# Impactful Visualizations

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impactful
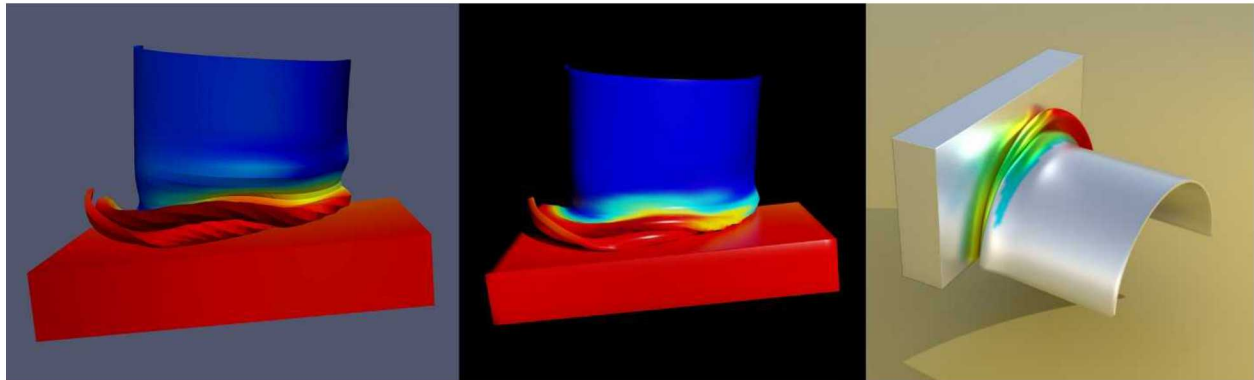im·pact·ful
im-ˈpakt-fəl
producing a marked impression

Traditionally, scientific visualization uses simple rendering techniques such as Gouraud or Phong shaded polygons or ray sampled transfer functions for volume rendering to reduce complex numerical data into images or animations. Newer hardware has enabled the use of computationally more expensive rendering techniques such as ambient occlusion, but the goal of these systems and techniques is high interactivity to speed insight into complex data. Impactful Visualization (sometimes called Cinematic Visualization) is the process of applying rendering techniques developed for film and entertainment to enhance visualizations or to provide a context for communication to a wider audience, e.g., a globe model for climate data.
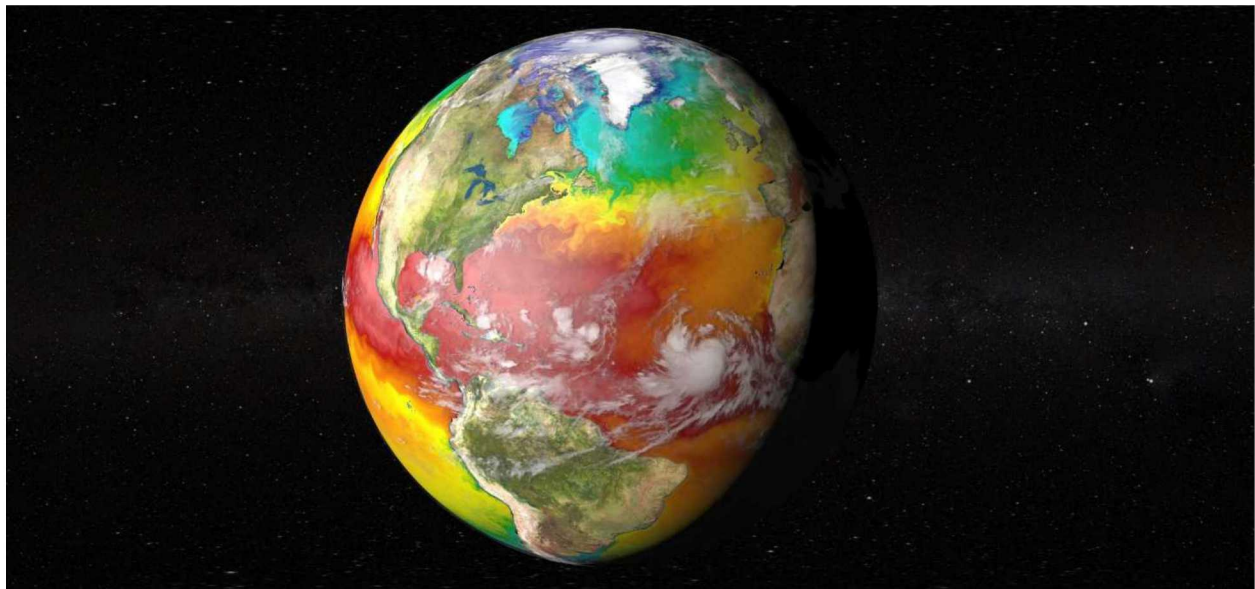
Figure 1: E3SM Ocean temperature data composited onto an earth object.

Typical Scientific Visualizations are designed to provide insight to a scientist or a group of their peers. It is generally not effective at communicating science to a wider audience. In order to produce impactful visualizations, visualization groups form multi-disciplinary teams of artists, scientists, and visualization specialists that collaborate over extended periods of 6 months or more to produce these kinds of visualizations.

As a recognized leader in the production of Impactful Visualizations, Sandia is working with industry partners to develop and test tools and techniques that will allow an end-user to create both Scientific Visualizations and "Impactful" visualizations simultaneously.

Figure 2: Paraview, NVIDIA Omniverse and Houdini renderings of HPC simulation data set.

Reviewing the submissions for the SC Visualization Showcase over the past number of years shows that impactful visualization is playing a larger role to help convey a science story to a broad audience. The Video will show how it's possible for a typical HPC end-user that creates visualization from scientific data, without a team of experts, can create impactful visualizations.

One of the difficulties in creating cinematic visualizations is bridging the divide between scientific formats and those formats that evolved for Digital Content Creation (DCC) tools such as Maya or Houdini. The Universal Scene Description (USD) from Pixar has the potential to be a bridge between the large scientific datasets and commercial 3d animation applications. NVIDIA's omniverse application uses USD to create this bridge. With these tools visualizing HPC simulations in Paraview and rendering Impactful visualization in Houdini will be simplified.
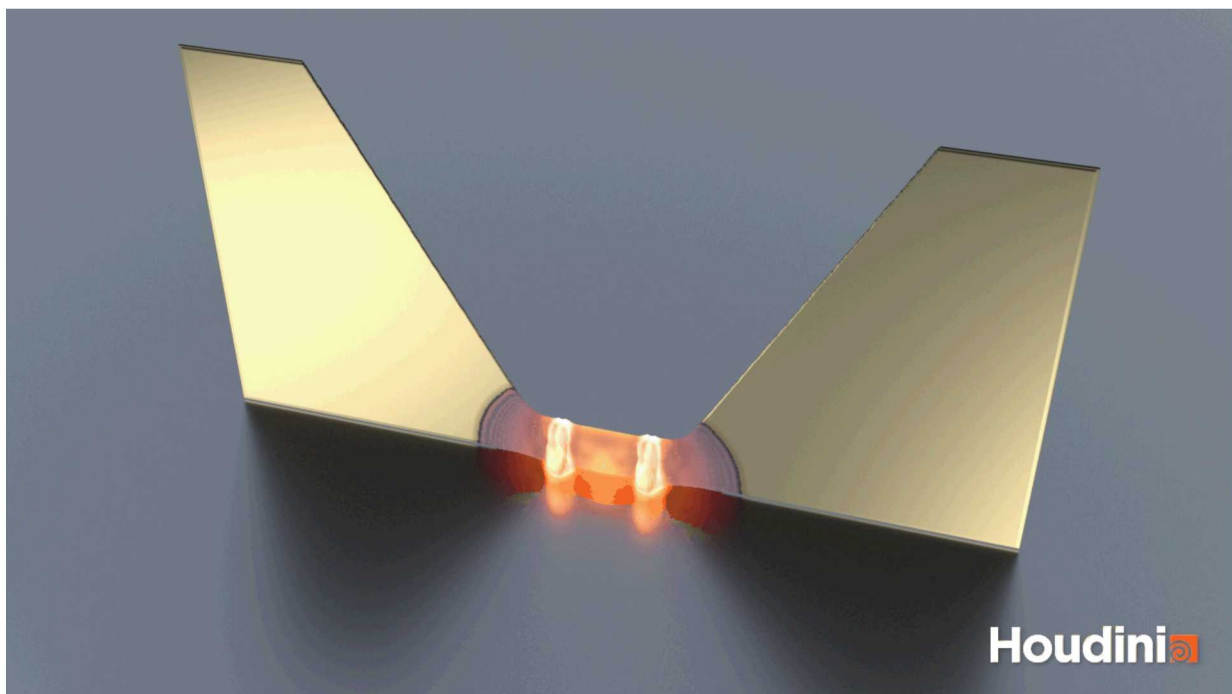
Figure 3: HPC simulation by Chris Garasi, Impactful Visualization rendered with Houdini