



Red Relief Image Map and its utilizing for Disaster Risk Reduction

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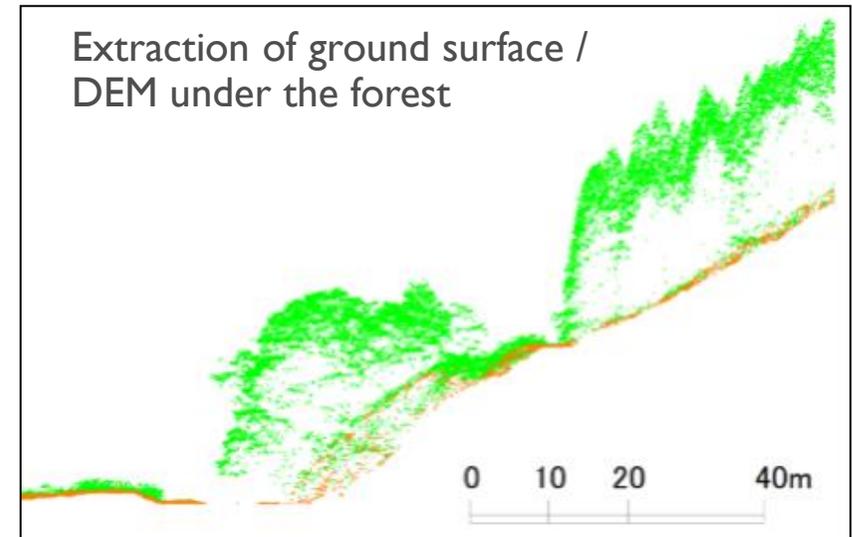
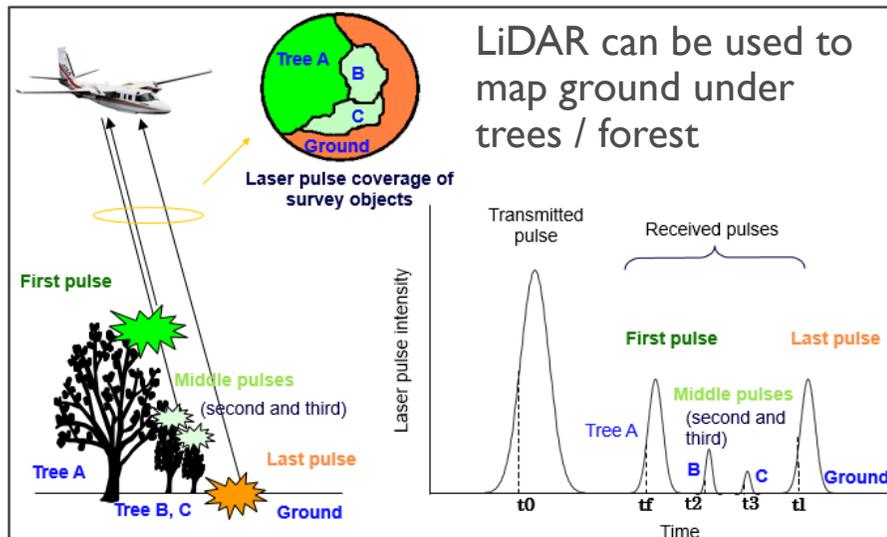
Asia Air Survey, Co., Ltd.

Progress of Geospatial data acquisition and Limitation of traditional methods for represent ground surface

Geospatial Data for DRR Consulting



- High resolution data is available from airborne to mobile mapping system and others
- How we can use these data for disaster risk reduction?
- Modeling, analyzing, evaluating are essential



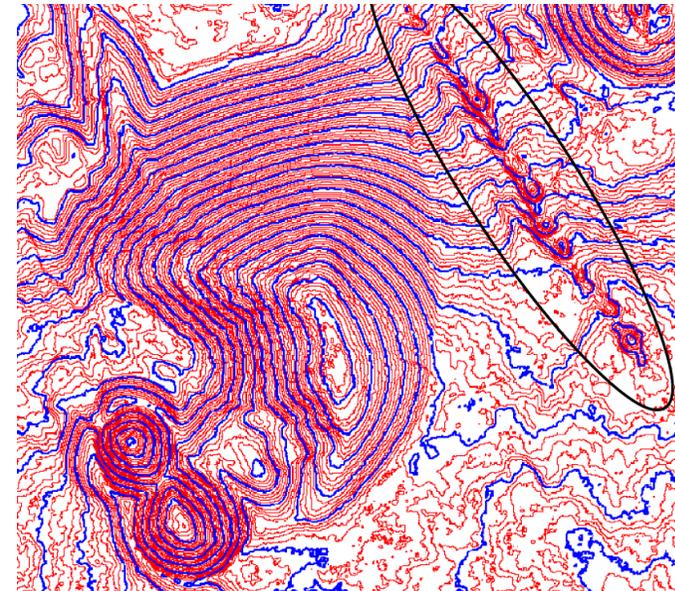
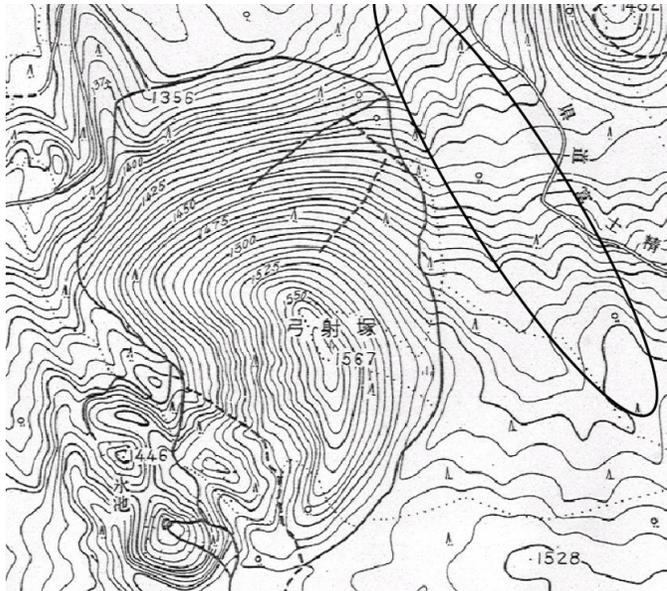
Traditional methods to represent ground surface

Aerial photograph/Satellite image:
Ground surface features are difficult to be recognized due to vegetation



Contour map: difficult to express the details of ground surface, especially in flat surface and steep slope. Even though we have very good data from LiDAR, it is still difficult to express the details of ground surface.

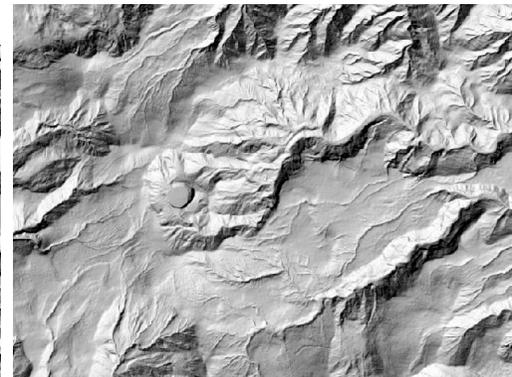
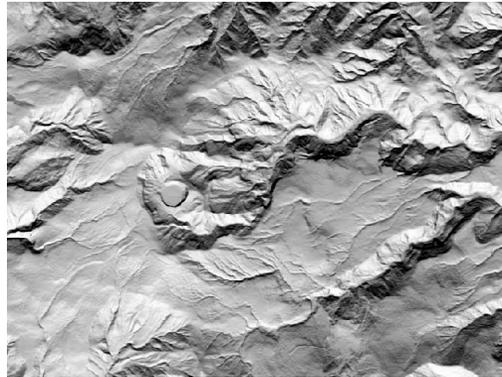
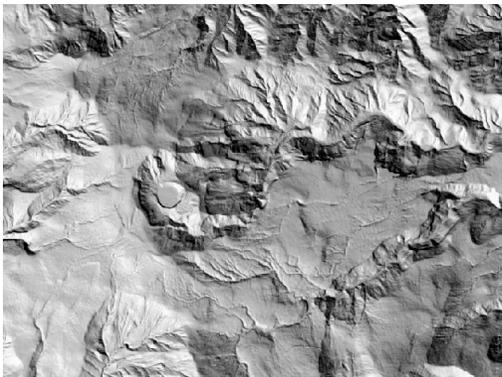
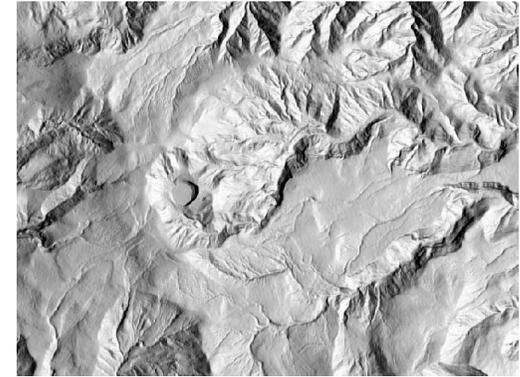
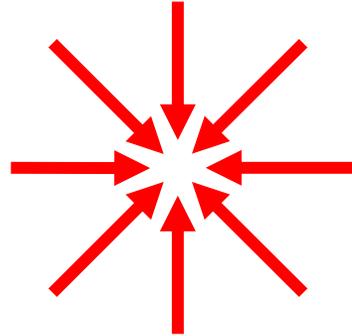
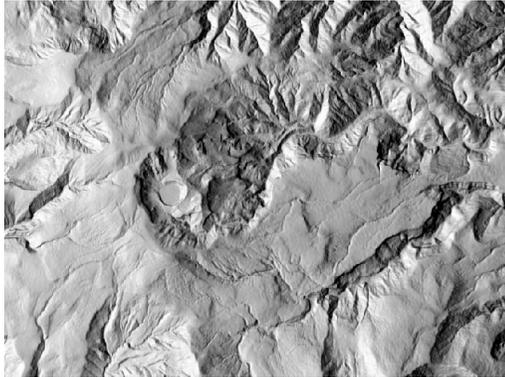
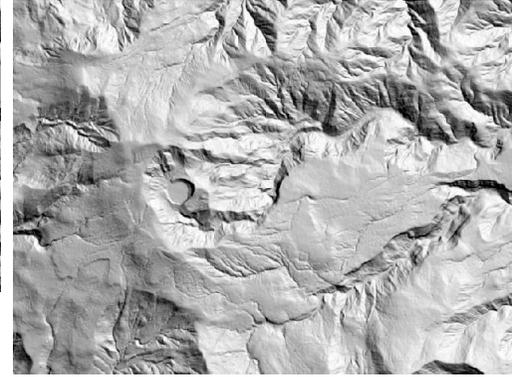
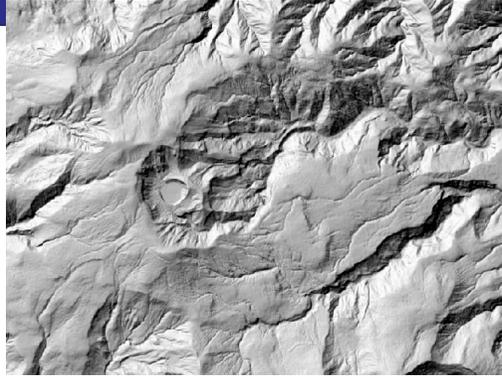
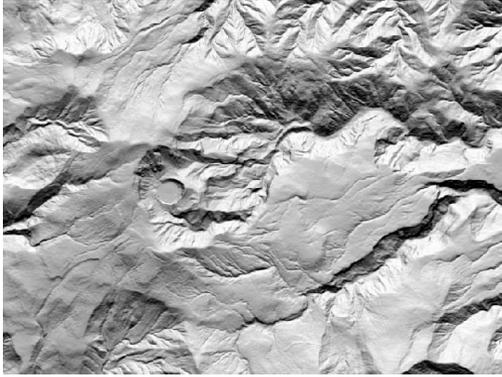
Contour map from aerial photo



Contour map from aerial LiDAR data

Traditional methods to represent ground surface

How about shade map?



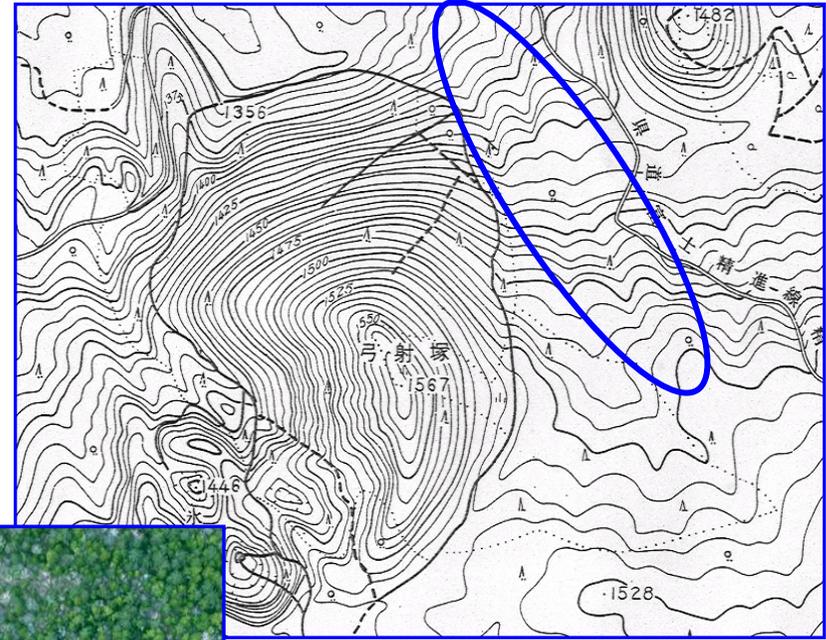
– Growth to the next Stage –

A New Visualization Method: Red Relief Image Map

A New Method for Terrain Visualization: Red Relief Image Map (RRIM)



Red Relief Image Map



Contour map

For RRIM samples, please
access:

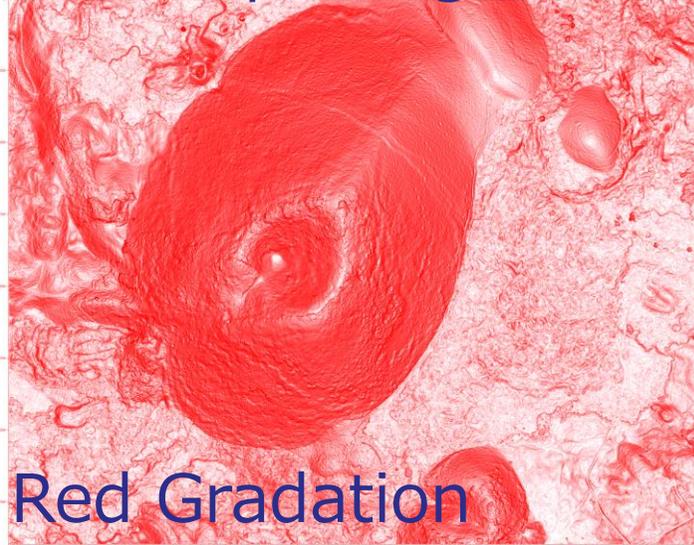
rrim.jp



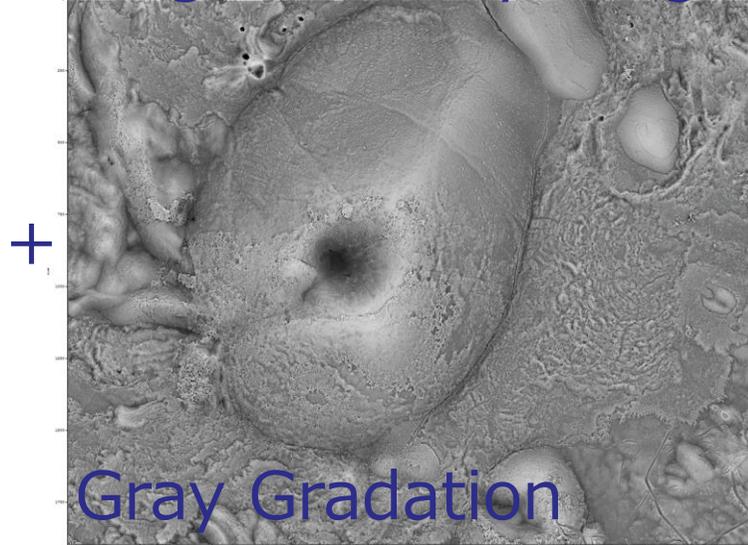
Aerial Photo

Make RRIM

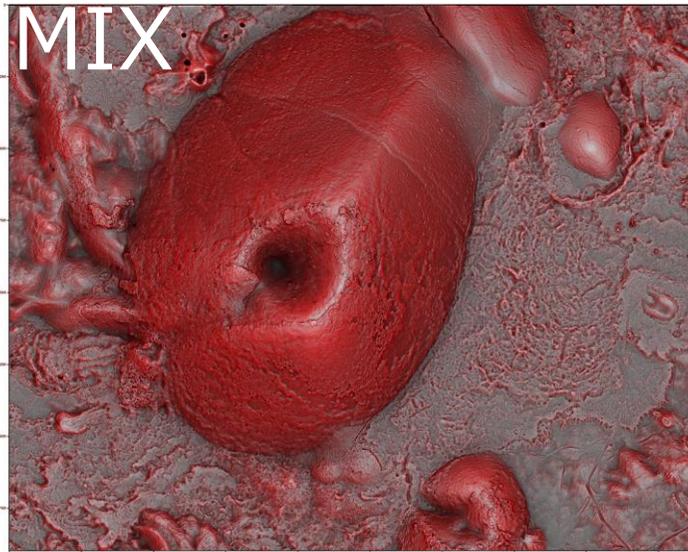
Slope Angle



Ridge & Valley Angle



+



RRIM

Details:
Chiba et al.(2008)

For RRIM samples,
please access:

rrim.jp

A Novel Terrain Visualization Method: RRIM

Ancient Tomb, Osaka Japan

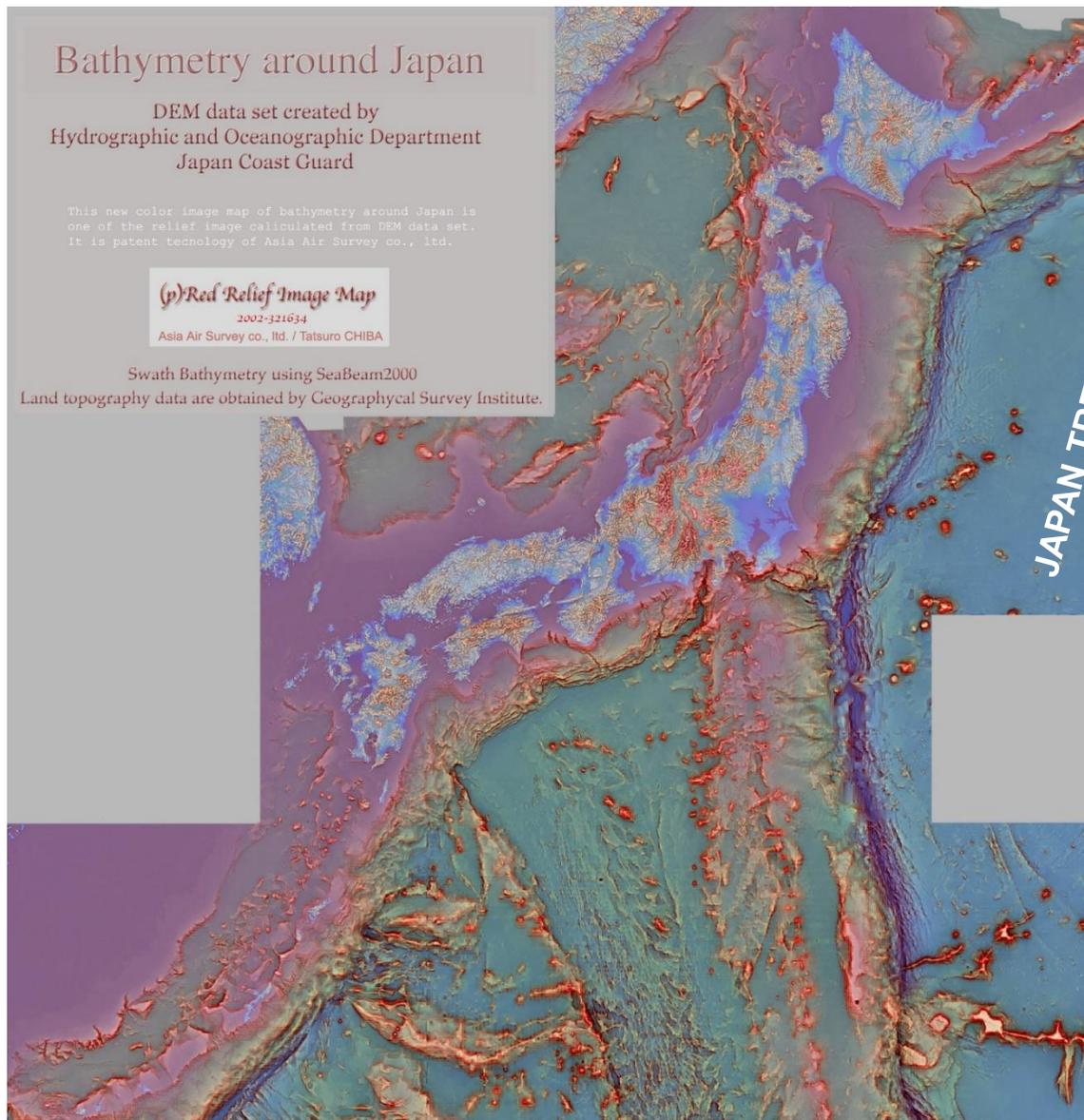


Aerial photograph

RRIM

Usage of RRIM for DRR: Examples of RRIM

A Novel Terrain Visualization Method: RRIM

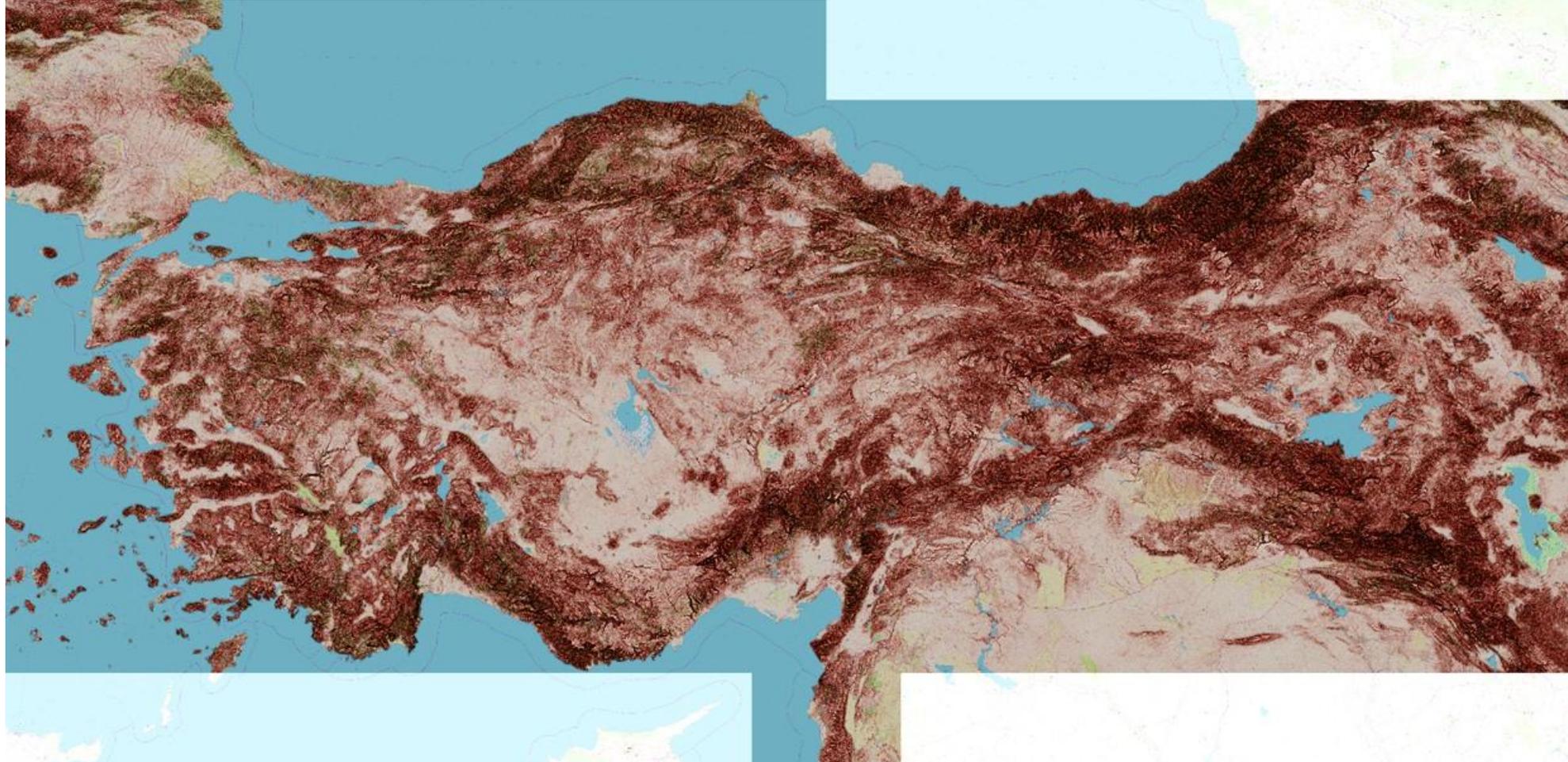


The characteristics

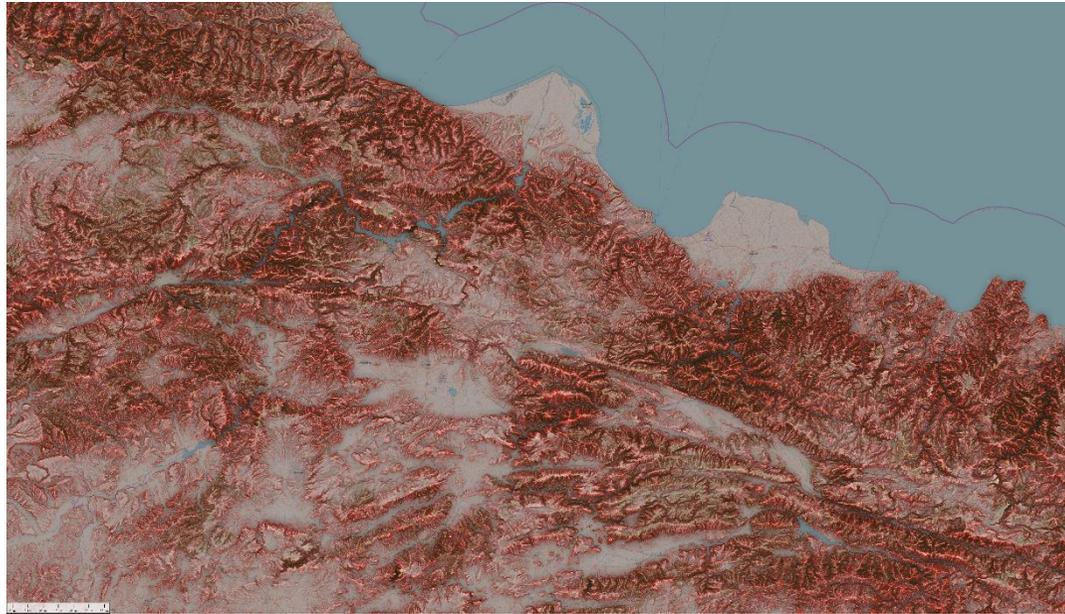
- 1) capacity to visualize ground surface from multiple viewing angles;
- 2) capacity to view 3D topographic features from single map and without specialized hardware;
- 3) any scale changing of the map has no influence for the 3D effect.

A Novel Terrain Visualization Method: RRIM

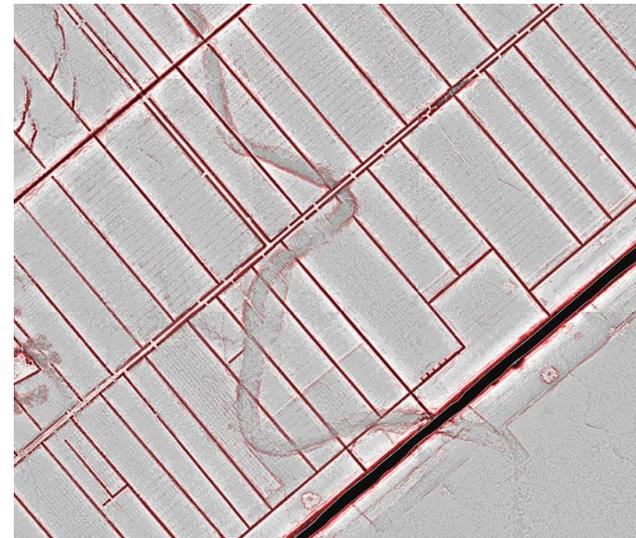
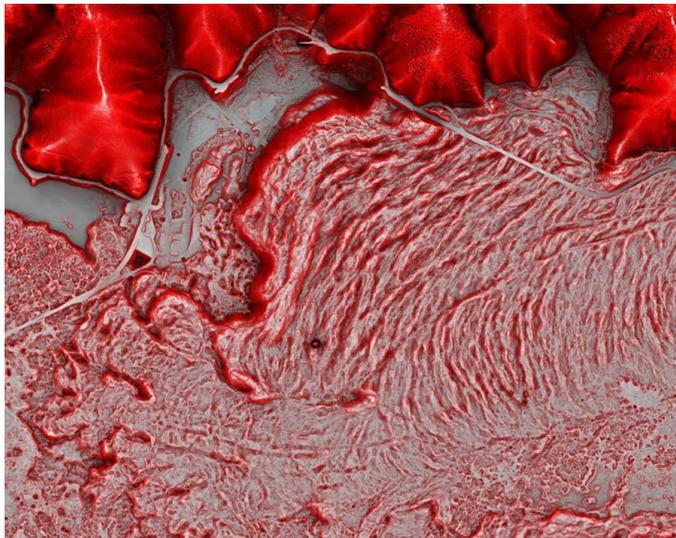
Terrain features on RRIM of the Republic of Turkey. Created from SRTM1, 100m mesh.



Application of RRIM for Slope Disaster Management



Small scale for large area. Created from SRTM1, 100m mesh. Active fault of North Anatolia, Turkey.

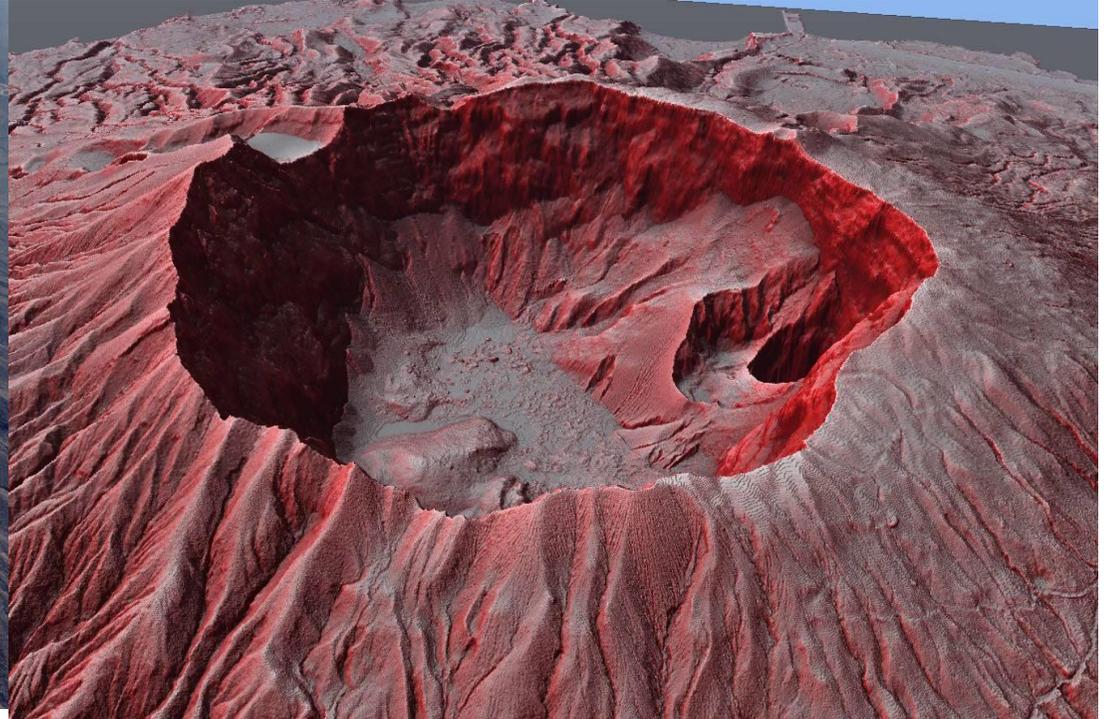


Large scale for small area. Lava flow feature, Mt.Fuji, Japan (left) and pasture (wet land) in Hokkaido, Japan (right)

Application of RRIM for Disaster Management: Volcanoes



Mt. Miyakejima, Aerial photograph from Asia Air Survey Co., Ltd.



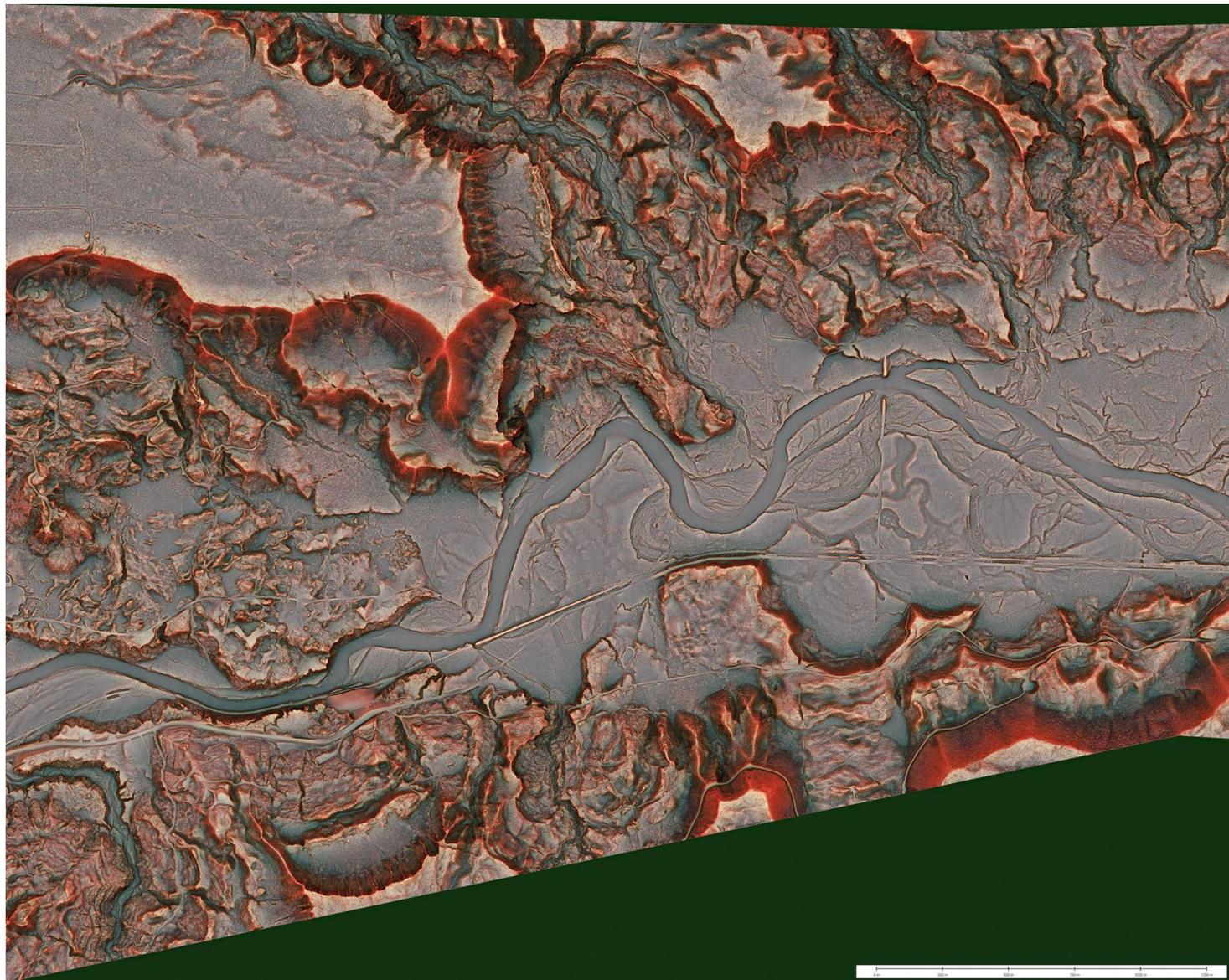
Mt. Miyakejima, Red Relief Image Map produced from 1m LiDAR DEM by GSI, Japan

Application of RRIM for River Management



RRIM of river basin and its banks, from geospatial data of ALB measurement.

Application of RRIM for Disaster Management: Slopes



**RRIM of Oso
Landslide,
Washington.
Created from
2013 Lidar data,
courtesy of the
Puget Sound
Lidar
Consortium**

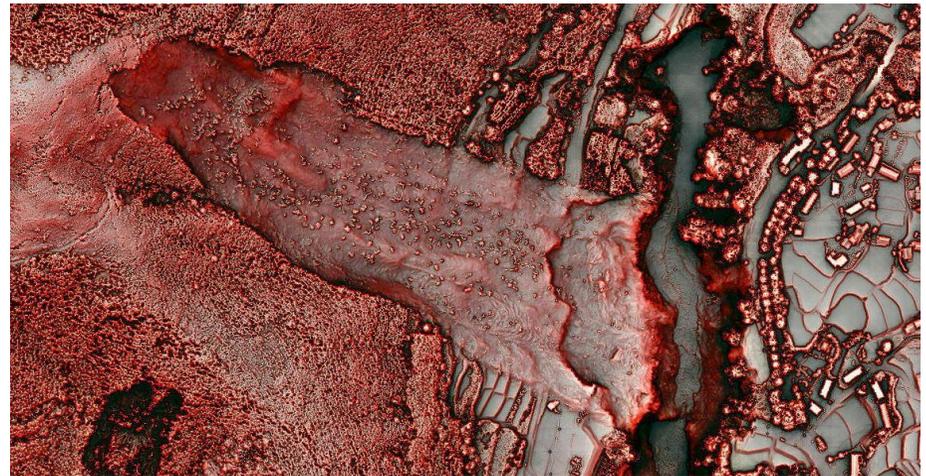
Application of RRIM for Disaster Management: Slopes

- Slope disasters, such as landslide, debris flow occur every year in all over the world, triggering by heavy rainfall, earthquake, etc..
- Use of geospatial data is essential for slope disaster management (identification, assessment, recovery).



Aerial photograph

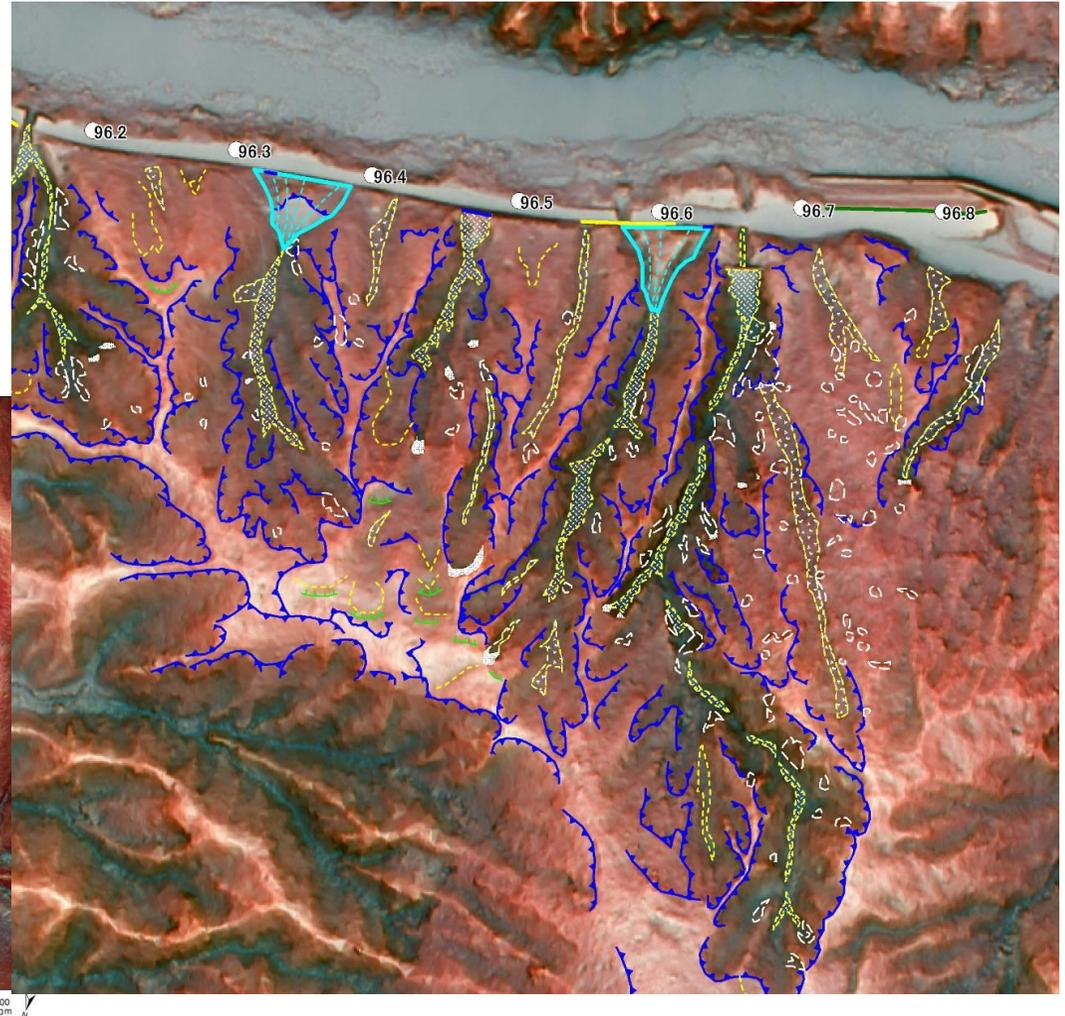
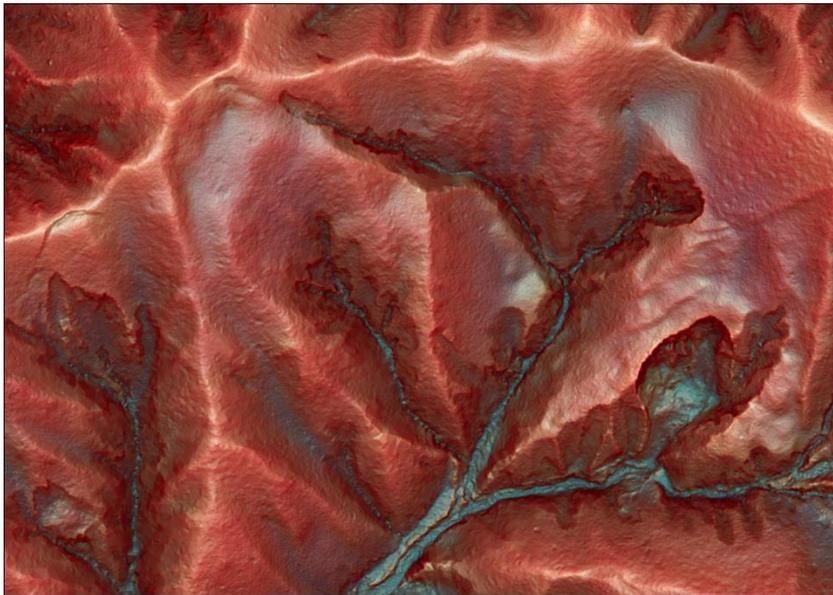
Earthquake-induced landslide of the April 2016 Kumamoto earthquake, Japan



RRIM

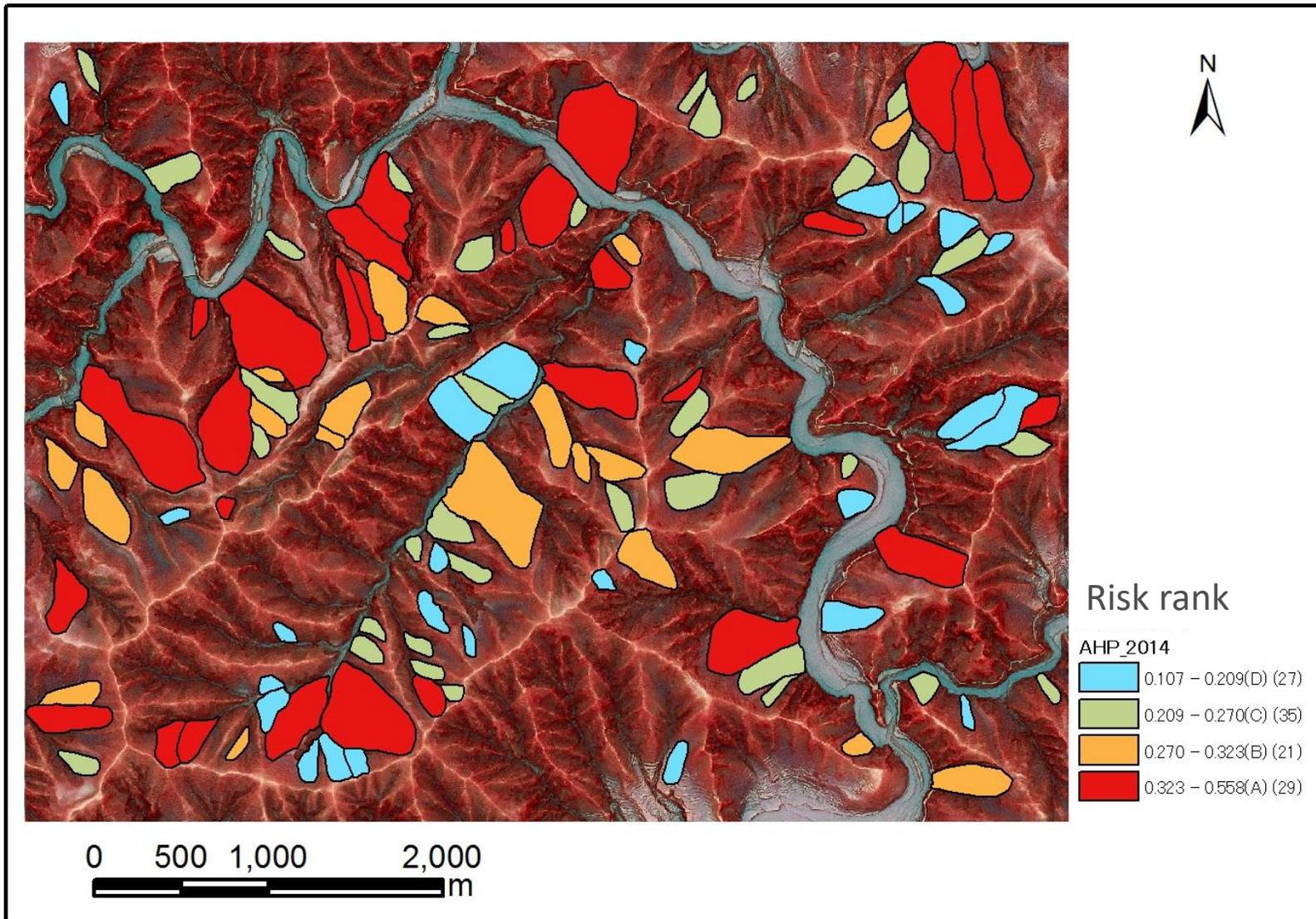
Application of RRIM for Disaster Management: Geomorphological interpretation

Using RRIM to interpret topographical characteristics of slopes and then evaluate landslide/debris flow risk along road, railway, etc.



Application of RRIM for Disaster Management: Evaluation of Landsliding

Susceptibility assessment for deep-seated landslides based on topographical interpretation



Summary

For detailed geospatial data, appropriate visualization method is useful for represent ground surface. There are some limitations for traditional methods for visualization. RRIM, a novel visualization method can be used for express ground surface, useful for ground surface interpretation, can contribute to disaster risk reduction.