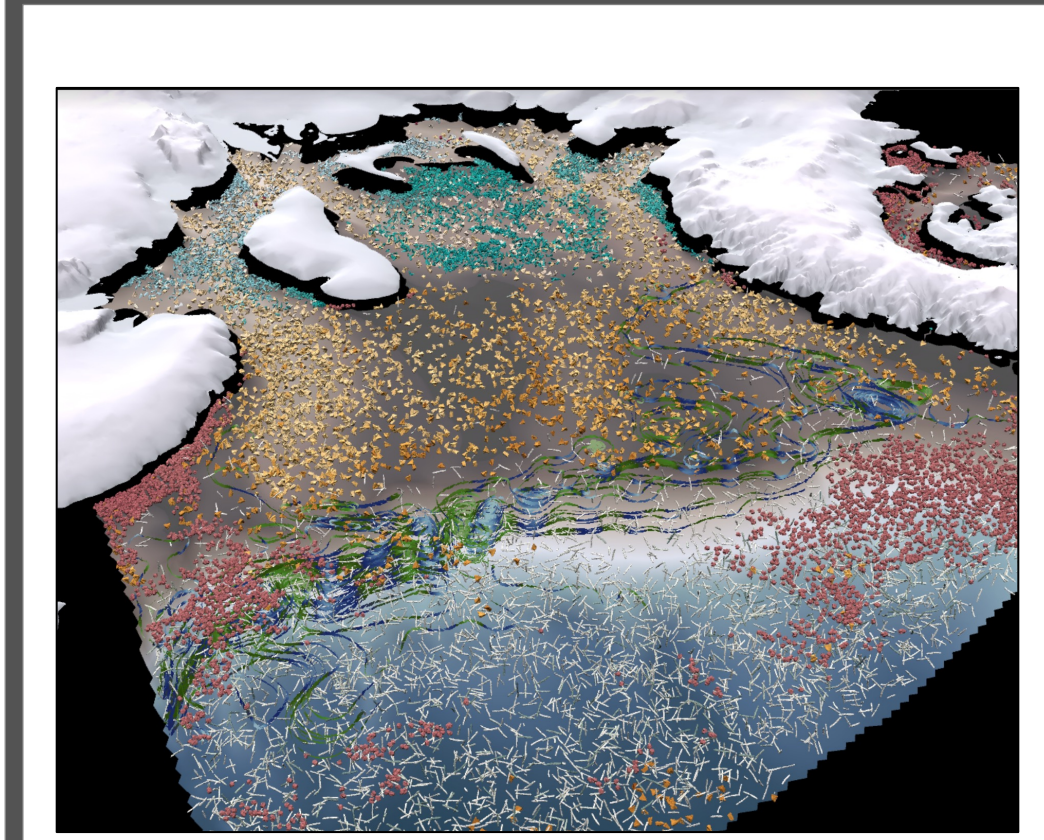


Textures



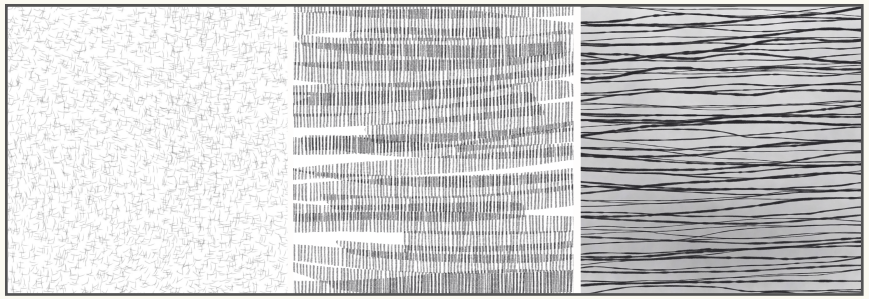
Making Colormaps



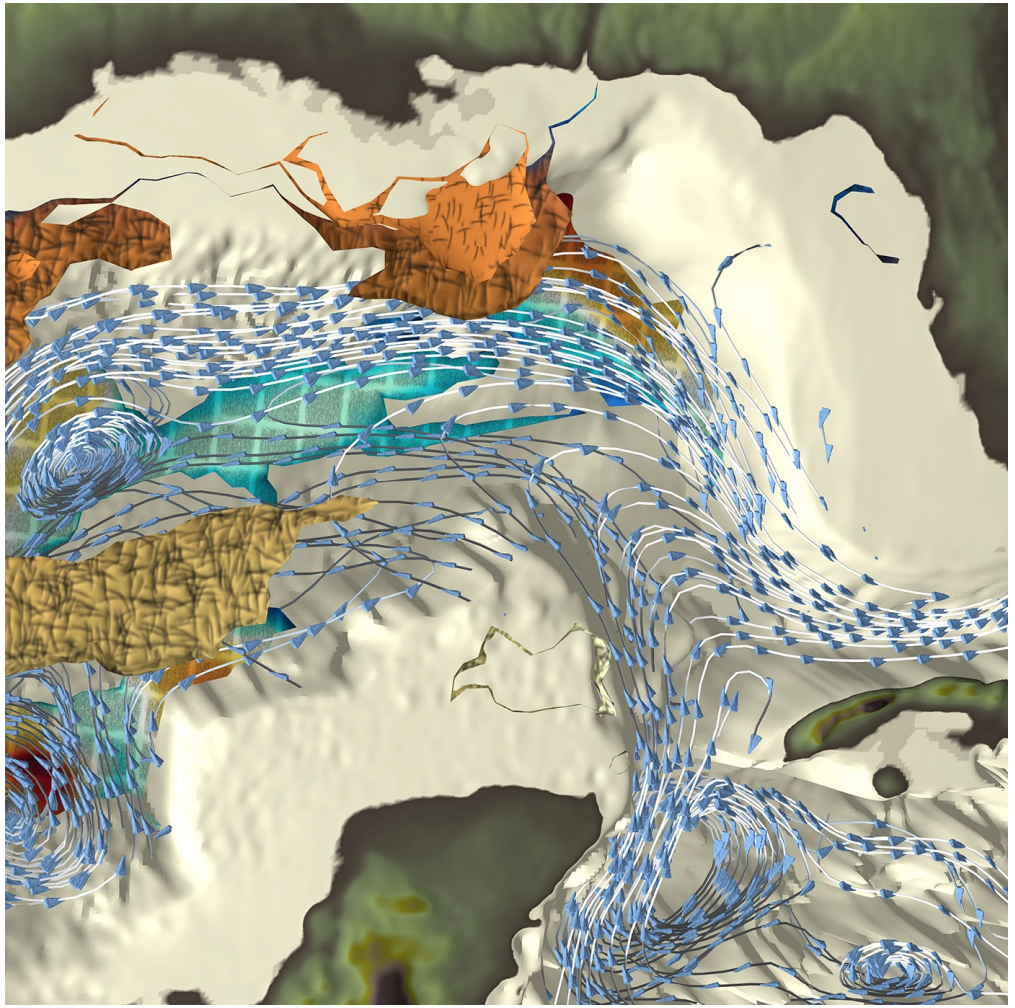


collage

A cyclical design process



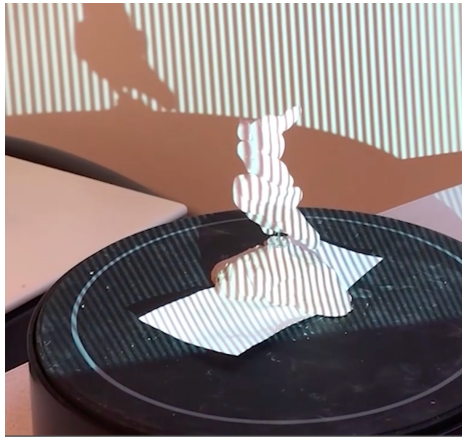
textures



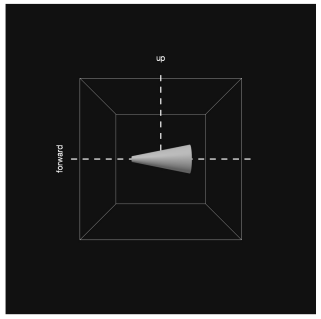
Artifact-Based Rendering

3D Artifacts

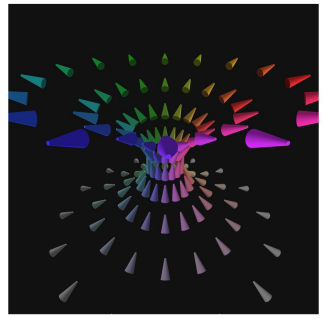
1. Making 3D Artifacts



2. Capturing 3D Artifacts

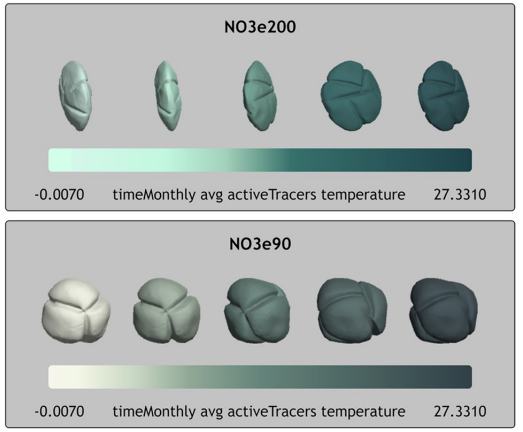


Glyph Align

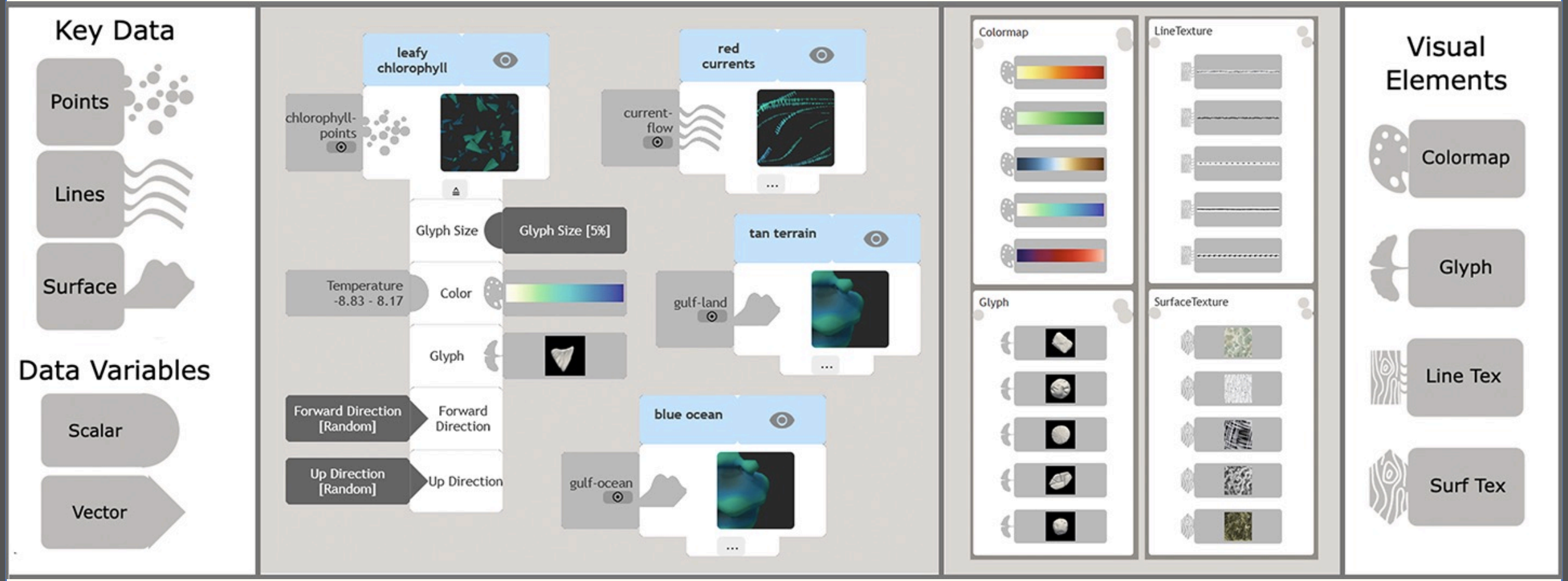


Data-Driven

3. Aligning 3D Artifacts

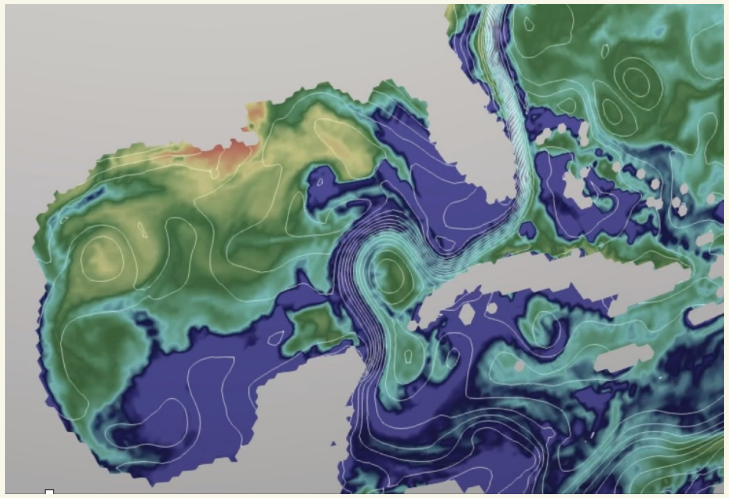


4. Resulting 3D Artifacts



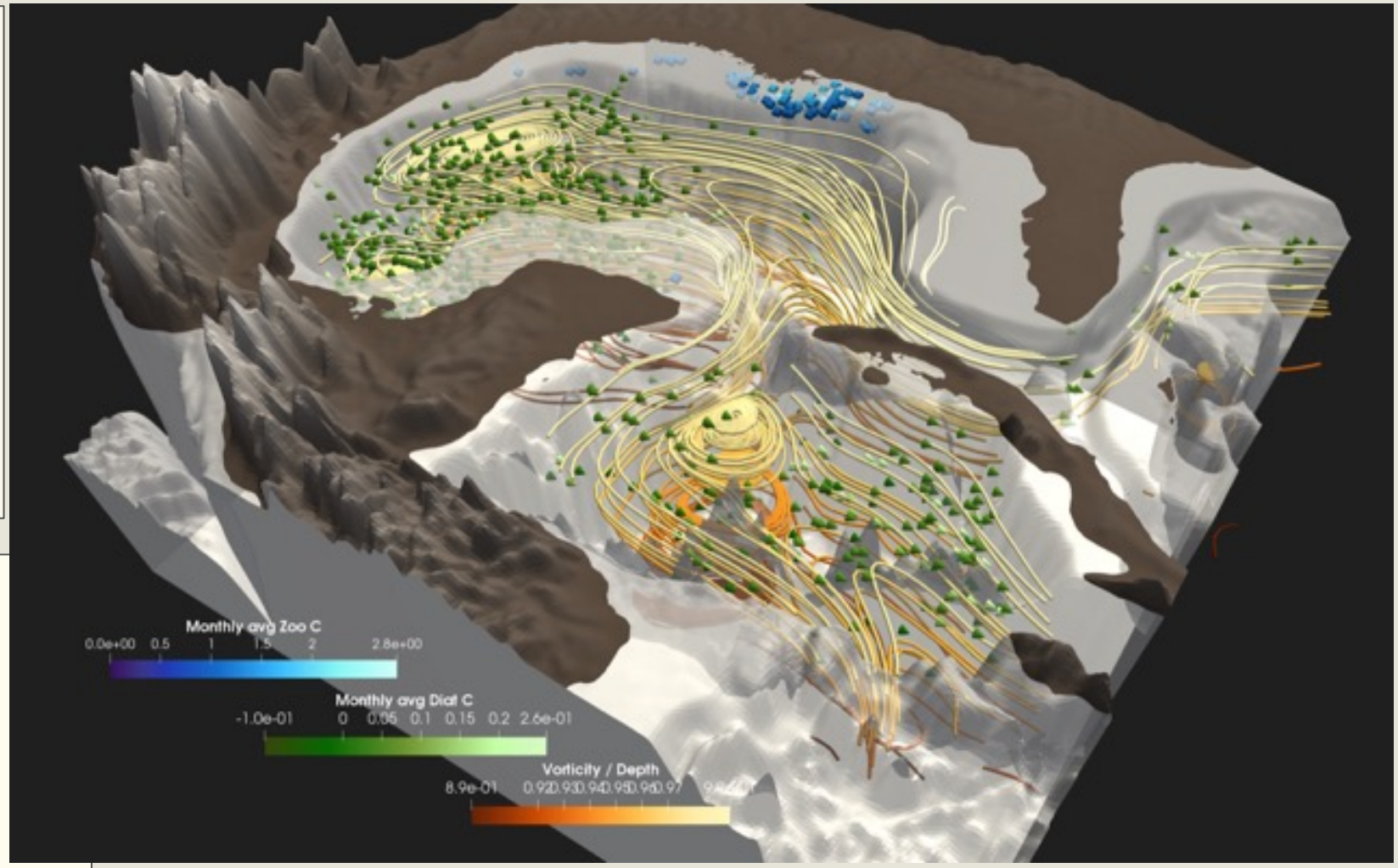
The interface, designed for ease of use

Visualizations created in ParaView, the role of sampling



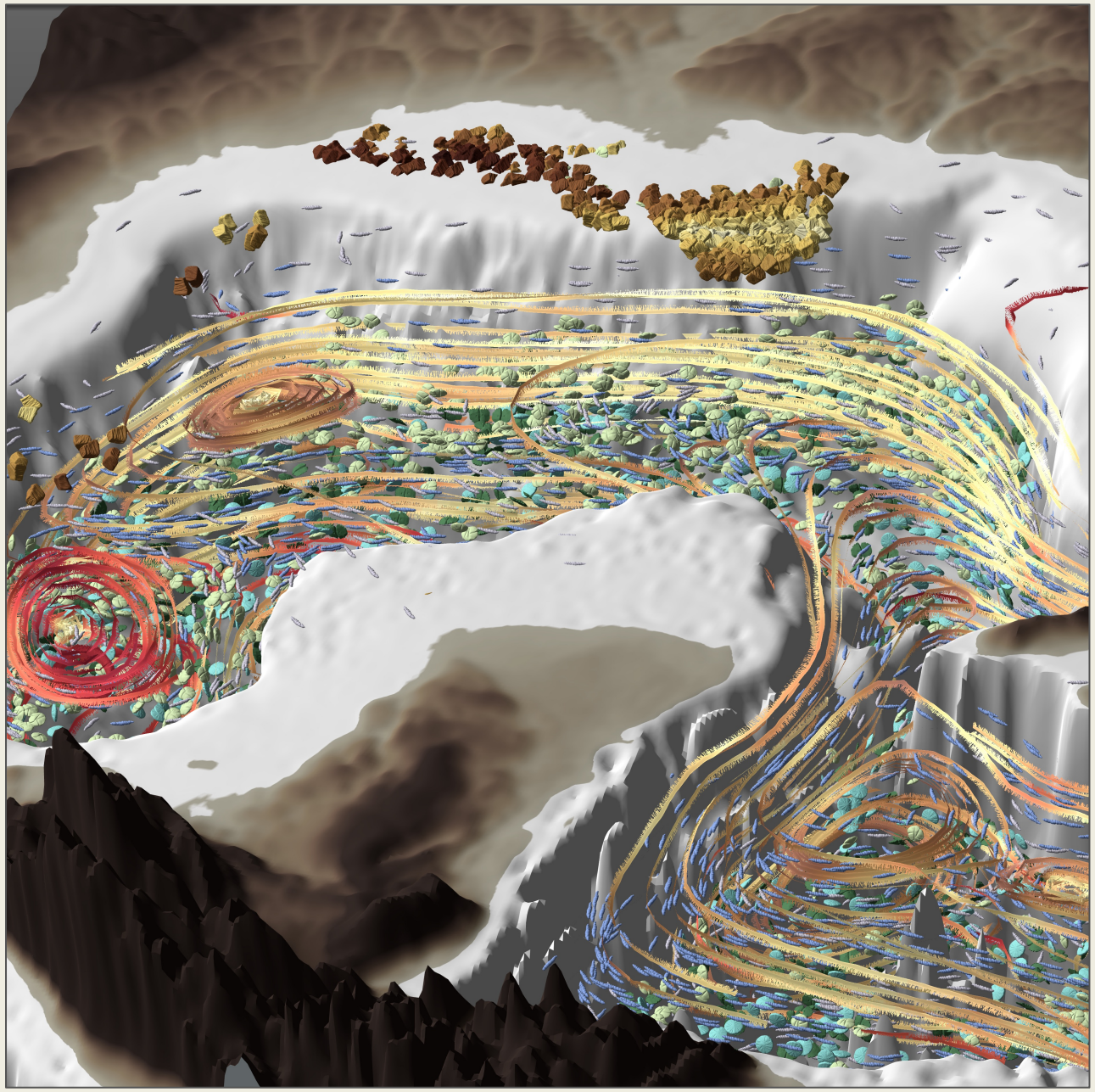
scientist team visualization

- Data processed in Paraview
- volume converted to point data
- glyphs rendered on point data based on density



biogeochemistry in the Gulf of Mexico, MPAS-Ocean. LANL

Above visualization, a collaboration with Data Science at Scale, LANL, and the TACC visualization team, funded by the Office of Science, ASCR, DOE

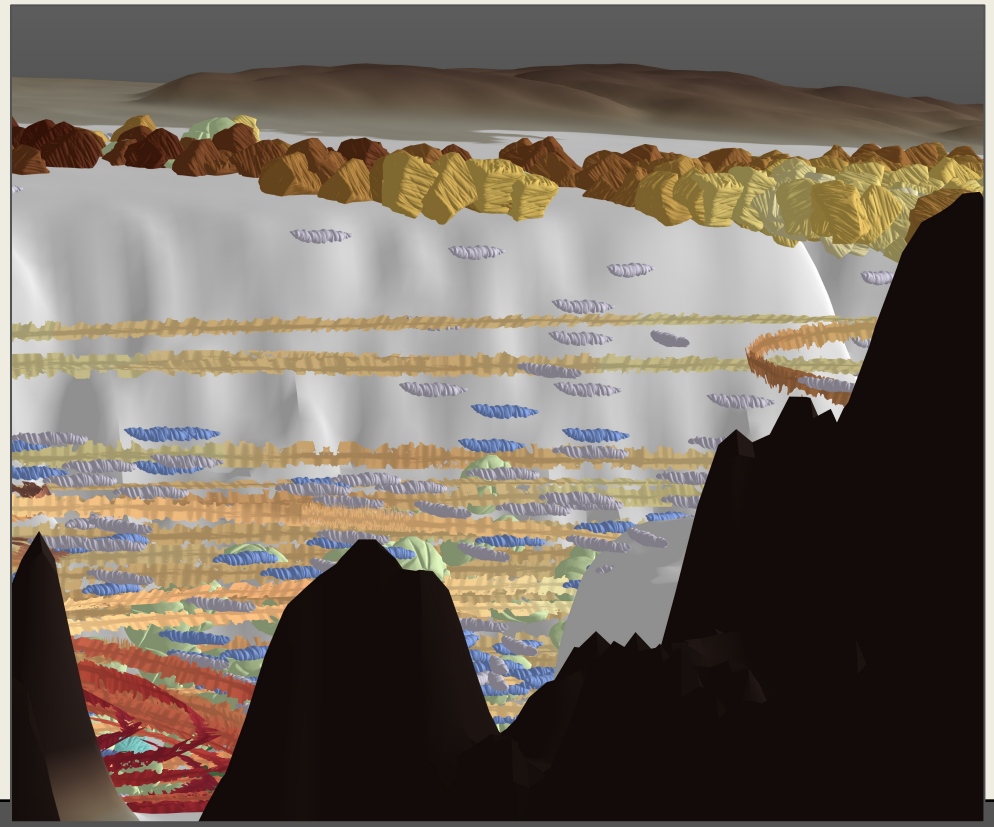


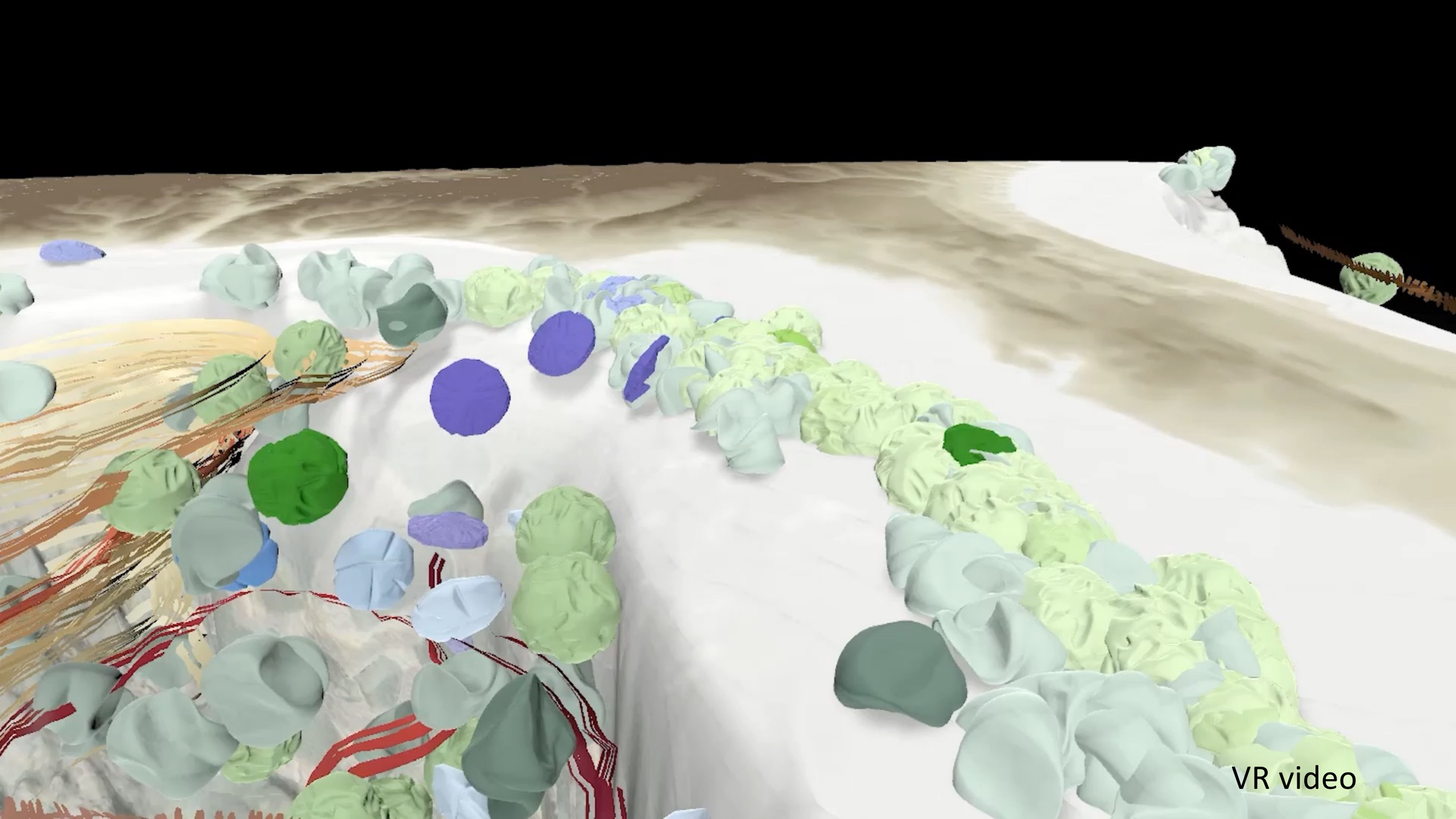
- engagement

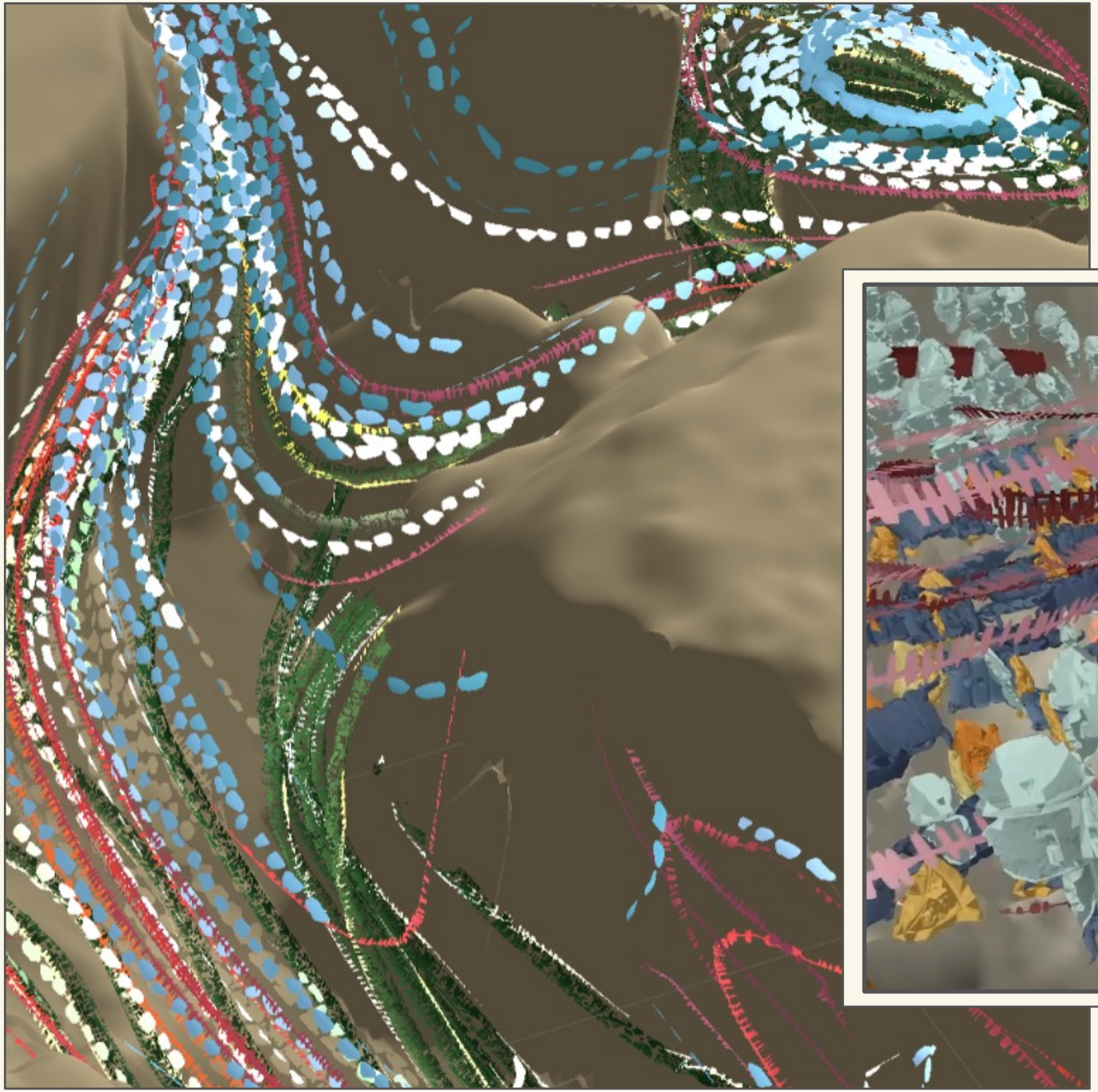
- represents and groups large number of variables

- associative representation

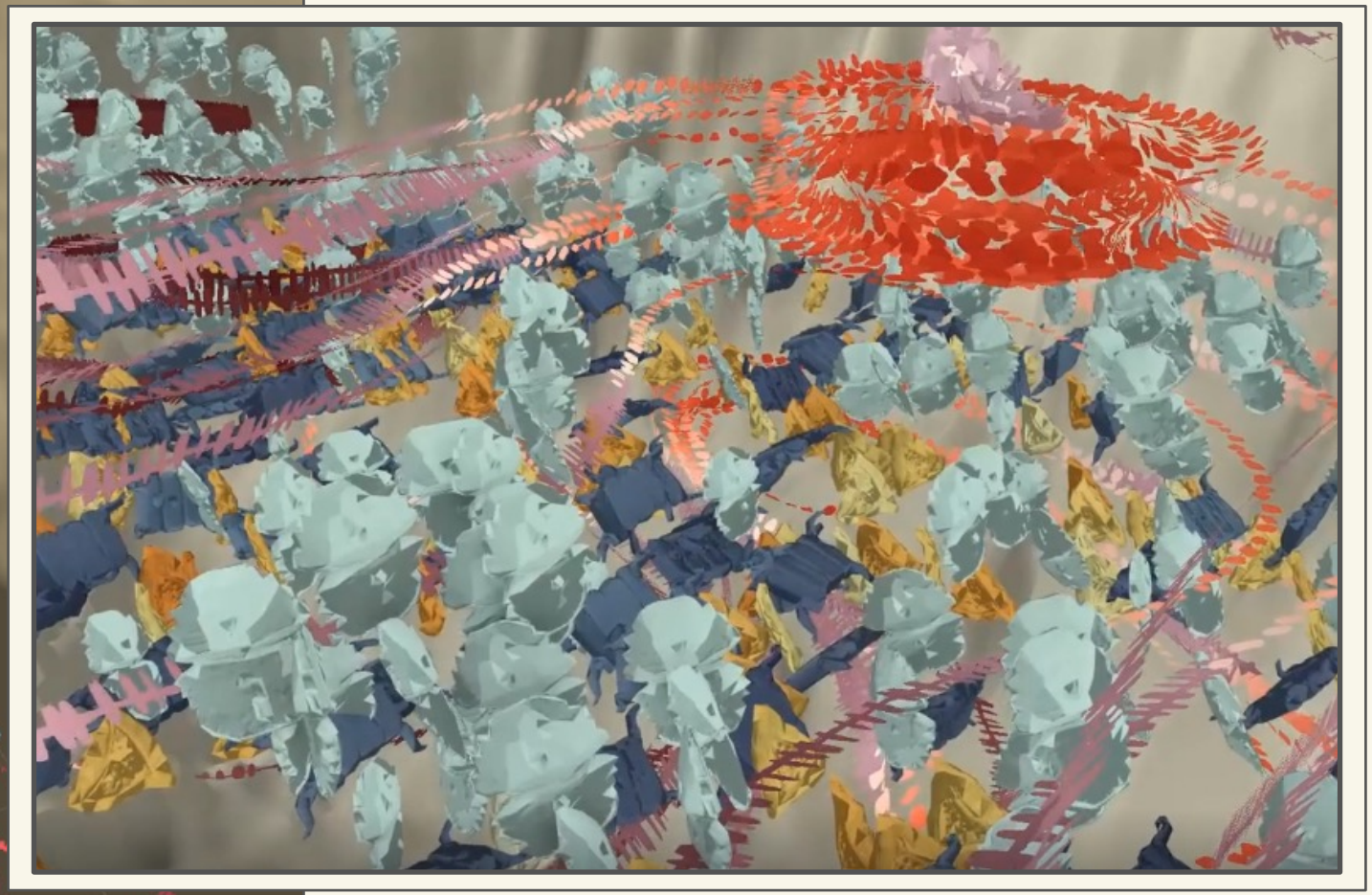
- communication

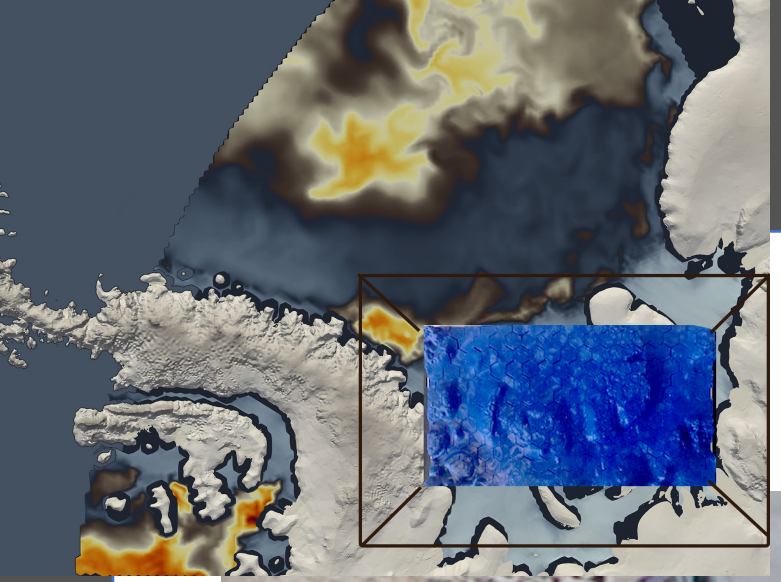



VR video

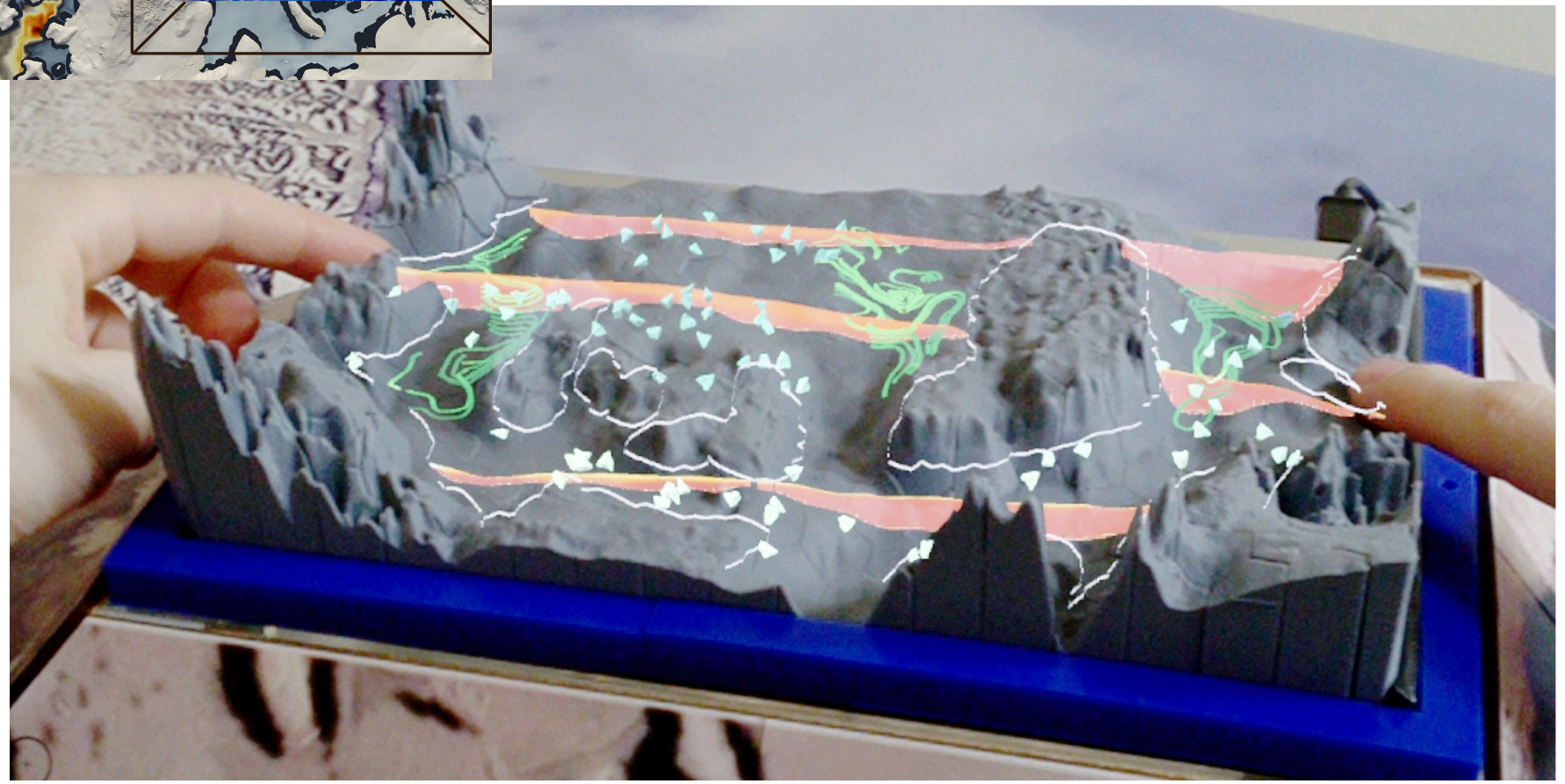


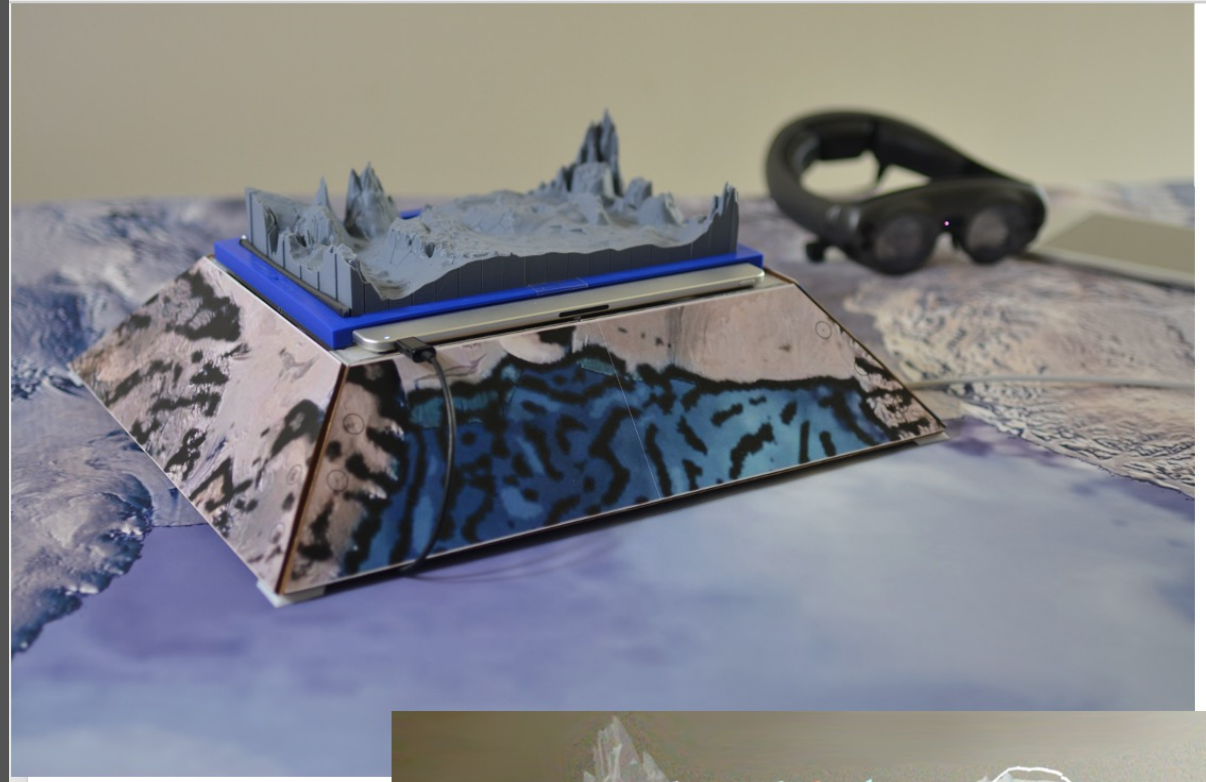
and for the artist,
moving full circle back to abstraction,
and exploring engagement.

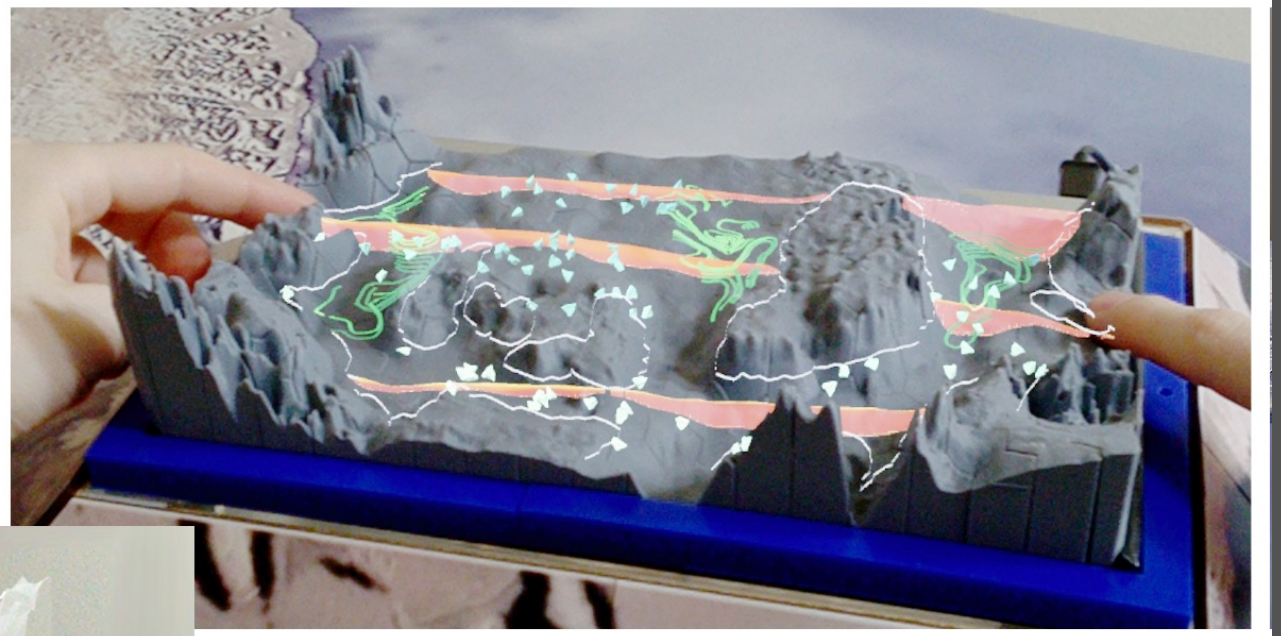


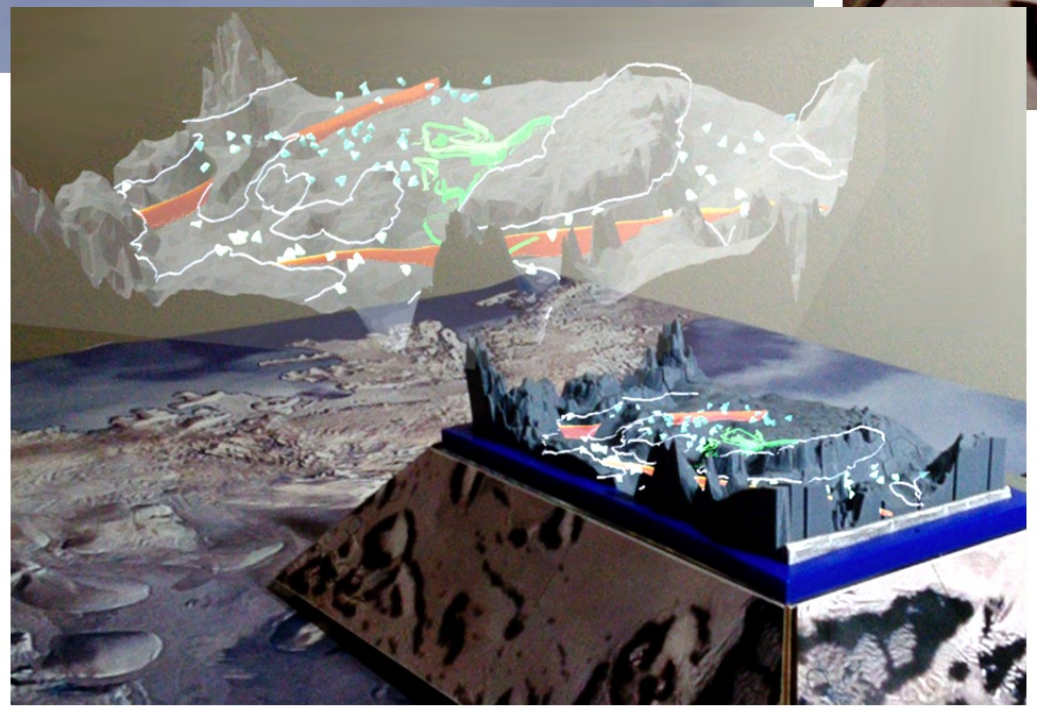


Touch-driven AR interface for exploring multivariate data





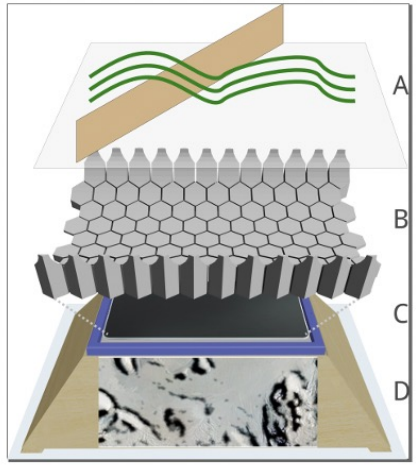
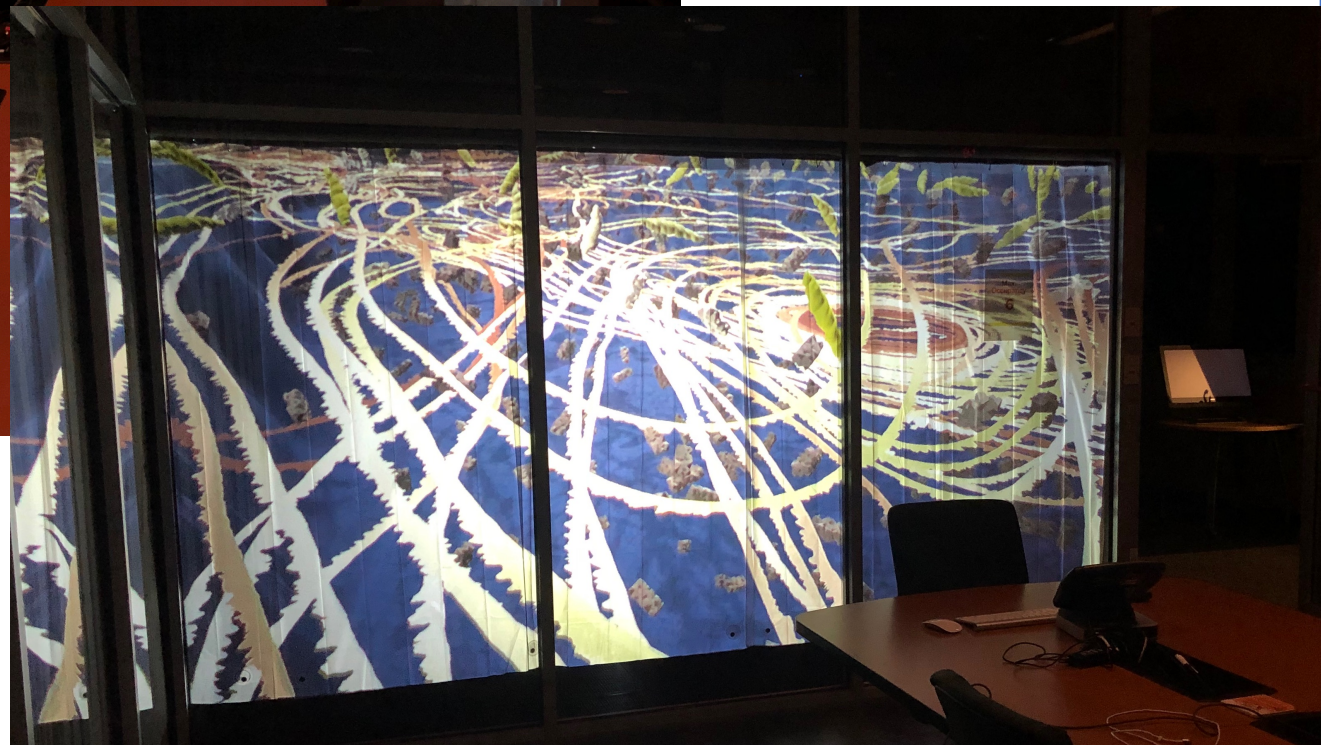




Data:
MPAS-Ocean, LANL

The waters under the Filchner-Ronne Ice Shelf shown in AR on the printed interactive bathymetry And in large format above.

Segmented touch-sensitive Bathymetry enables scientists To select positions of streamlines and cutting planes.



Rear projection
Creating immersion,
without breaking the bank