Yan Sun ✉(18/19) ⟳59:00

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| ## | Summary | Status | Action |
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| 1 | **3D Weather Data Visualization with IDV: Computational Thinking Contextualized in Atmospheric Science**, *Yan Sun; *Jamie Dyer; *Mahnas Jean Mohammadi-Aragh; *Jonathan Harris; *Mengni Bai; *Pat Ko<br>**In Full Session Type:** Innovate! Session<br>**Submission type:** Innovate! Session<br>**Keywords:** Technology Integration, Emerging technologies | **Accepted - In Session** | upload<br>unavailable<br>review summary |
| 2 | **Using IDV to Promote Computational Thinking in Atmospheric Science Learning**, *Yan Sun; *Jamie Dyer; *Mahnas Jean Mohammadi-Aragh; *Jonathan Harris; *Mengni Bai; *Pat Ko<br>**In Full Session Type:** Showcase Session<br>**Submission type:** Showcase<br>**Keywords:** Technology Integration, Emerging technologies | **Accepted - In Session** | add/edit poster boards<br>upload / remove<br>download<br>review summary<br>Edit Link to external URL |

## Using IDV to Promote Computational Thinking in Atmospheric Science Learning

This session showcases the innovative science learning experience of using IDV (Integrated Data Viewer) for 3D visualization of real-world weather data and promotion of computational thinking development among middle and high school students. Attendees of this session will be engaged in visualizing real-world weather data to experience the science learning experience innovated by IDV.

### Introduction

The 3D Weather project is funded by the NSF STEM+C project. Adopting a design-based research approach, the project designed and developed the IDV integrated science learning experience that engages middle and high school students in active computational thinking developing through 3D visualization of weather data using IDV. IDV is a free and open-source software developed by Unidata for analyzing and visualizing geoscience data that runs on Windows, macOS, and Linux platforms. Using IDV, students are able to visualize various weather conditions or phenomena in 3D images and/or 3D animations. They can try different parameters or IDV features to "see" weather and weather changes along both space and time dimensions. They can also zoom in and out or rotate the 3D visualizations to better observe and understand weather conditions and changes in a dynamic way. In this process, a series of computational thinking skills focusing on spatial ability and associated with atmospheric science are embedded.

The Innovation

While large atmospheric datasets such as the North American Mesoscale (NAM) modeling system, Global Forecast System (GFS), and North American Regional Reanalysis (NARR) are publicly available and offer exciting educational possibilities, they are difficult for secondary science teachers and students to access, make sense of, and use in meaningful ways that reflect how atmospheric scientists work in the real world. The IDV integrated science learning experience designed and developed by the 3D Weather project turns publicly available large-scale weather data into unique and exciting science learning experiences; help build students' comfort and competency for data visualization, analysis, and modeling; infuses computational thinking and practices necessary to model, visualize, and communicate atmospheric processes

and changes into science instruction; and creates innovative science learning pathways by harnessing the data revolution in atmospheric science.

## 3D Weather Data Visualization with IDV: A Showcase

The four 3D Weather science learning modules cover four themes: temperature, moisture, pressure and wind, and mid-latitude cyclone. The temperature module covers three topics: Global Temperature Cycle, Seasonal Temperature Cycle, and Diurnal Temperature Cycle. Attendees will be able to visualize seasonal temperature cycle using weather data GFS files corresponding to the 1st day of each month for 2018 available from https://www.ncei.noaa.gov/data/global-forecast-system/access/historical/analysis/. Specifically, attendees will visualize the 0°C Isothermal Surface over the Course of a year and experience the "engage, observe, and explain & communicate" learning process to understanding how the 3D visualization and animation of the 0°C isothermal surface can help promote computational thinking that is practiced by atmospheric scientists. The potentials and limitations of using IDV to promote computational thinking in science education will be identified and discussed with attendees during the session.

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