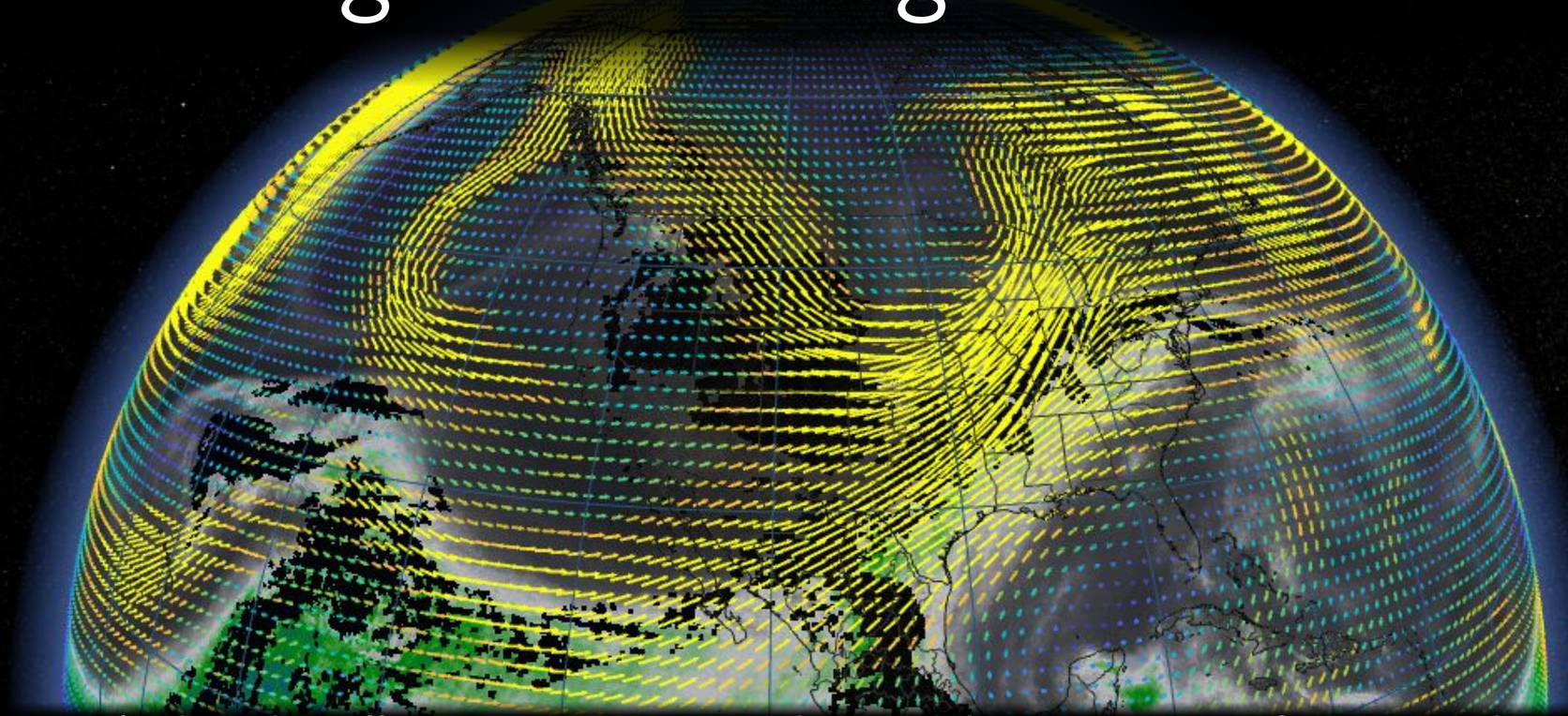
MeteoVis

Visualizing Meteorological Events in VR



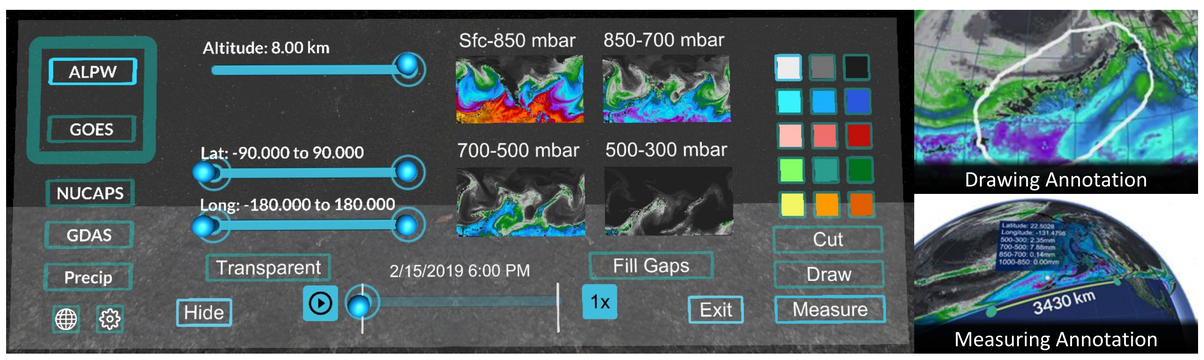
David Li, Eric Lee, Elijah Schwelling, Mason G. Quick, Patrick Meyers, Ruofei Du, and Amitabh Varshney

Introduction

We present MeteoVis, an interactive system to visualize and analyze spatio-temporal atmospheric weather data from multiple sources simultaneously in an immersive 3D environment.

By leveraging the 3D environment and immersion offered by virtual reality, MeteoVis allows meteorologists to quickly identify weather events across different altitudes and different data products. MeteoVis features a variety of interaction tools that allow users to manipulate the visualizations as they explore the data.

User Interactions

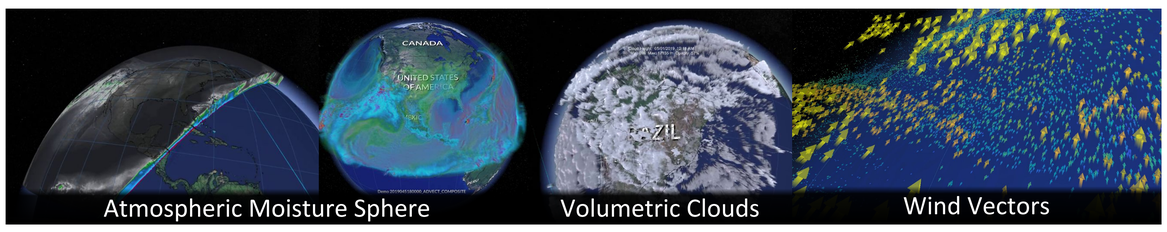


Throughout a 6-month long iterative design process including first-time users and experienced meteorologists, we developed a user interface that is both approachable by novice users and useful for domain experts.

MeteoVis features a dynamic control panel that allows users to select from among 10 different datasets. Upon selection, the layout of the control panel changes automatically to present a sub-menu of options relevant to the selected dataset visualization.

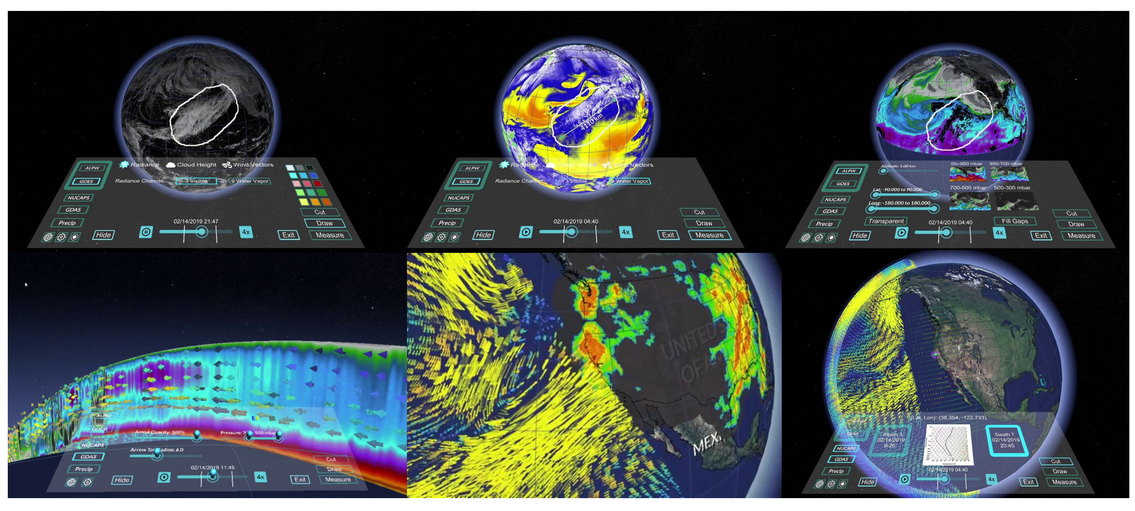
MeteoVis also features 3 spatial interaction tools. The *cut* tool allows users to produce vertical cross sections through an arbitrary plane by slicing the visualization to reveal data at a range of altitudes. The *draw* tool allows users to make annotations on the globe to highlight data features. The *measure* tool allows users to measure the size of meteorological events according to the great circle distance.

Visualizations



MeteoVis visualizes atmospheric water content from the Advected Layered Precipitable Water (ALPW) product, radiance and cloud data from the NOAA's GOES-16 satellite, wind velocity from NOAA's Global Data Assimilation System (GDAS) as well as snow and rain precipitation data from NOAA's Multi-Radar/Multi-Sensor System (MRMS). Each product is shown using a unique visualization method.

Atmospheric River Event



In a pilot case study, we use MeteoVis to visualize an atmospheric river (AR) event that impacted the west coast of North America on February 13-15, 2019. This AR event created flash flooding and mudslides throughout southern California. Certain regions of California experienced over 12 inches of rain during this period. Redding, CA experienced more than a foot of snow. Using MeteoVis, we see 3D arrows representing wind as moist air over the Pacific Ocean is driven over the west coast, enhancing rainfall.

UNIVERSITY OF MARYLAND
UMIACS
University of Maryland Institute for Advanced Computer Studies
EARTH SYSTEM SCIENCE INTERDISCIPLINARY CENTER
ESSIC
UNIVERSITY OF MARYLAND
MARYLAND BLENDED REALITY CENTER
UNIVERSITY OF MARYLAND STRATEGIC PARTNERSHIP
MPOWERING THE STATE