Visualization of 3D geoinformation

working group chaired by:
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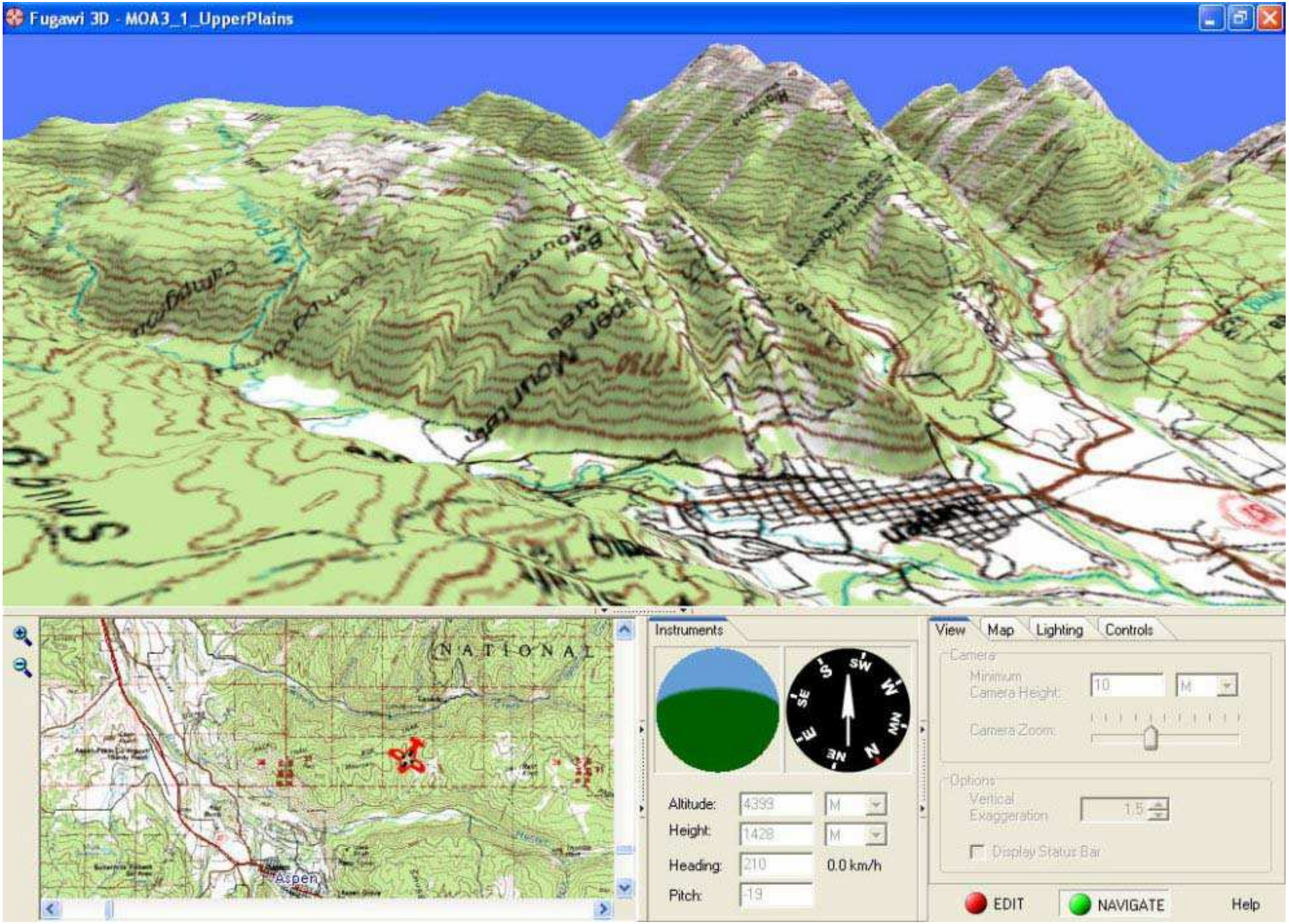
WG discussions

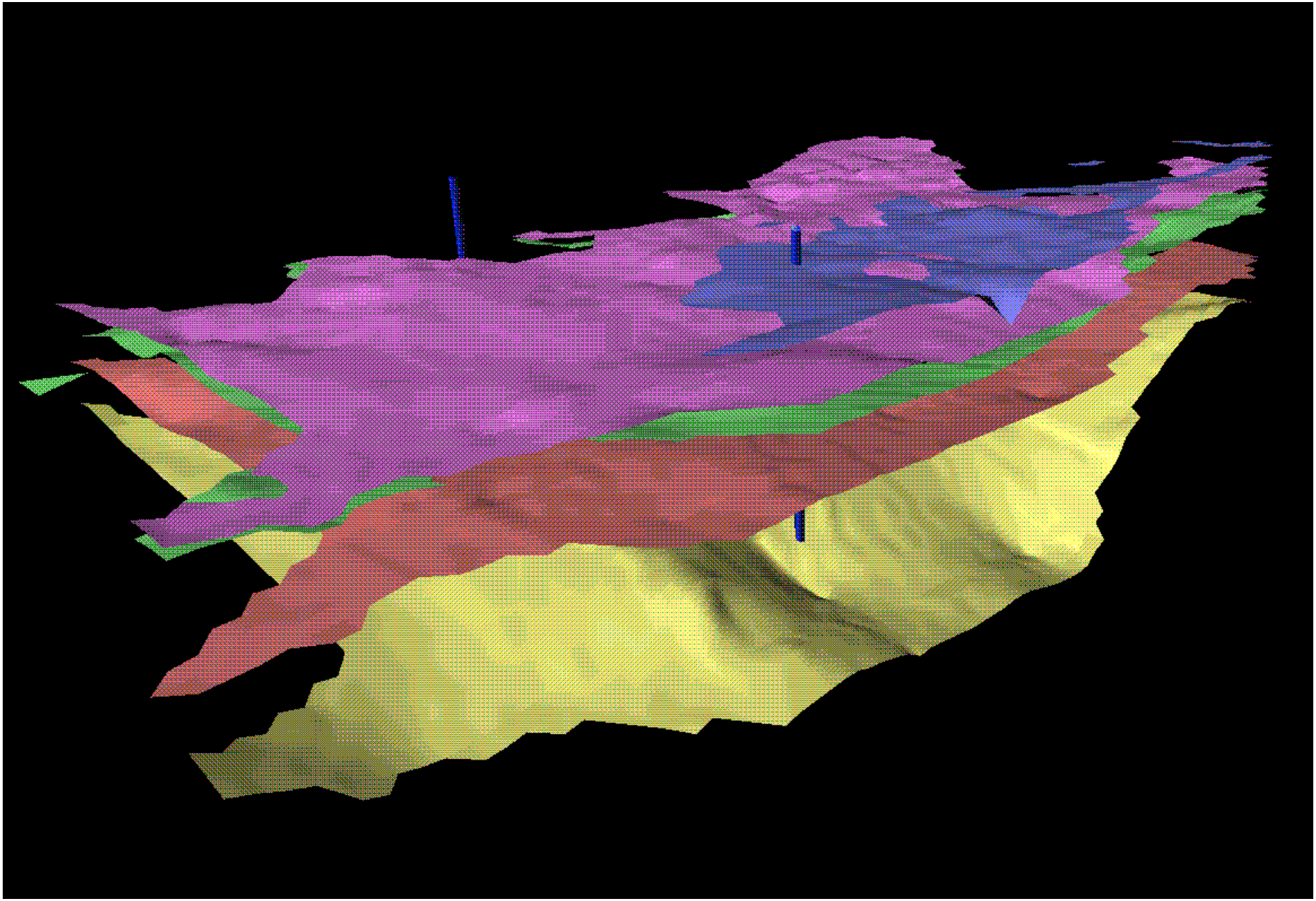
- **“**Each WG will (under coordination of a chair) identify **current problems** to be solved and come up with **potential solutions** and **recommendations”**

- **“**The results of each WG will be presented by the chairs at the closing plenary sessions**”**

Buildings in Google


Fugawi 3D - MOA3_1_UpperPlains
NATIONAL
Aspen
Instruments
Altitude: 4393 M
Height: 1428 M
Heading: 210 0.0 km/h
Pitch: -19
View
Map
Lighting
Controls
Camera
Minimum Camera Height: 10 M
Camera Zoom:
Options
Vertical Exaggeration: 1.5
Display Status Bar
EDIT
NAVIGATE
Help

Fly through



Subsurface layers

Disaster management

3D geovisualization, main topics?

- 3D vis. on mobile and alternative devices
- 3D vis. and multimedia
- 3D animation and interaction
- 3D symbols, labels, depth cues
- 3D urban visualization (city models)
- 3D vis. for geo-exploration
- 3D vis. for movement data, patterns, analyses results

from: recent conferences

Our discussion, day 1

- The user
- Huge data sets
- Generalization
- Errors, inconsistencies
- Motion, fuzziness, …

Our group

- Most of us only have experiences but are no experts
- Most cases discussed were oriented to 3D visualization for the general public
- Issues that came up were not new; we simply collected our shared knowledge

Some examples mentioned

- We all know city models …

- Visualizing 3D utility structures
- Visualizing 3D ownership (incl. apartment buildings), or occupancy
- Visualizing 3D point clouds

The user

- Need to keep testing what the user wants from 3D visualization:
  - *abstract or realistic?*
  - *transparent or opaque?*
  - *incremental showing of 3D scene?*

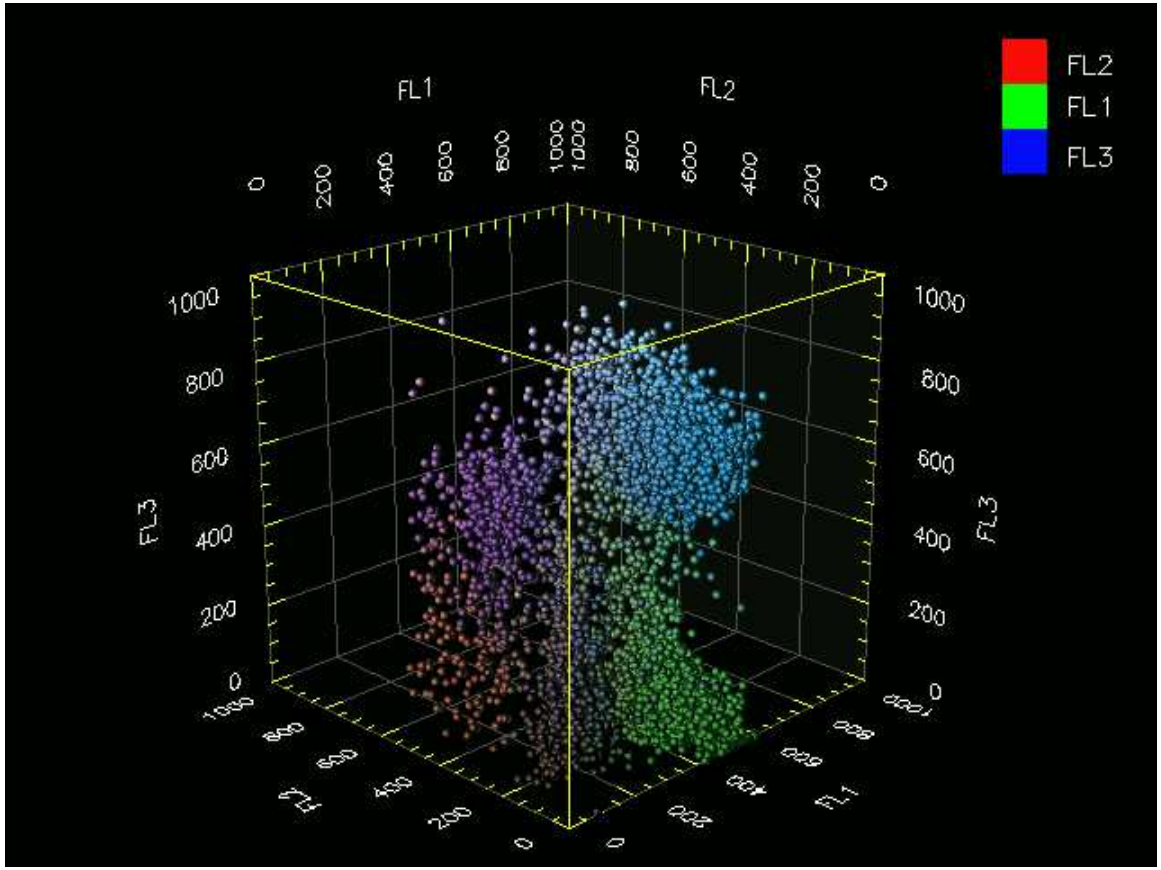
  Each case will have different requirements

- Users:
  - don’t know what is possible
  - are different, have personal taste
  - often aren’t involved in tests enough

Huge data sets

- Need to visualize 3D point clouds with millions of points for geo-exploration

  - How?
  - How to reduce sheer size (but not destroy patterns)?
  - How to interact?



Generalization

- Need to generalize:
  - for data transmission (client-server)
  - for convenient visualization/abstraction

- What counterparts do 2D generalization operators have? Are there new ones?
- What data reduction and filtering techniques can be used for huge data sets?

Generalization cont’d

- How to visualize multiple levels of detail without any artifacts between different levels?
- Appropriate blending between detail levels needed
- Perhaps morphing (which is like having no discrete levels of detail)

- Blending/morphing is also needed to switch view to next data acquisition position


Analysis 8 : Base Scenario
File Layers Motion Paths Eyepoints Display Environment Options Help
Mode : Fly
S: 0.00
Z: 1528.53
H: 229.73

Errors, inconsistencies

- How to visualize to detect errors in 3D data sets?
- How to visualize multiple 3D data sets to detect inconsistencies?

Visualization can help to determine if errors or inconsistencies are spatially auto-correlated

Motion, fuzziness

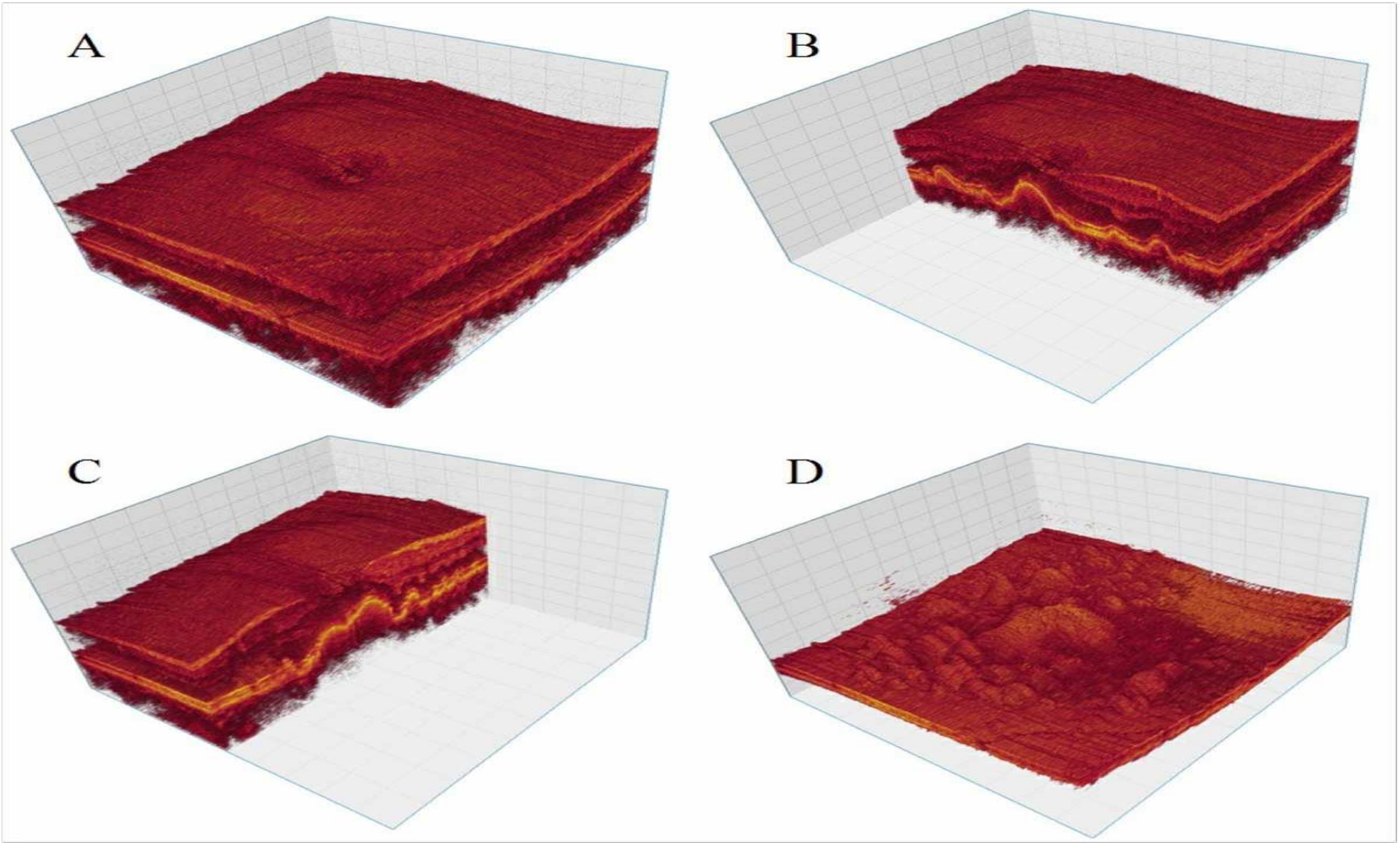
- Visualizing 3D motion seems to become more important (not the changing point of view like in navigation systems, but *moving objects*)
- Visualizing 3D fuzzy objects in motion like mist?

For better under-standing, pattern detection, analysis by expert

More thoughts

- 3D geo-visualization is mostly for large-scale data → more links with other areas (architecture, civil engineering, scientific visualization, games research), need to keep track of new developments

- VR and AR have current limitations too (e.g. disorientation in VR); we did not really know enough about this though



not subsurface layers, but medical visualization…

Main problems

- The user and what (s)he wants
- Navigation/interaction remains hard
- Acquisition will give more and more data, need to deal with huge data sets → generalization
- Dealing with occlusion
- High-quality, small, cheap displays for AR, VR and stereo

Solutions

- None

Recommendations

- Look closely at game industry, e.g. game engines, for navigation/interaction
- For the user, allow 3D geo-visualization for different purposes (need meta-data?)
- More attention to user requirements
- Huge 3D data sets: Focus on generalization and efficient processing
- Look forward to improved hardware

The group

- Mahmud Shahrear Kibria
- Aidan Slingsby
- Krzysztof Kozlowski
- Pawel Ksiezopolski
- Peter van Oosterom
- Sijmen Wesselingh
- Joris Bak
- Stéphane Côté
- Rob van Son
- Chris Parker
- Vincent Berkien
- Jonathan Damen
- Hele Luigujõe
- Erik Kjems
- Tassilo Glander
- Edgar Butwilowski
- Marc van Kreveld