Models will soon be connected to a Virtual Globe with fault models, earthquake hypocentres…
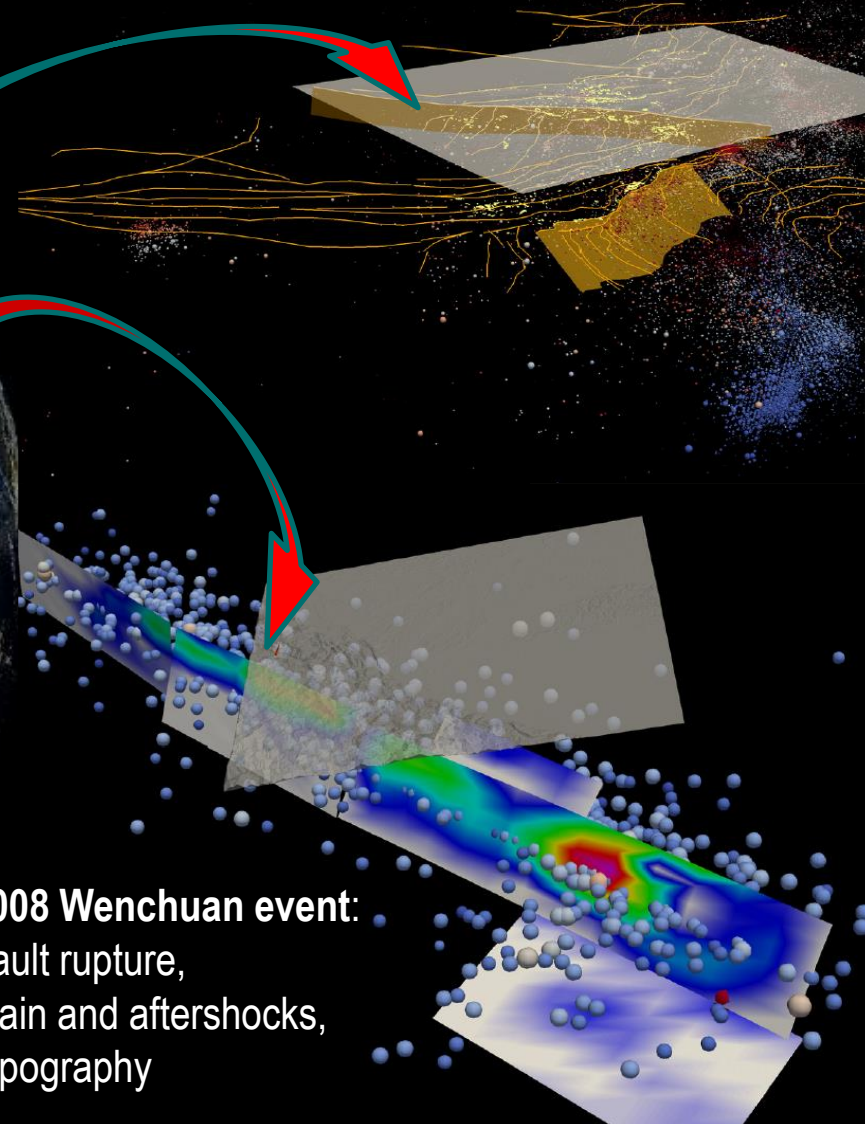
Virtual Globe and seismicity

Tien Shan and Pamir: Faults, seismicity, topography

2008 Wenchuan event: Fault rupture, main and aftershocks, topography
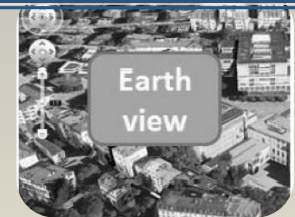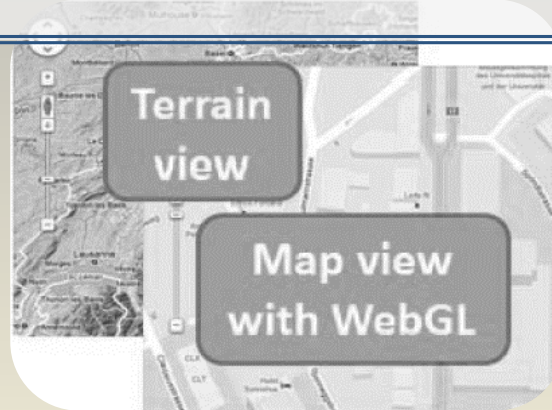
Visualisation .. Today!

Domain not fully exploited

Axis labels:
- Vertical axis (top): 3D...+ Time ...4D
- Vertical axis label: **Dimension**
- Vertical axis (bottom): 2D
- Horizontal axis: **Level of realism**
- abstract → real

Labels within figure: Virtual Globe, Regional model view, Local model view, Terrain view, Map view with WebGL, Earth view, Street view, Map view, Satellite view

Modified from
Boér, A., **Çöltekin, A.**, & Clarke, K. C. (2013). Evaluating Web-based geovisualizations online: A case study with abstraction-realism spectrum in Focus. In *International Cartographic Conference, ICC 2013, Dresden, Germany*. Dresden.

Visualisation .. Today!

VR technology needed

CAVEs

real

Visual realism

abstract

Photorealistic 3D (mono)

Shaded relief map

Raised 3D objects

Rendered 3D (shaded)

Contour

3D plots

3D chart

Wireframe 3D

Immersiveness

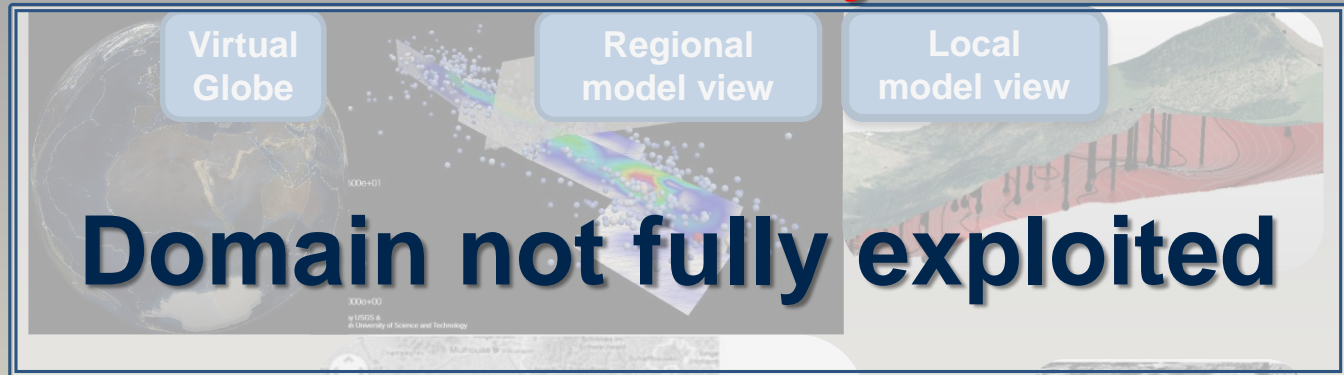non-immersive

immersive
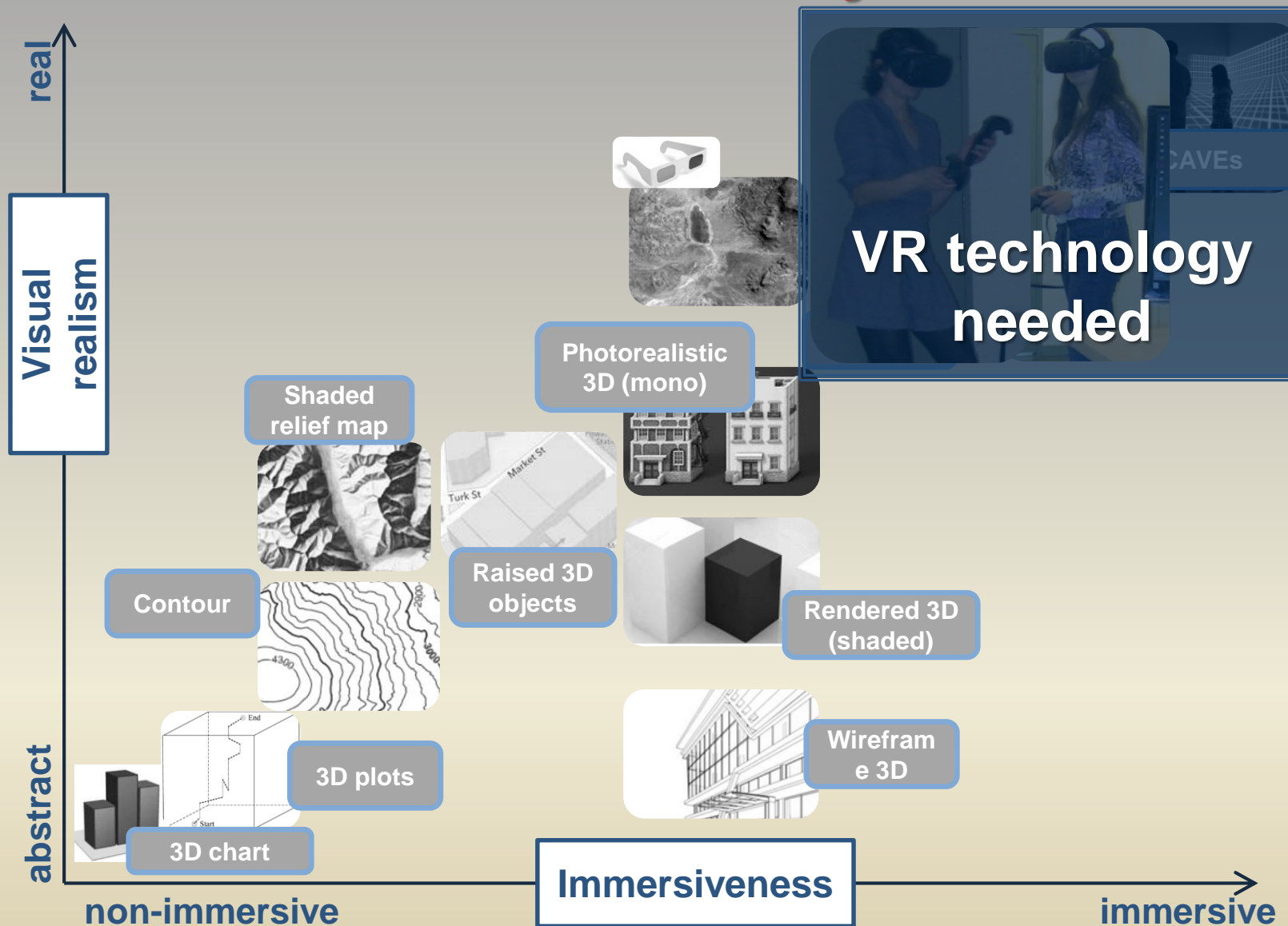
Modified from
Boér, A., **Çöltekin, A.**, & Clarke, K. C. (2013). Evaluating Web-based geovisualizations online: A case study with abstraction-realism spectrum in Focus. In *International Cartographic Conference, ICC 2013, Dresden, Germany*. Dresden.
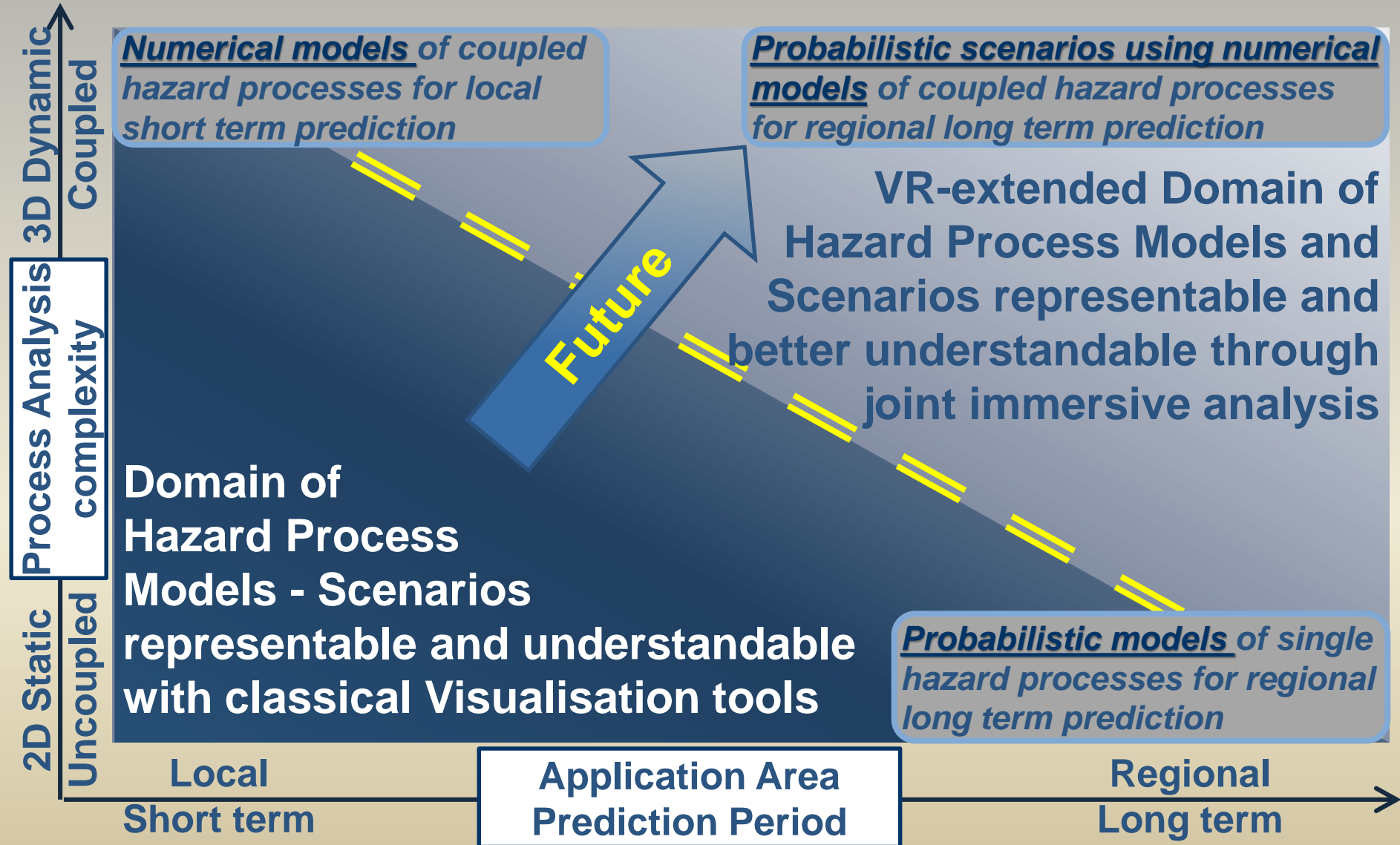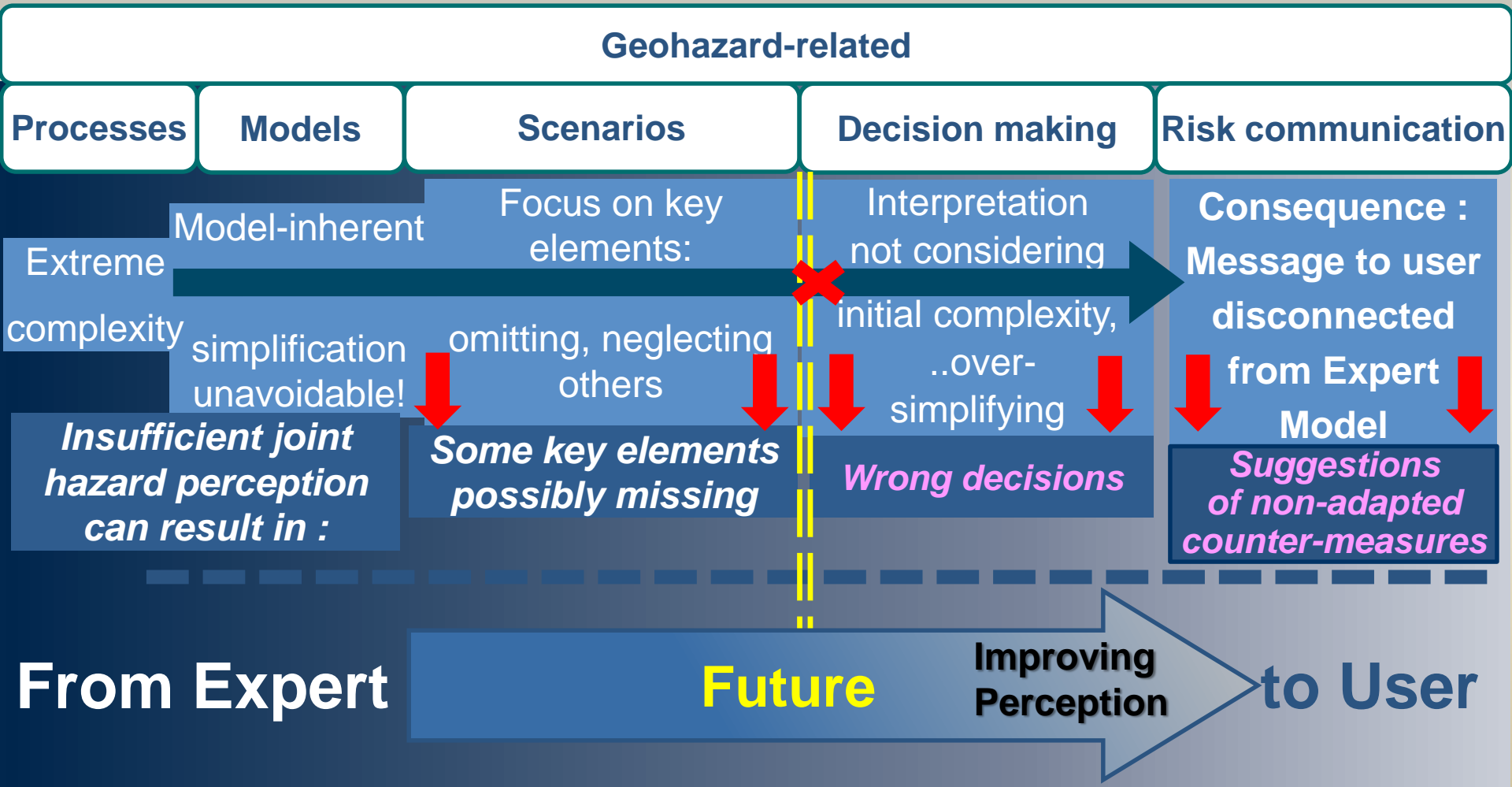
Serious efforts needed to be able to work in 3D+time .. at regional and local scale. …

3D Dynamic | Coupled

Process Analysis complexity

2D Static | Uncoupled

__Numerical models__ of coupled hazard processes for local short term prediction

__Probabilistic scenarios using numerical models__ of coupled hazard processes for regional long term prediction

VR-extended Domain of Hazard Process Models and Scenarios representable and better understandable through joint immersive analysis

Future

Domain of Hazard Process Models - Scenarios representable and understandable with classical Visualisation tools

__Probabilistic models__ of single hazard processes for regional long term prediction

**Local
Short term**

**Application Area
Prediction Period**

**Regional
Long term**

Serious efforts needed to be able to work in 3D+time .. at regional and local scale. …

... to finally improve risk perception AND communication

Geohazard-related				
Processes	Models	Scenarios	Decision making	Risk communication

Extreme complexity

Model-inherent simplification unavoidable!

Focus on key elements: omitting, neglecting others

Interpretation not considering initial complexity, ..over-simplifying

Consequence : Message to user disconnected from Expert Model

Insufficient joint hazard perception can result in :

Some key elements possibly missing

Wrong decisions

Suggestions of non-adapted counter-measures

From Expert   **Future**   **Improving Perception**   to User

Examples of local complex expert models : required inputs : surface + subsurface

a) Broad fault zone ? Fault gauge

b) Estimated sliding surface

c) N-S section, E-W section, NE-SW section

d) Layer 1 : 10-50m thickness; Layer 2 : 15-35m thickness; Layer 3 : >50m thickness; Estimated sliding surface; Fault zone; Bedrock

500 m