Cinematic Scientific Visualization for the Documentary Film *Atlas of a Changing Earth*

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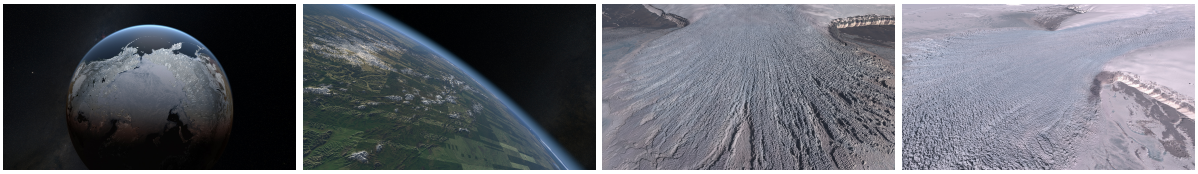

Figure 1: *S*tills from visualization video, starting with whole Arctic region (left) and zooming into collapsing Vavilov ice cap (right).

Abstract

The Advanced Visualization Lab (AVL) created a visualization of a collapsing arctic ice cap to communicate one aspect of climate science with the general public. This cinematic presentation of the data required new technical developments and design strategies to tell the story of the ArcticDEM data collection and the changing landscape of the arctic in one seamless scene.

Index Terms: Human-centered computing—Visualization—Visualization techniques—Treemaps; Human-centered computing—Visualization—Visualization design and evaluation methods

1 Atlas of a Changing Earth

The AVL co-produced and created visualizations for the documentary *Atlas of a Changing Earth* in both 24-minute digital fulldome and 50-minute 4K flatscreen formats. The topic of the documentary is the importance of geospatial mapping for past explorers and current scientists in observing and predicting the changing face of our planet, focusing on the modern revolution in mapping using satellites and supercomputers. The documentary prominently features visualizations of datasets processed on the Blue Waters supercomputer, with particular focus on ArcticDEM [3]. Several datasets are visualized in this film, but we focus on one particular ArcticDEM visualization here.

2 ArcticDEM Visualization

The visualization starts by showing a distant birds-eye view of the full span of the ArcticDEM dataset. The data is freely open for anyone to download from `https://www.pgc.umn.edu/data/arcticdem/`. The animation portrays the survey collection method, in which data are collected in "strips" over time, gradually covering and re-covering the landscape. The camera then goes closer in to ground-level around the regions of the Vavilov ice cap. This region visualizations show the data evolving over time, featuring an ice cap collapse.

The visualization combined multiple data sources: ArcticDEM altitude data as time-dependent strips, manually processed to remove clouds and other defects and to align them accurately; optical imagery from the LANDSAT satellite; and a high-resolution Community Earth System Model (CESM) simulation computed by Bates et al [2].

3 Visualization Processing

Visualizations for the film were primarily rendered on the Blue Waters supercomputer, using a total of 194,707 node hours. Software used included Houdini from SideFX, Inc.; the locally-developed tool Blurend, which enables using Houdini to render imagery on Blue Waters; and Nuke from Foundry, Inc. for compositing imagery, data cleaning and alignment, as well as for tracking motions of ice. A new tool called CloudFindr was developed as an outcome of this project, which uses machine learning to automatically mask clouds in DEM imagery [1].

Acknowledgments

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References

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