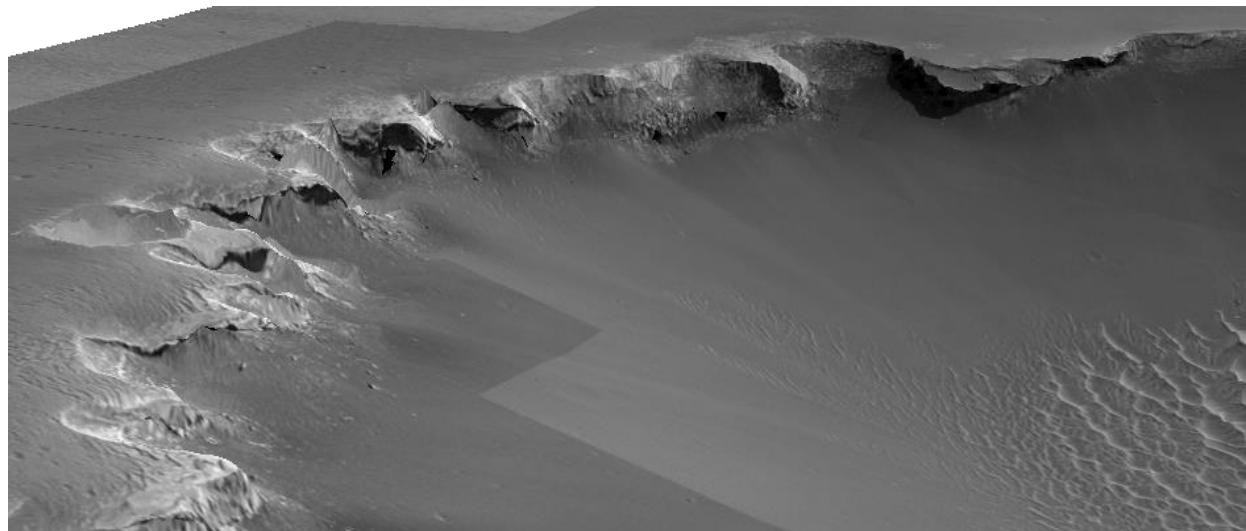
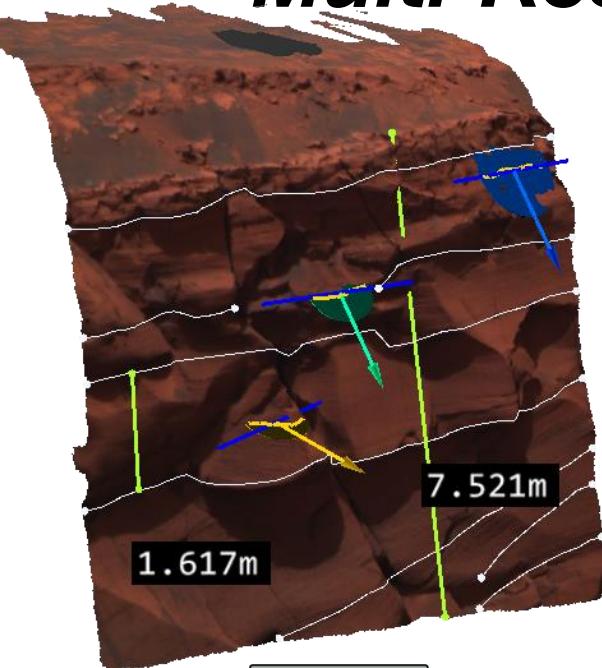


PRo3D -A Tool for Remote Exploration and Visual Analysis of Multi-Resolution Planetary Terrains



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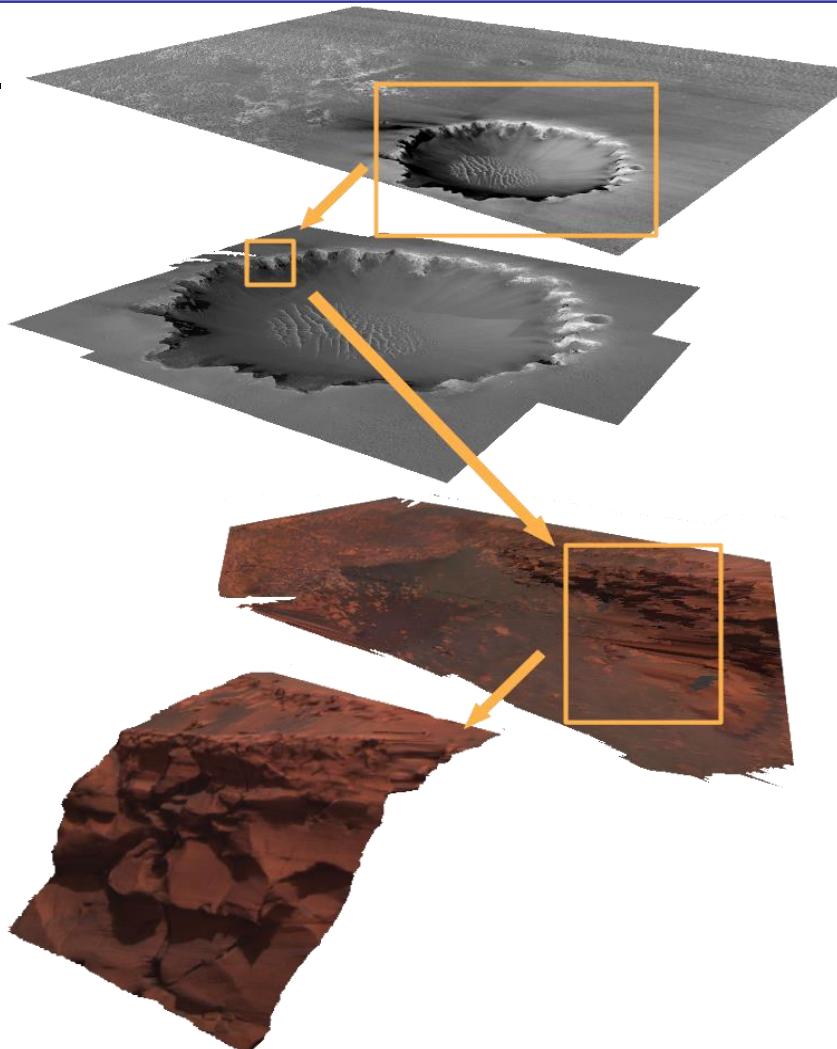
Motivation

- Large number of **images** provided by **rovers**, **landers**, and **orbiters** using a large variety of recording instruments
- 3D **reconstruction** processing of obtained image data produces **multi-resolution 3D surfaces**...
- ...ranging from **planetary scale** to **microscopic scale**

Already **existing viewers** focus on specific application domains, e.g. 3DROV on operations planning and Rover simulation. Application domain of **geological analysis** has different **requirements**:

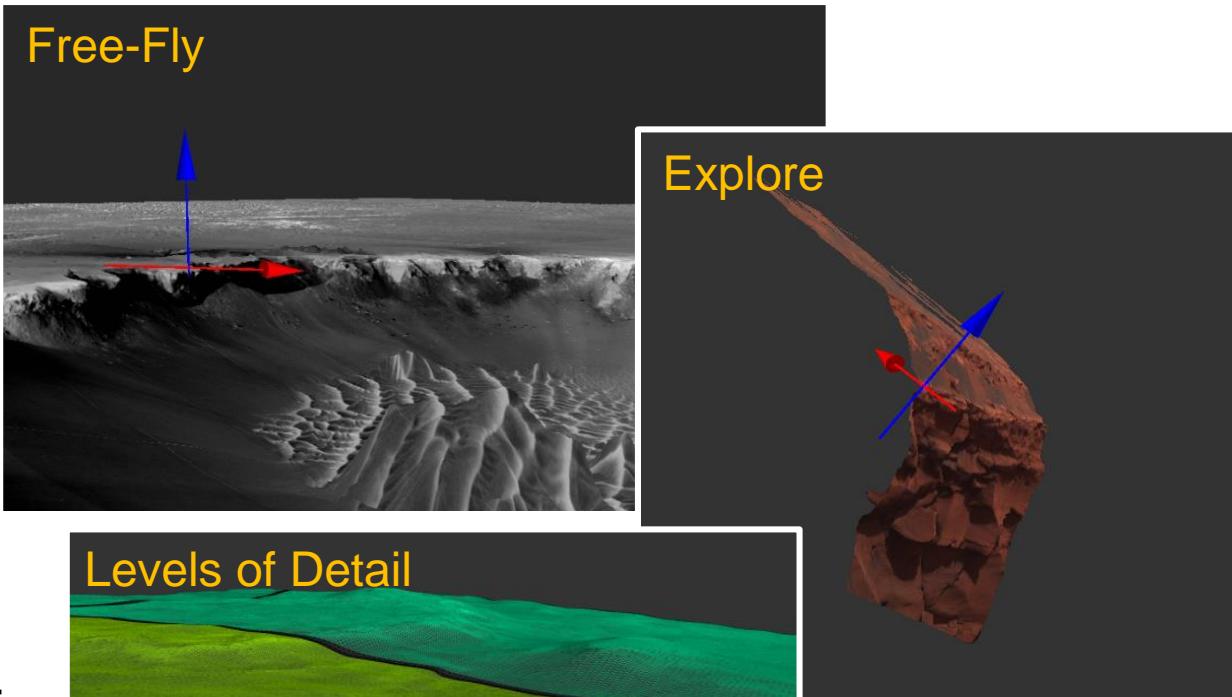
Requirements

- Interactive **rendering** of multi-scale, multi-resolution 3D surfaces
- Efficient **navigation** of the 3D scene to study rock outcrops from different perspectives
- Accurate **measurement** of geological features with various tools
- **Annotation** and localization of geological phenomena



Virtual Exploration

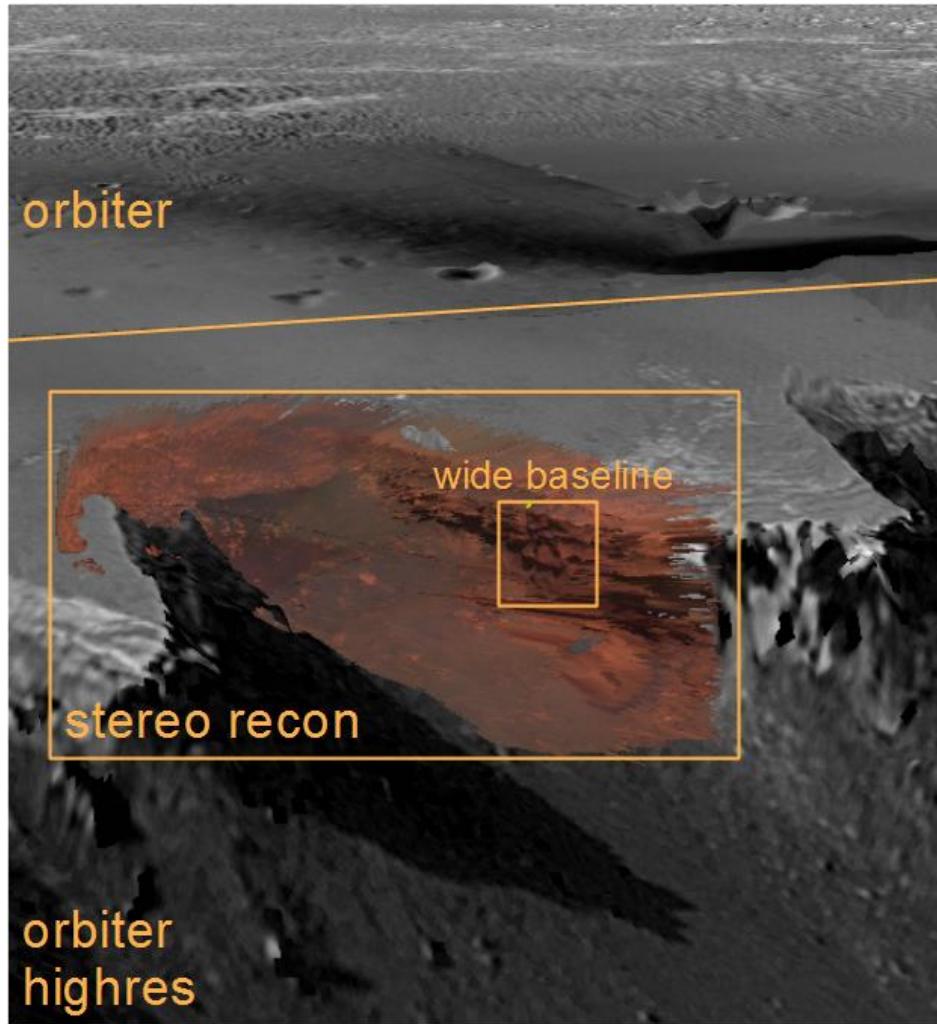
- Navigation
Free-Fly and Explore



- Levels of Detail
patches
red > high detail
turquoise / blue >
low detail

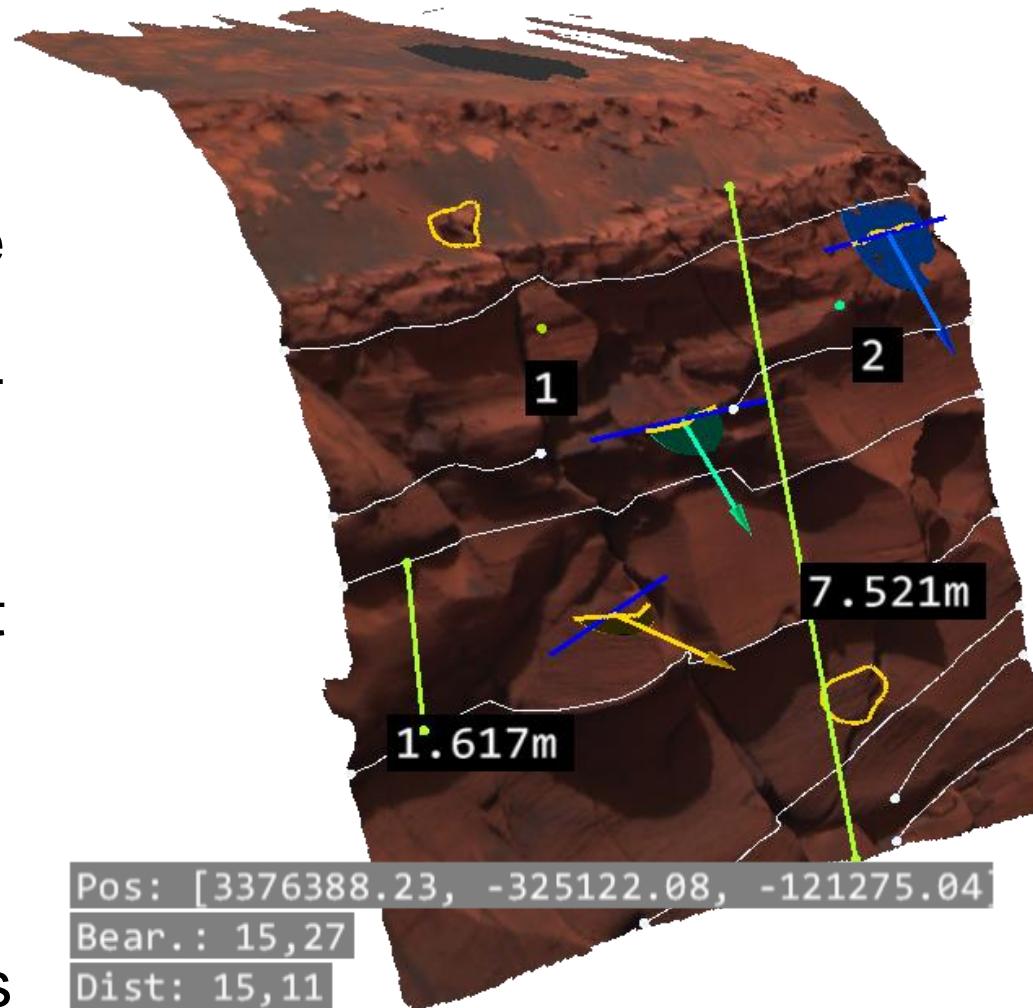
Data Fusion – Multi-Res ‘fused’ together

- Multi-scale / multi-resolution
- Orbiter data:
Tens of kilometers at ~1m resolution
- Mixed with outcrops of 100m at ~1cm
- Resulting in tens of gigabytes rendered at interactive frame rates



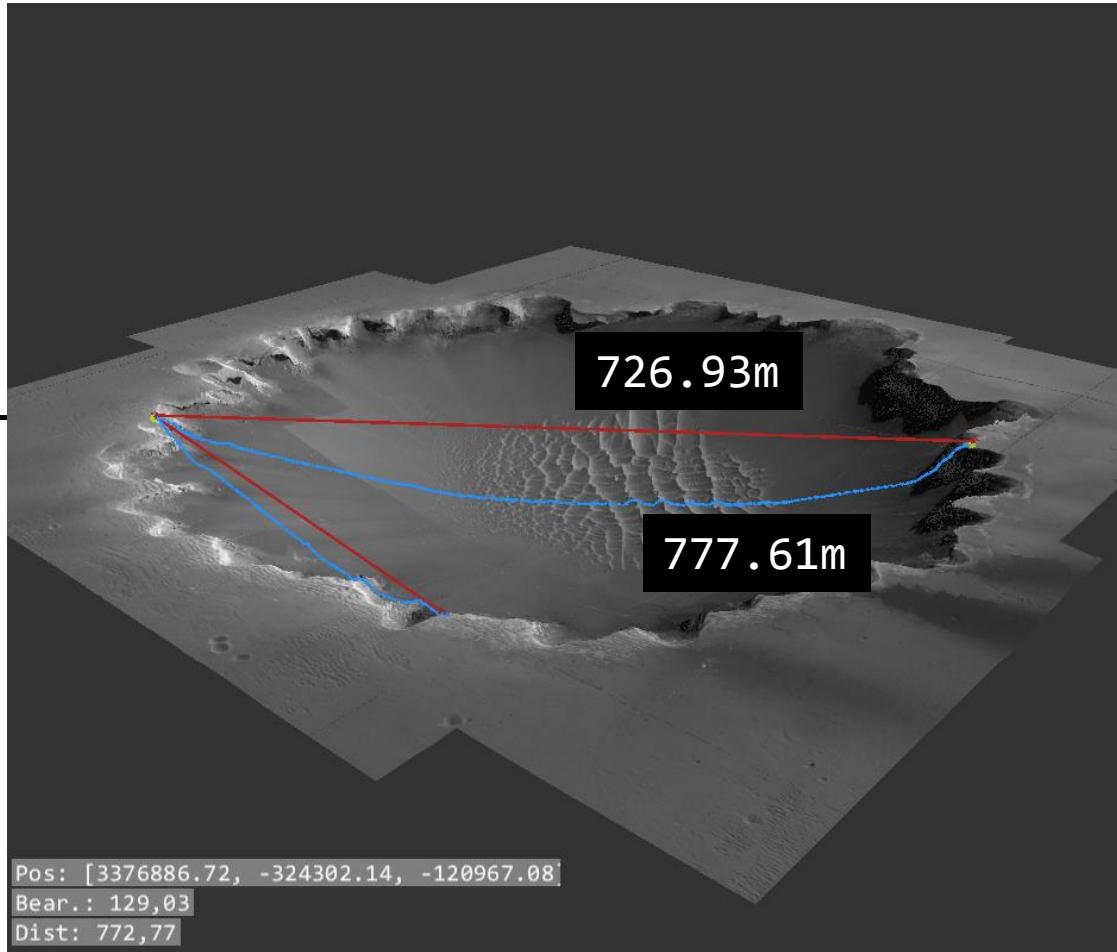
Measurements and Annotations (M&A)

- Single Point
- Dynamic viewer to surface distance
- Linear distance vs. Waylength
- Polylines and Regions of Interest
- Textual annotation
- Dip and Strike estimate palaeo-transport directions



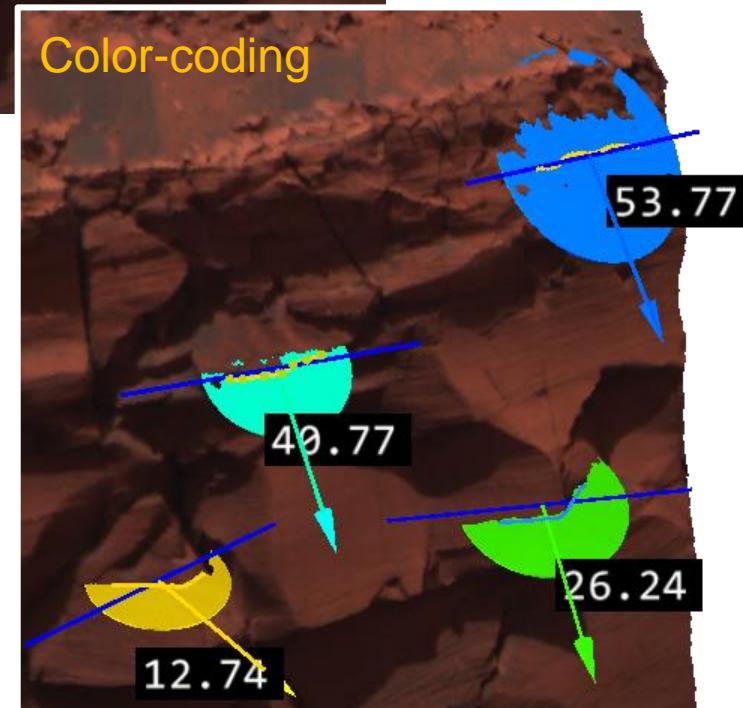
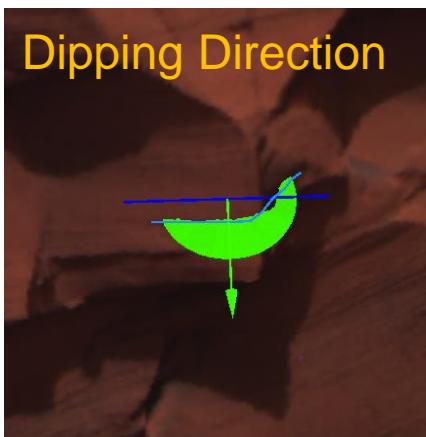
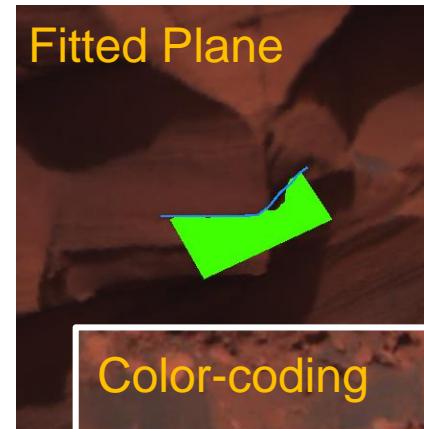
M&A – Linear Distance vs. Waylength

- Pick two points on surface
- Linear distance (red)
- Projected distance – waylength (blue)



M&A – Dip and Strike

- Click points on surface (polyline)
- Fit plane (least squares regression)
- Dip & Strike computation
- Color-coded dipping angle (0° - 90° > red-blue)

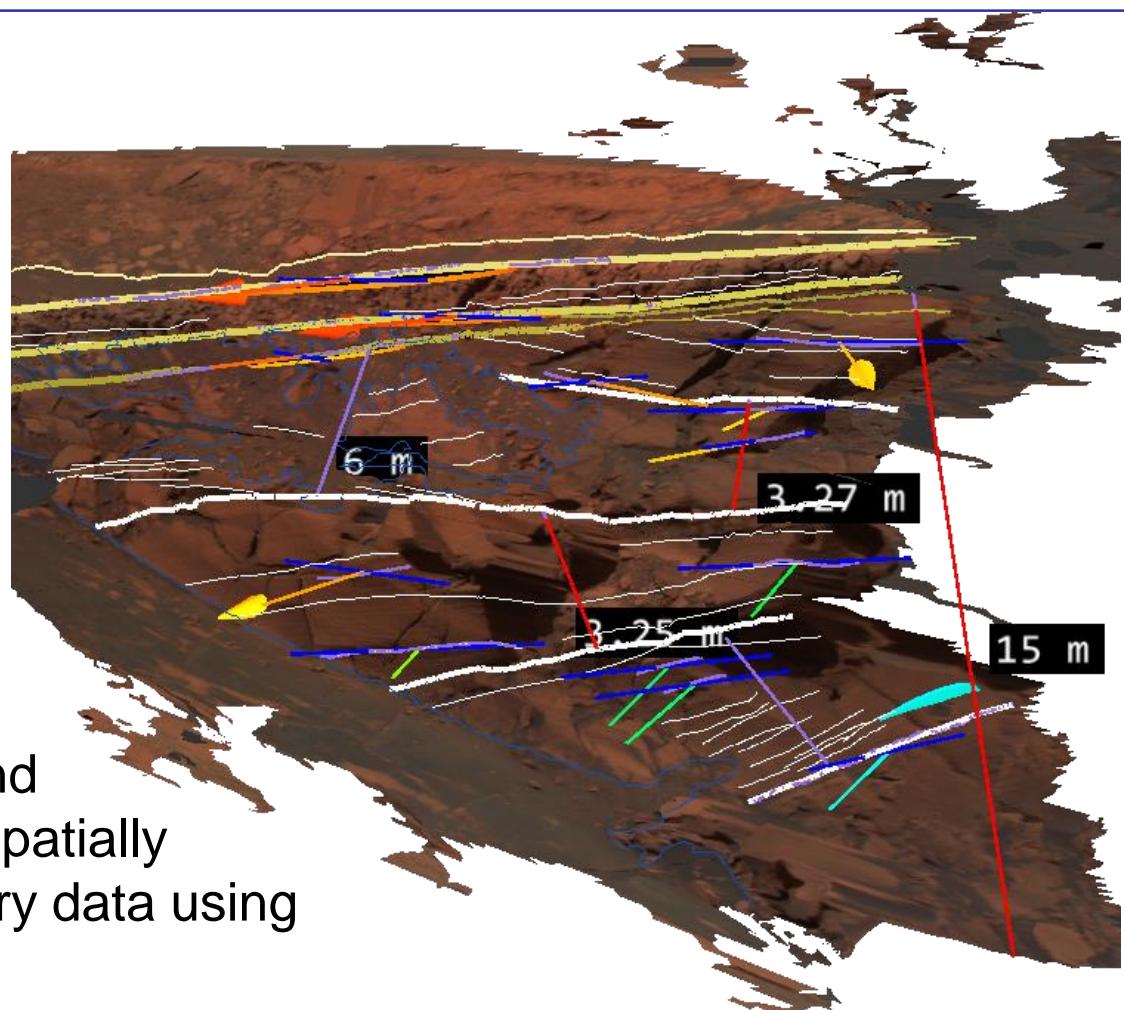


M&A – Full Scale Analysis

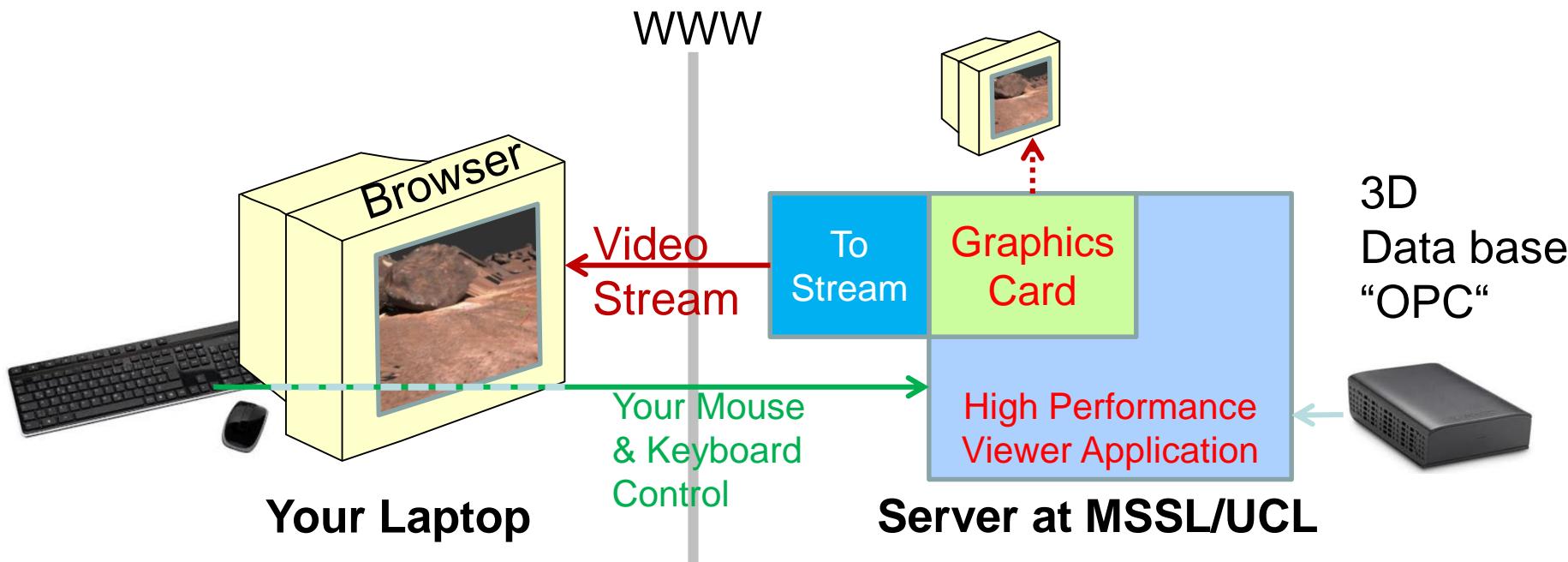
- Use of different styles and measurement tools in full scale analysis
- More details in following presentation:

Robert Barnes

'Geological interpretation and analysis of surface based, spatially referenced planetary imagery data using PRoGIS 2.0 and Pro3D'



3D Geology via Remote Rendering

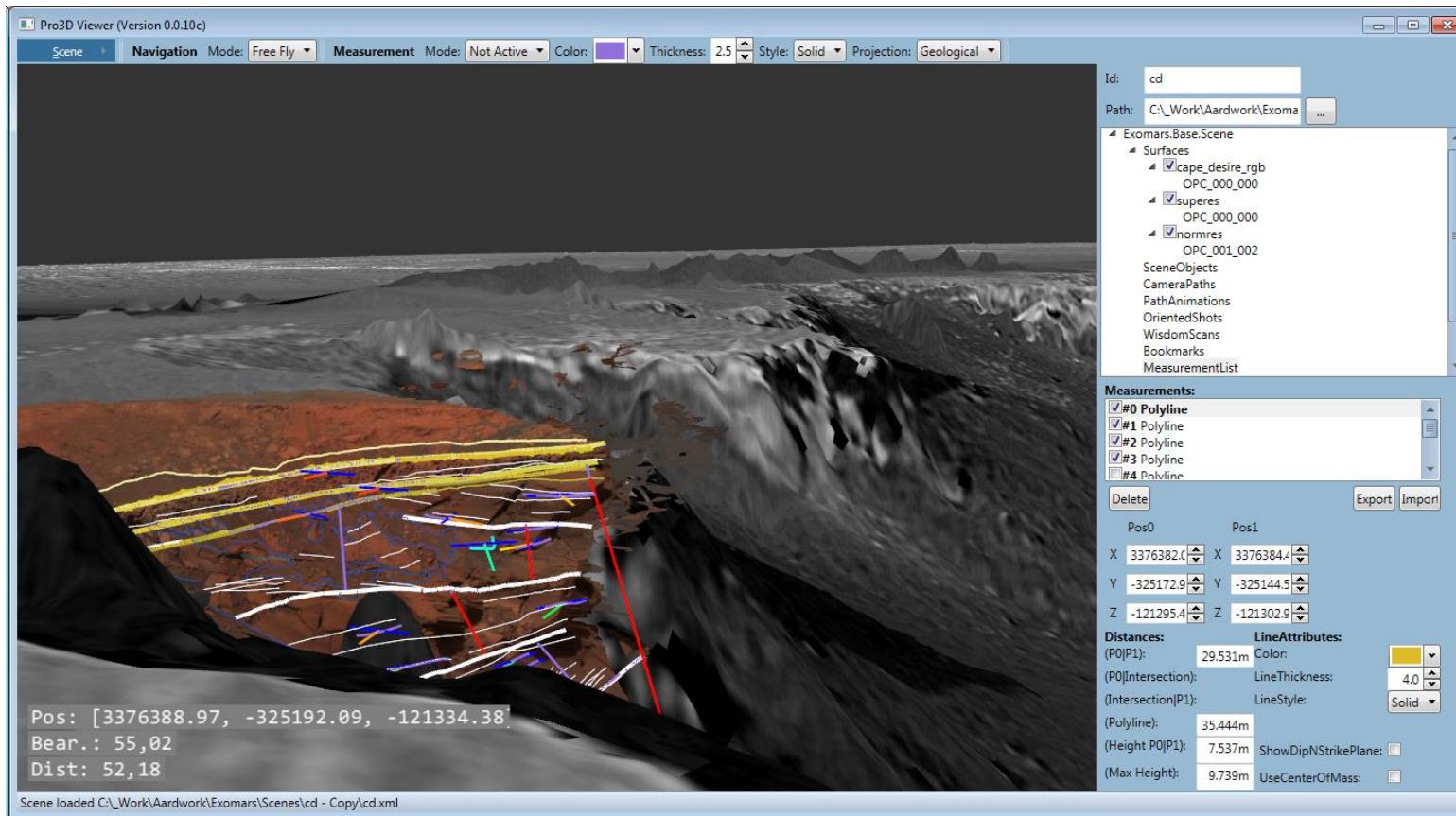


Summary and Conclusion

- Viewer efficient tool for navigation and analysis of reconstructed Martian surface
- Accuracy high enough for geological analysis and route planning
- Users see this as an important additional method for analysis

The PRo3D viewer will also be used in the ExoMars PanCam 3D vision products' presentation

Thank You for Your Attention!



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