

Our group at the University of Texas at El Paso has begun a research effort in visualization, both in terms of fundamental understanding of how subjects interact with and perceive visual displays, as well as using visualizations in the classroom. We have built a GeoWall to use in these studies. This past fall we conducted an experiment using the GeoWall to investigate the impact of stereo views on the Earth-Moon system on student ideas around the phases of the Moon. We also conducted a study of 2-D versus 3-D visualization; the abstract of the paper submitted on this topic is below.

Student Interpretations of 2-D and 3-D Renderings of the Substorm Current Wedge

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Abstract

In this paper we report the results of a study of eight subjects, all physics students with some exposure to space physics, who were provided with 2-D and 3-D depictions of the substorm current wedge. Student understanding of the current wedge was probed by asking them to determine the magnetic perturbations produced by the substorm current wedge system. None of the students were able to determine the complete correct set of north-south and east-west perturbations from the 2-D drawing, but all of them were able to do so from the 3-D rendering. Three students had, in fact, interpreted the 2-D drawing incorrectly and were able to correct the misconception on seeing the 3-D rendering. Other comments from students make it clear that the cognitive processing of mental images is a key factor in their ability to correctly determine the magnetic perturbation due to the current wedge and that the ability to determine the direction of a magnetic field from an arbitrary current is not an impediment. We also discuss the broader implications of this result for in general teaching about magnetism and the relationship to electric current.