Abstract—Physics-based simulations are actively used in the design, testing, and operations phases of surface and near-surface planetary space missions. One of the challenges in real-time simulations is the ability to handle large multi-resolution terrain data sets within models as well as for visualization. In this paper, we describe special techniques that we have developed for visualization, paging, and data storage for dealing with these large data sets. The visualization technique uses a real-time GPU-based continuous level-of-detail technique that delivers multiple frames a second performance even for planetary scale terrain model sizes.

Figure 1: A Mars data set displayed using a continuous level of detail technique. The mesh grid overlaid on the planet, shows the underlying levels of detail.