Avalanches on Atlantis

Real or Fake? The "true" story!

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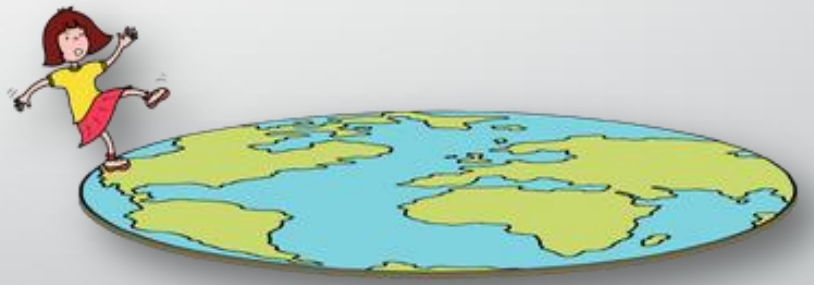
@fthierygeo

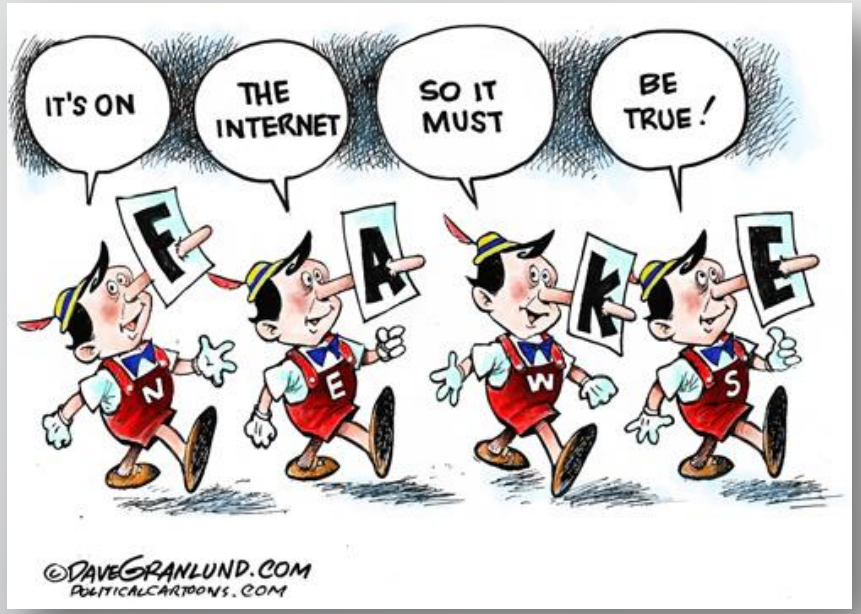
That‘s me!

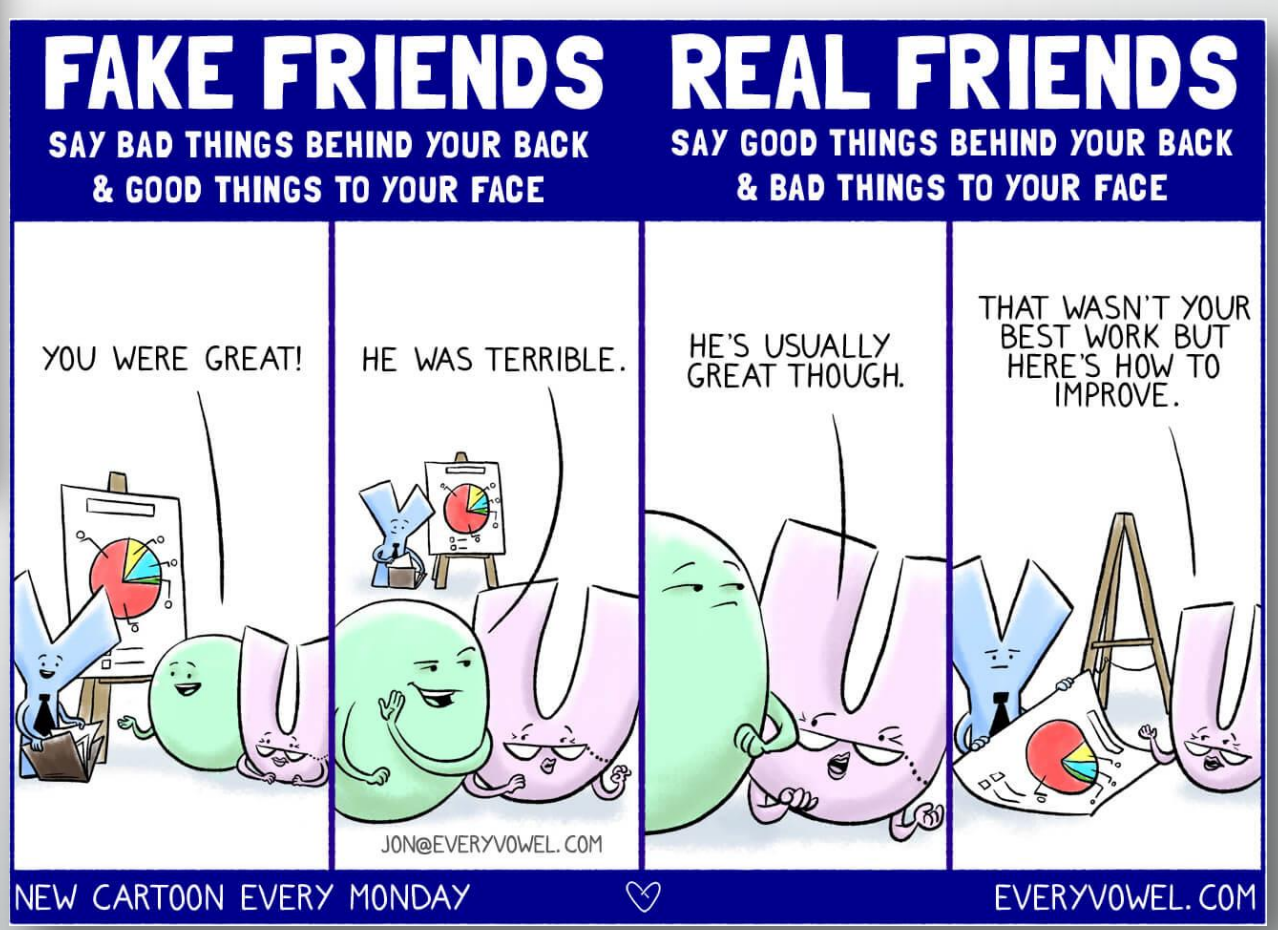
- **Master Degree** (Master of Science) in **Geoinformatics and Surveying**
- Research Associate at **i3mainz** – Institute for Spatial Information and Surveying Technology
- Computer Scientist at **RGZM** – Archaeological Research Institute

We are living in a world of »fake news« and »alternative facts«, also in history …



But what is REAL, what is FAKE?

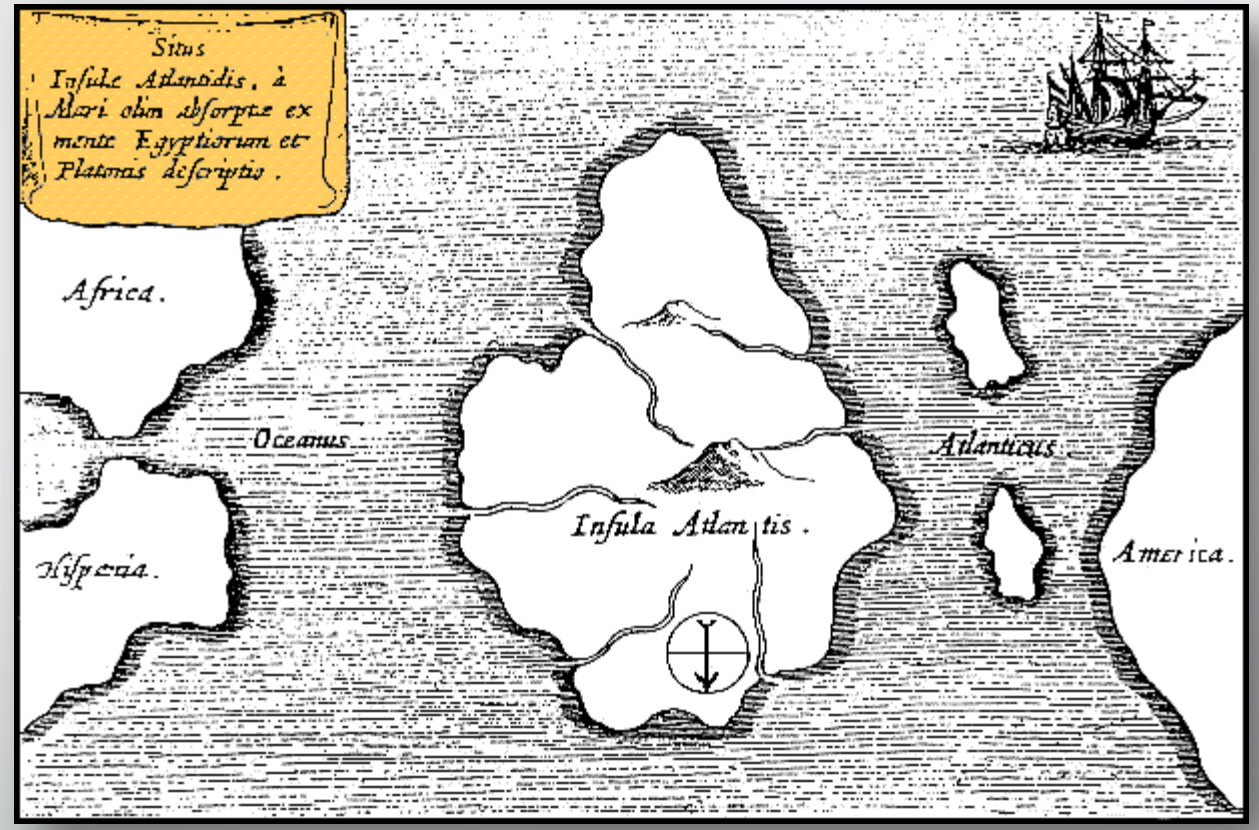




But is fake information always bad?

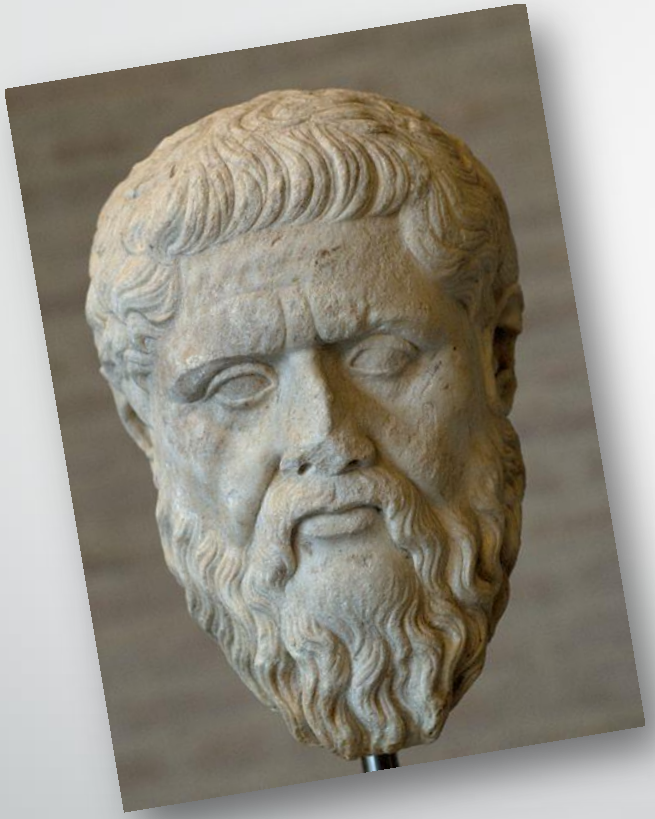
Have a look in books, there are fairy tales and myths – ideas in mind – with “real” facts…

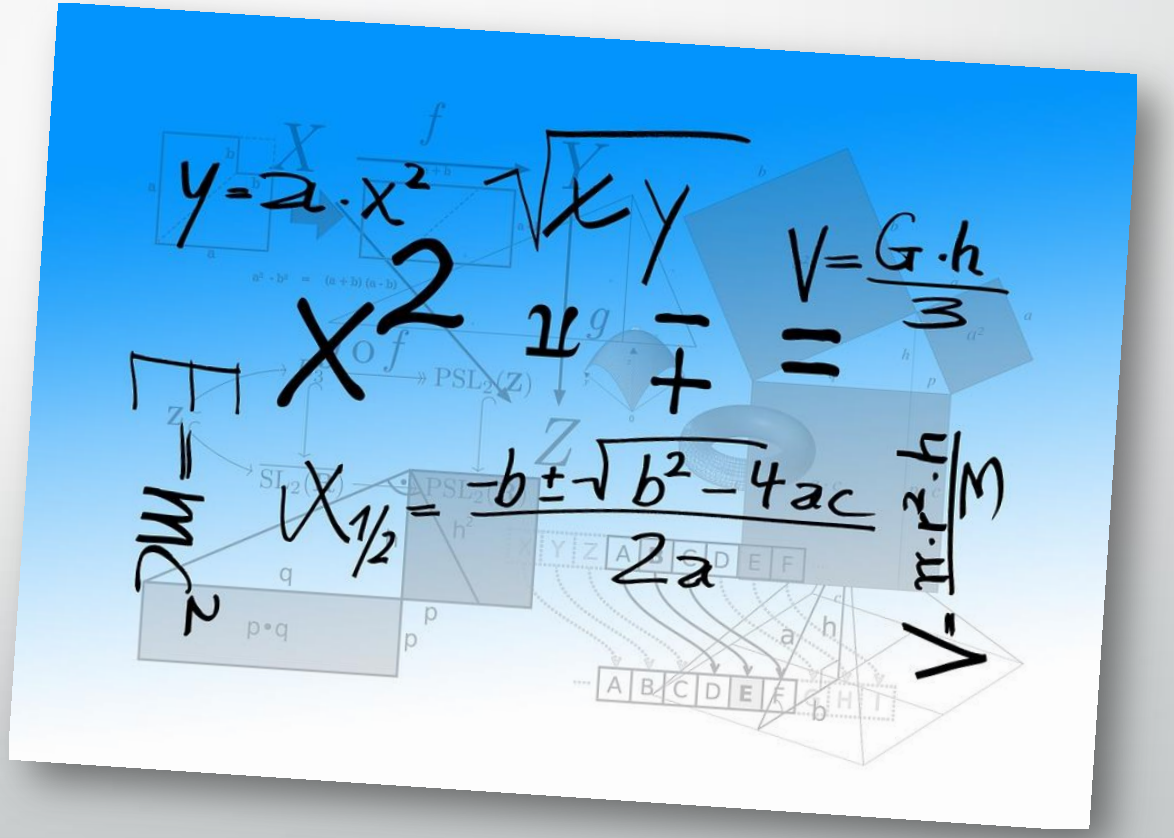
In Greek history, the famous philosopher Plato mentioned the mythical island Atlantis…



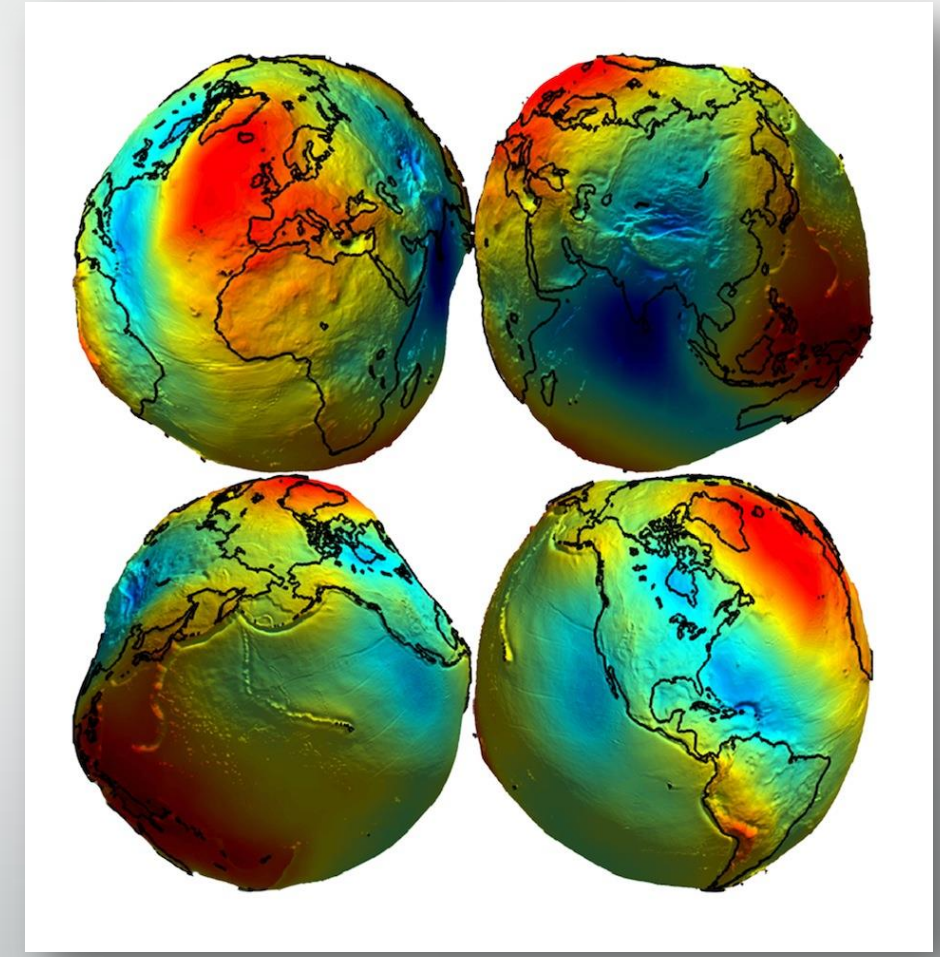
Atlantis was a „real“ empire, assigned to the sea god Poseidon…

…but only in Platon's mind, to show and explain his theories!



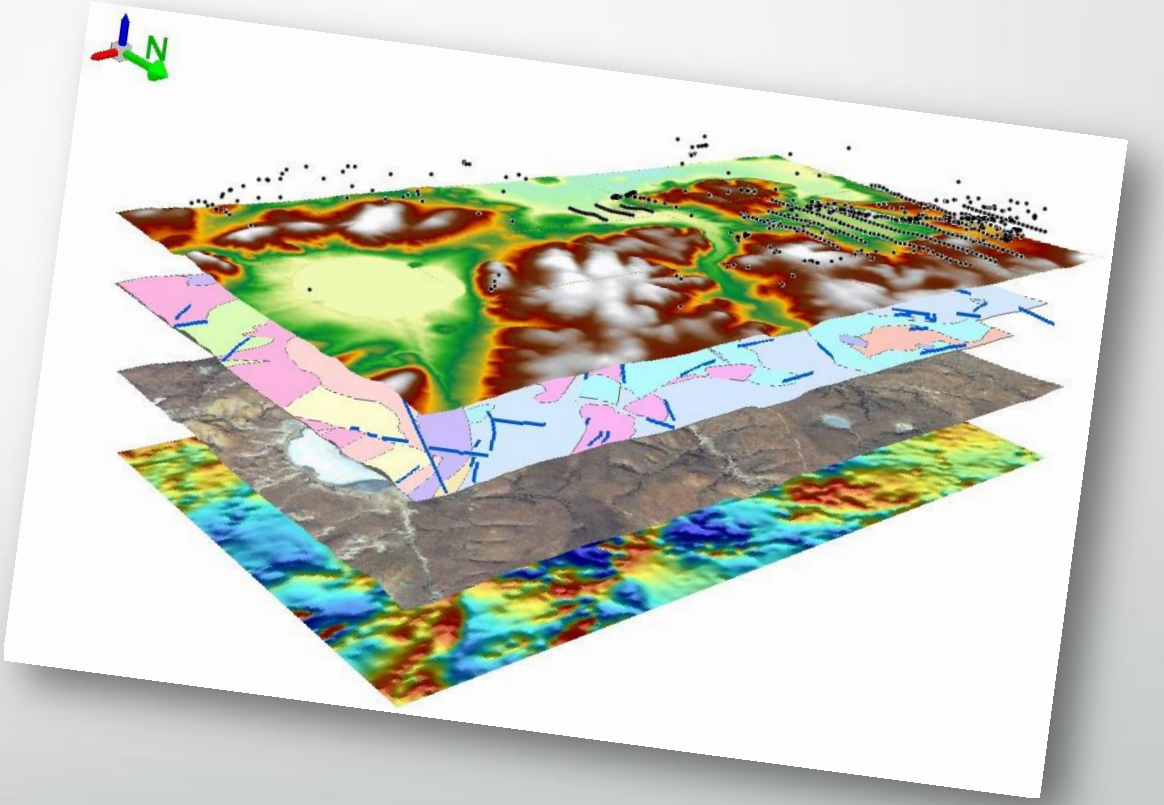


In geodesy we try to model and measure the real world as perfect as we can…



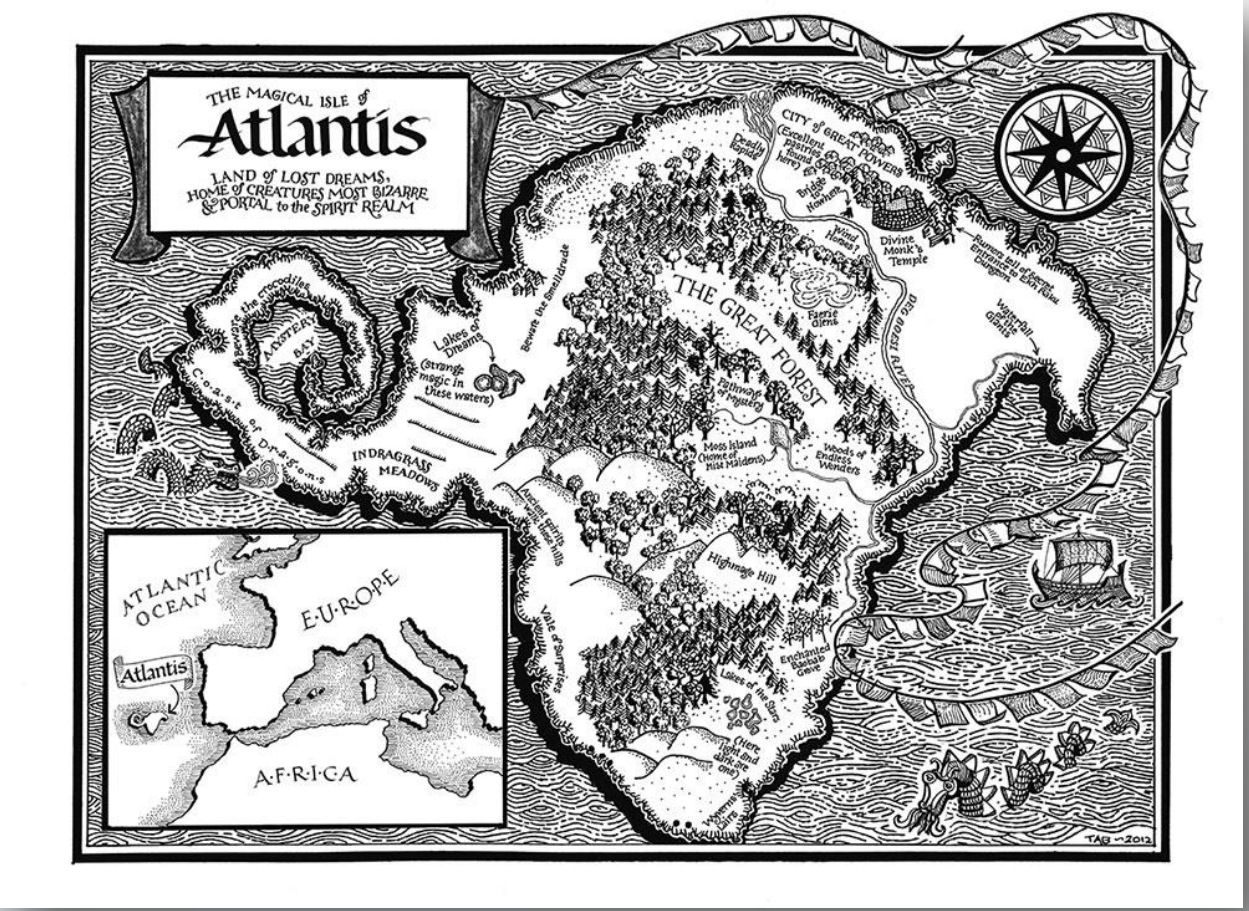
… but we all know, that it will never fit perfectly!

For demonstrating geodetic methods in GIS, we do not need real data, if it does not exist…



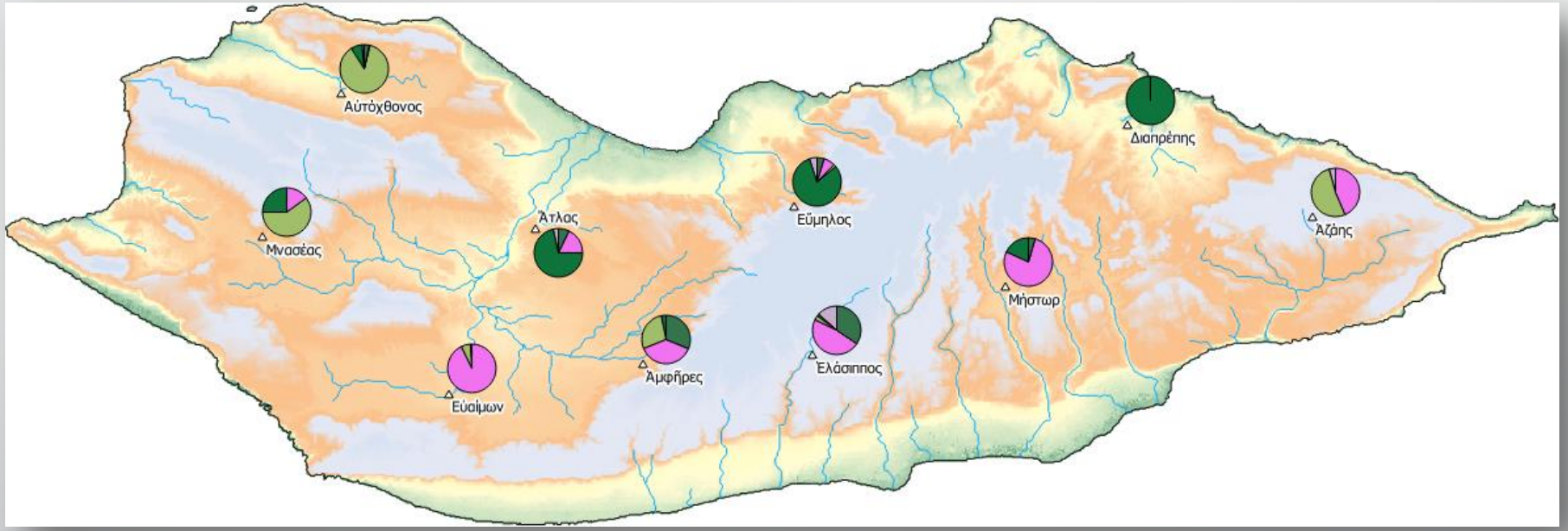
…we can use modelled, “faked” information for demonstrating anything we want!

In case of Atlantis, it is hard to get “real” spatial information out of Platon’s work…

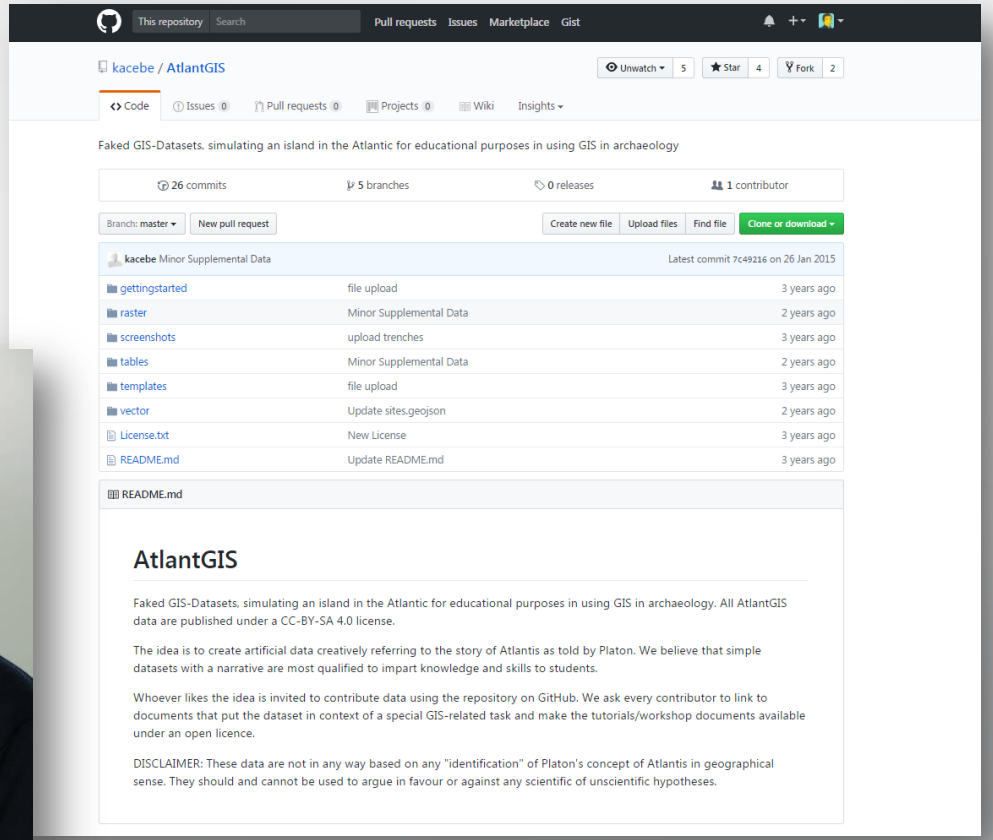


…because Atlantis could have looked like this…

…and modelled in a faked dataset like this:



The »AtlantGIS« dataset by Prof. Dr. phil. Kai-Christian Bruhn!

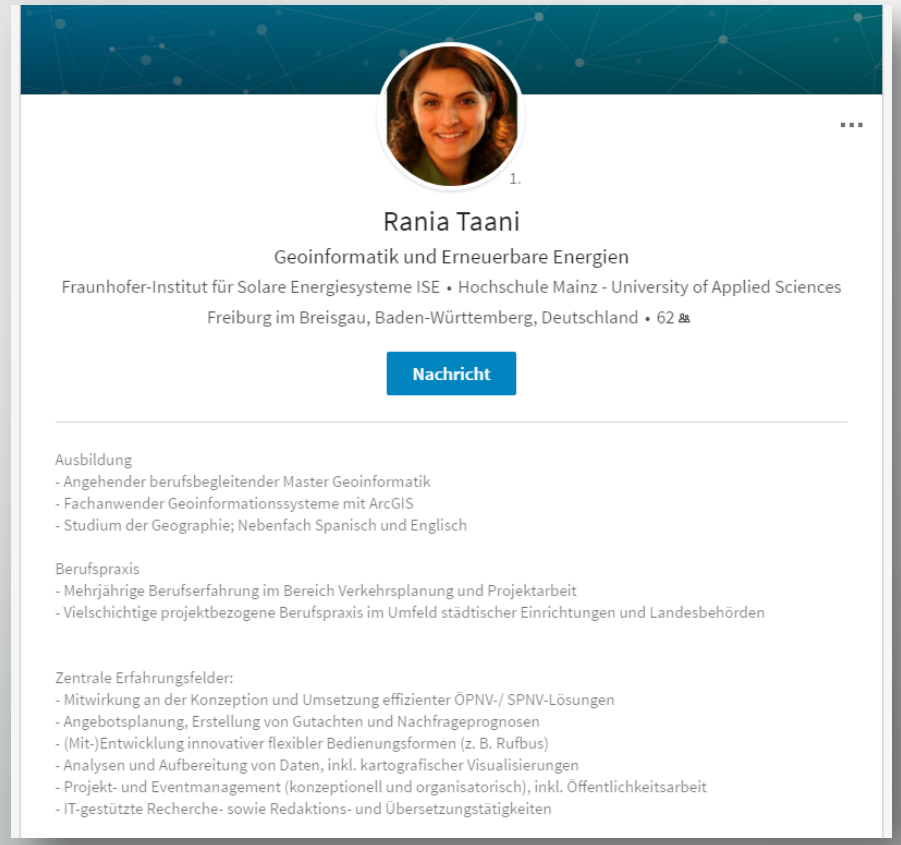


https://github.com/kacebe/AtlantGIS

Imagine, you have real problems like avalanches threatening populated areas…

…just simulate and calculate demolition sites on Atlantis using the AtlantGIS dataset!

This was done in a students project by Rania as part of an interdisciplinary GIS module focusing on applications in Digital Humanites!



1.

Rania Taani

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Nachricht

Ausbildung
- Angehender berufsbegleitender Master Geoinformatik
- Fachanwender Geoinformationssysteme mit ArcGIS
- Studium der Geographie; Nebenfach Spanisch und Englisch

Berufspraxis
- Mehrjährige Berufserfahrung im Bereich Verkehrsplanung und Projektarbeit
- Vielschichtige projektbezogene Berufspraxis im Umfeld städtischer Einrichtungen und Landesbehörden

Zentrale Erfahrungsfelder:
- Mitwirkung an der Konzeption und Umsetzung effizienter ÖPNV-/ SPNV-Lösungen
- Angebotsplanung, Erstellung von Gutachten und Nachfrageprognosen
- (Mit-)Entwicklung innovativer flexibler Bedienungsformen (z. B. Rufbus)
- Analysen und Aufbereitung von Daten, inkl. kartografischer Visualisierungen
- Projekt- und Eventmanagement (konzeptionell und organisatorisch), inkl. Öffentlichkeitsarbeit
- IT-gestützte Recherche- sowie Redaktions- und Übersetzungstätigkeiten

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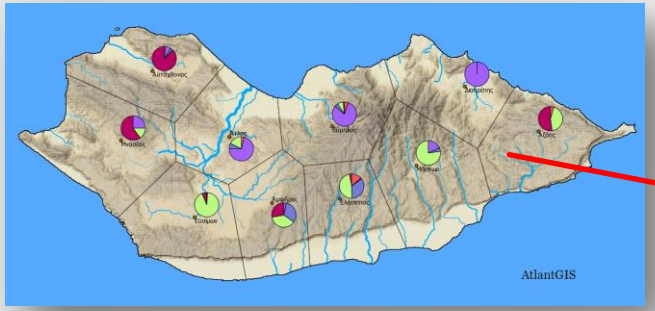
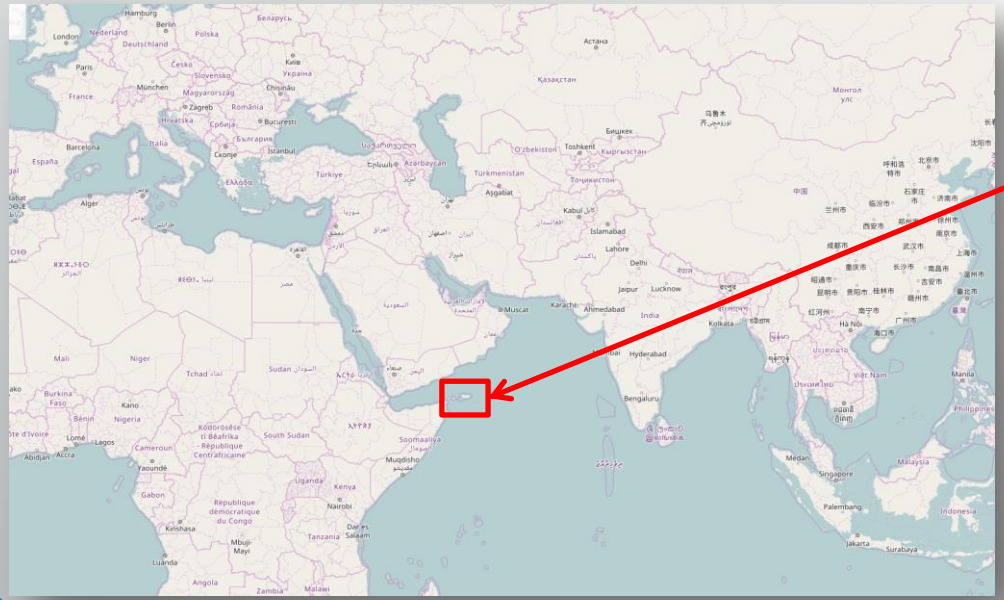
Rania's scenario…

One day, there was a great concern on Atlantis. Atlas and his twin brothers gathered for the annual island party at the king's palace as they heard a sound coming from the surrounding mighty mountains. It was an avalanche! Nothing happened, puh! Both were responsible for the well-being of their countrymen. Thus, they were obligated to deal with "avalanches". In order to make protective arrangements, areas prone to avalanches, had to be recorded. To analyse the recorded data, a GIS was established. As a result the demolition sites of avalanches have been calculated and will now be presented to the audience.

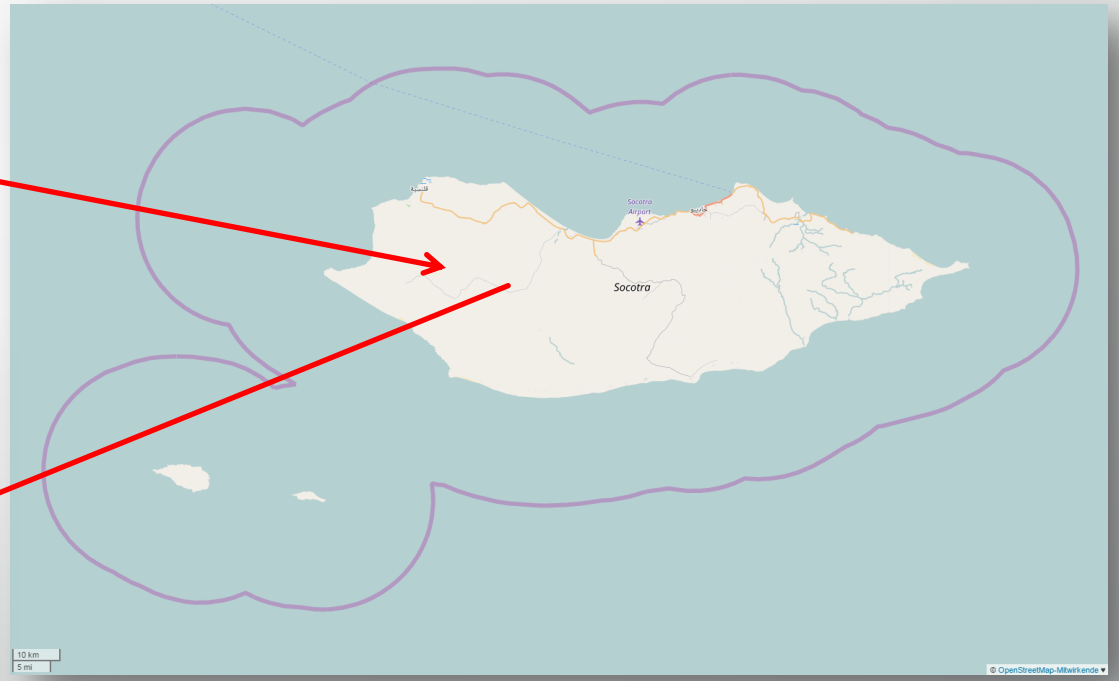
The investigation area, “real” and “faked”…

AtlantGIS





Sokotra



http://osm.org/go/ySlMFR

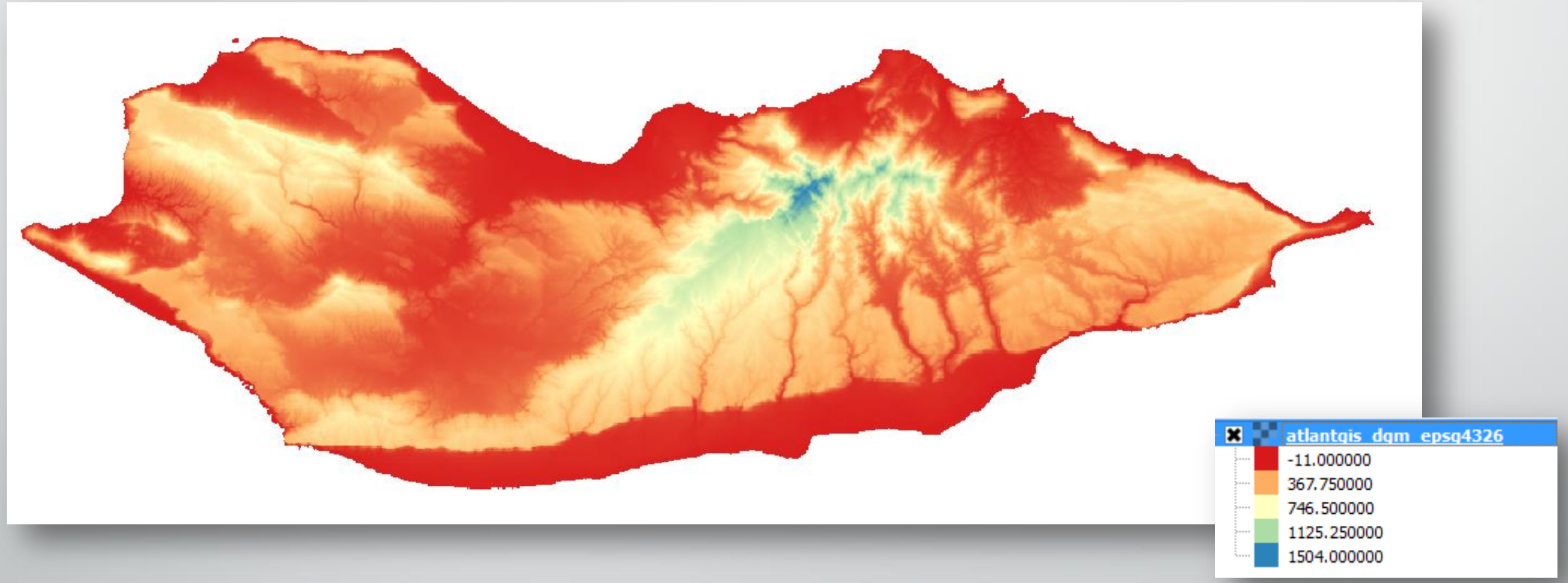
The data is based on…

- https://github.com/kacebe/AtlantGIS
- a Digital Terrain Model (DTM) for the visualization and analysis of the height, slope, terrain alignment and the vertical curvature
- current Landsat data for surface roughness (calculated using vegetation information)
  - https://earthexplorer.usgs.gov
  - Data Set Landsat Archive, Pre-Collection, L8 OLI/TIRS
- QGIS, SAGA, GRASS, GDAL

Important characteristics of areas prone to avalanches are…

- …slope, surface design, snow depth, temperature, wind and the soil character (rubble &. Covering of vegetation)
- A multi criteria analysis was done for…
  - height
  - slope
  - terrain alignment
  - vertical curvature
  - surface roughness

The digital terrain model in pseudo colour …



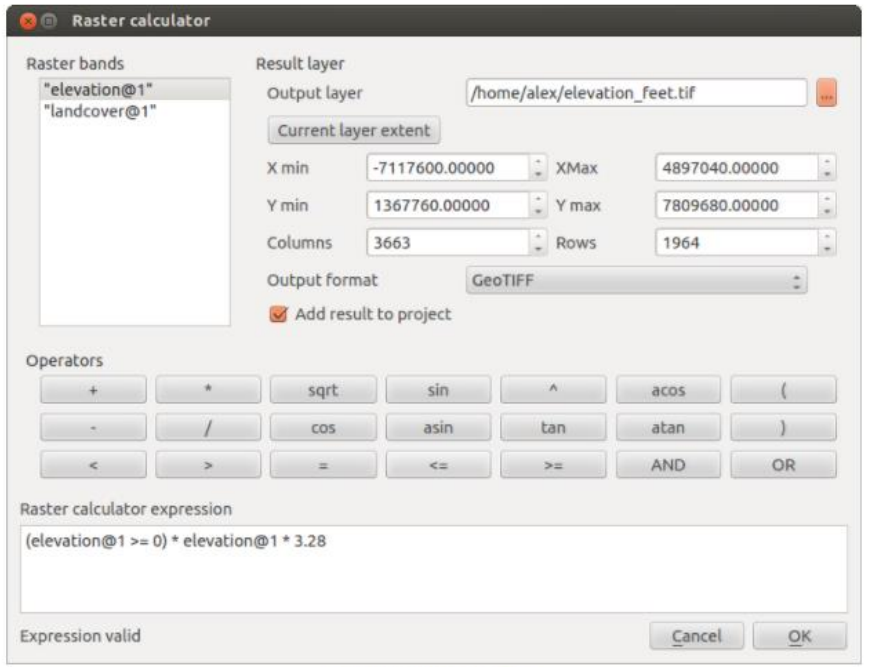
The calculations…

…include reclassifications using QGIS Raster Calculator

Raster Calculator

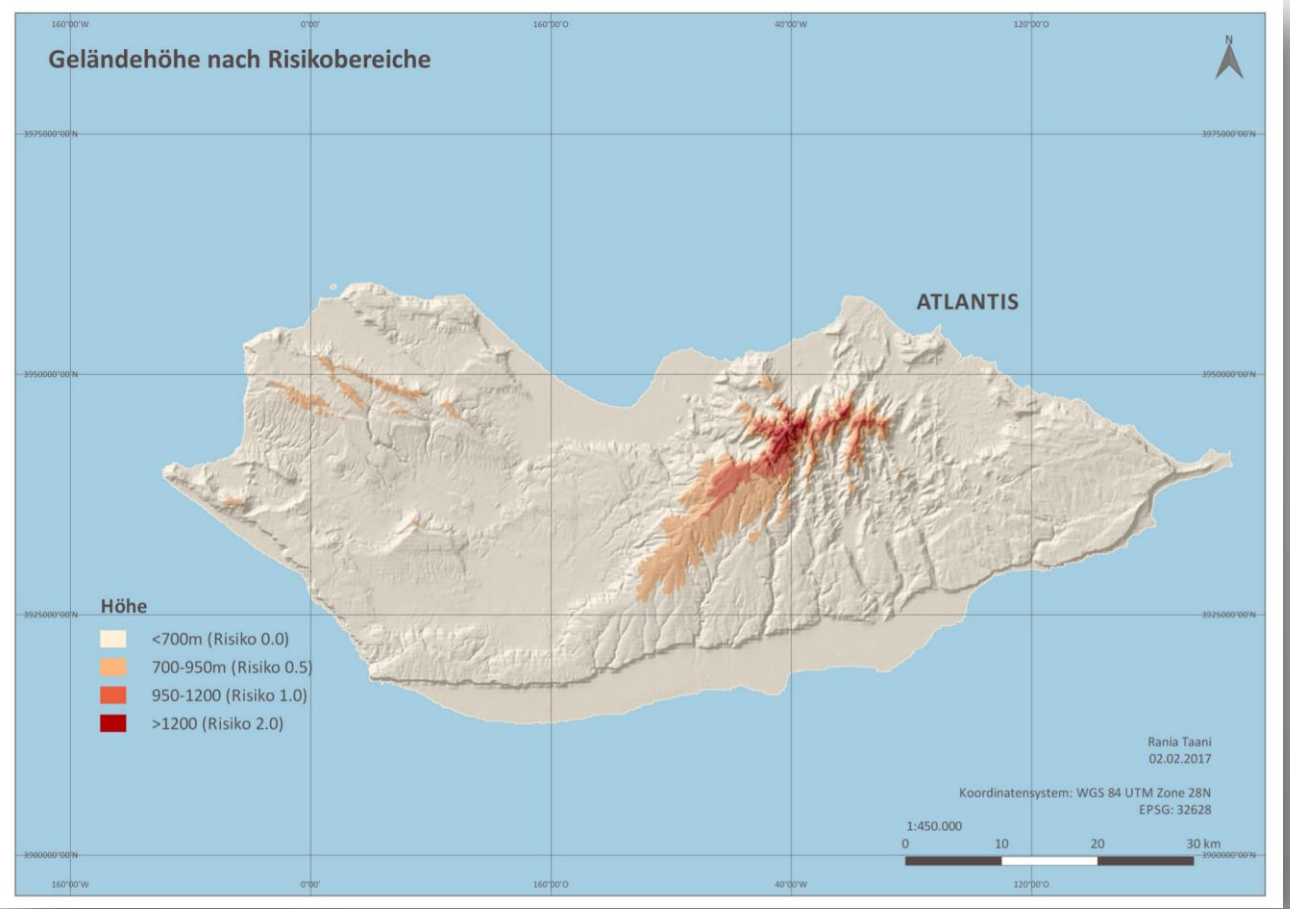
The ***Raster Calculator*** in the ***Raster*** menu allows you to perform calculations on the basis of existing raster pixel values (see figure_raster_10). The results are written to a new raster layer with a GDAL-supported format.

Figure Raster 10:

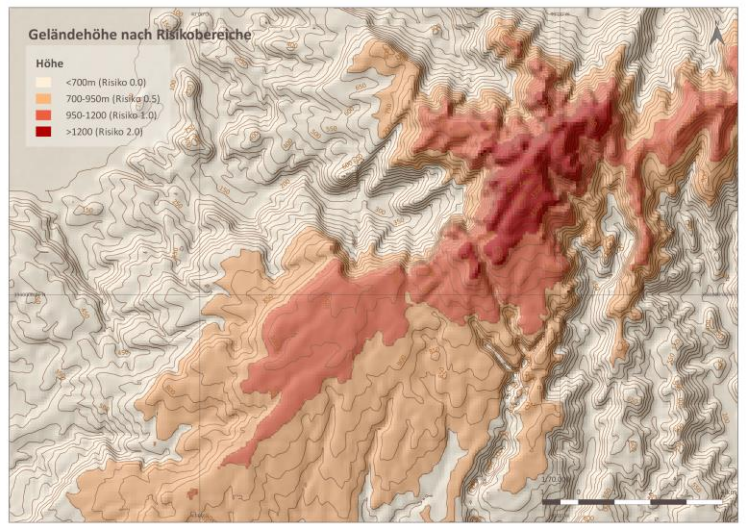


Raster Calculator

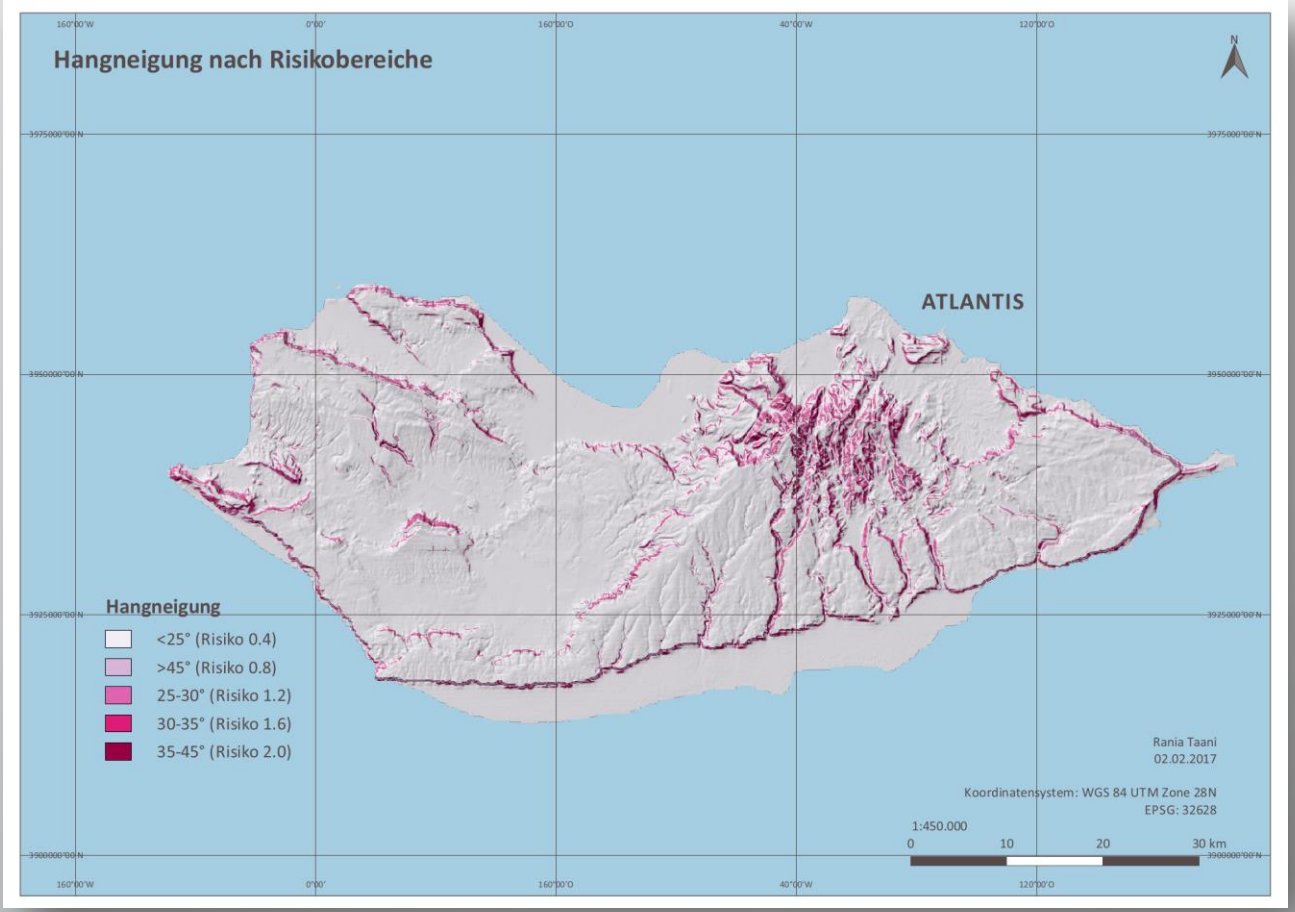
Risk areas based on height…



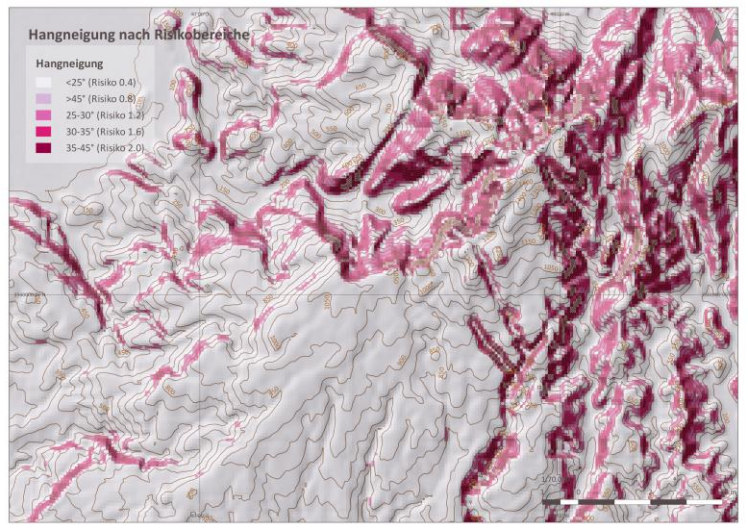
avalanches occur at a certain altitude, which is oriented at the 0°C frost limit of the area; the higher, the more risk



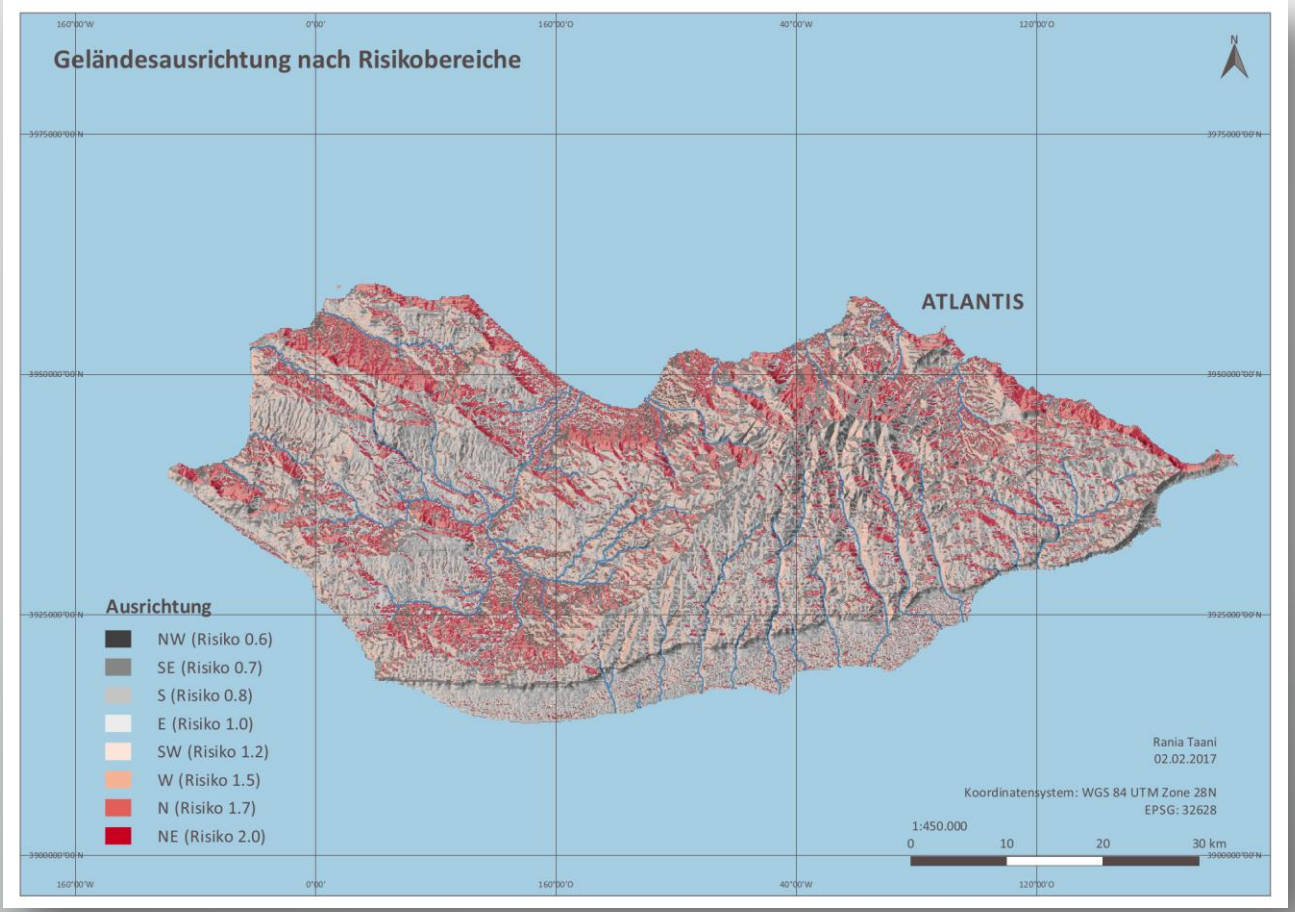
Risk areas based on slope…



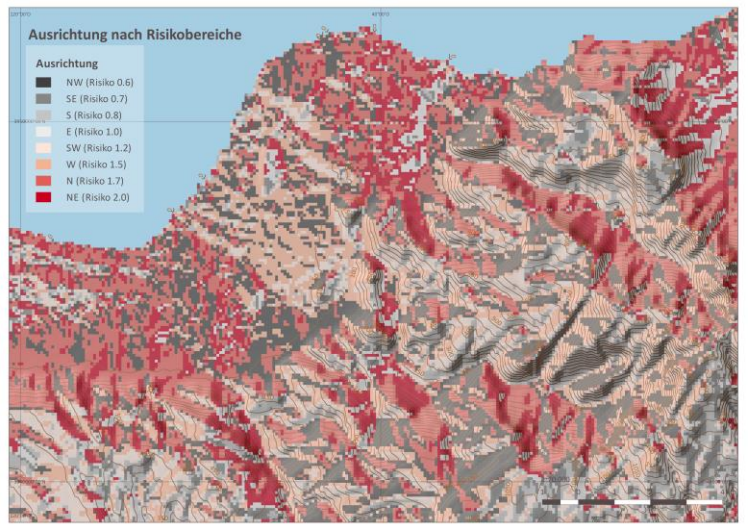
major influence!
critical inclination for avalanches between 25 ° and 45 °



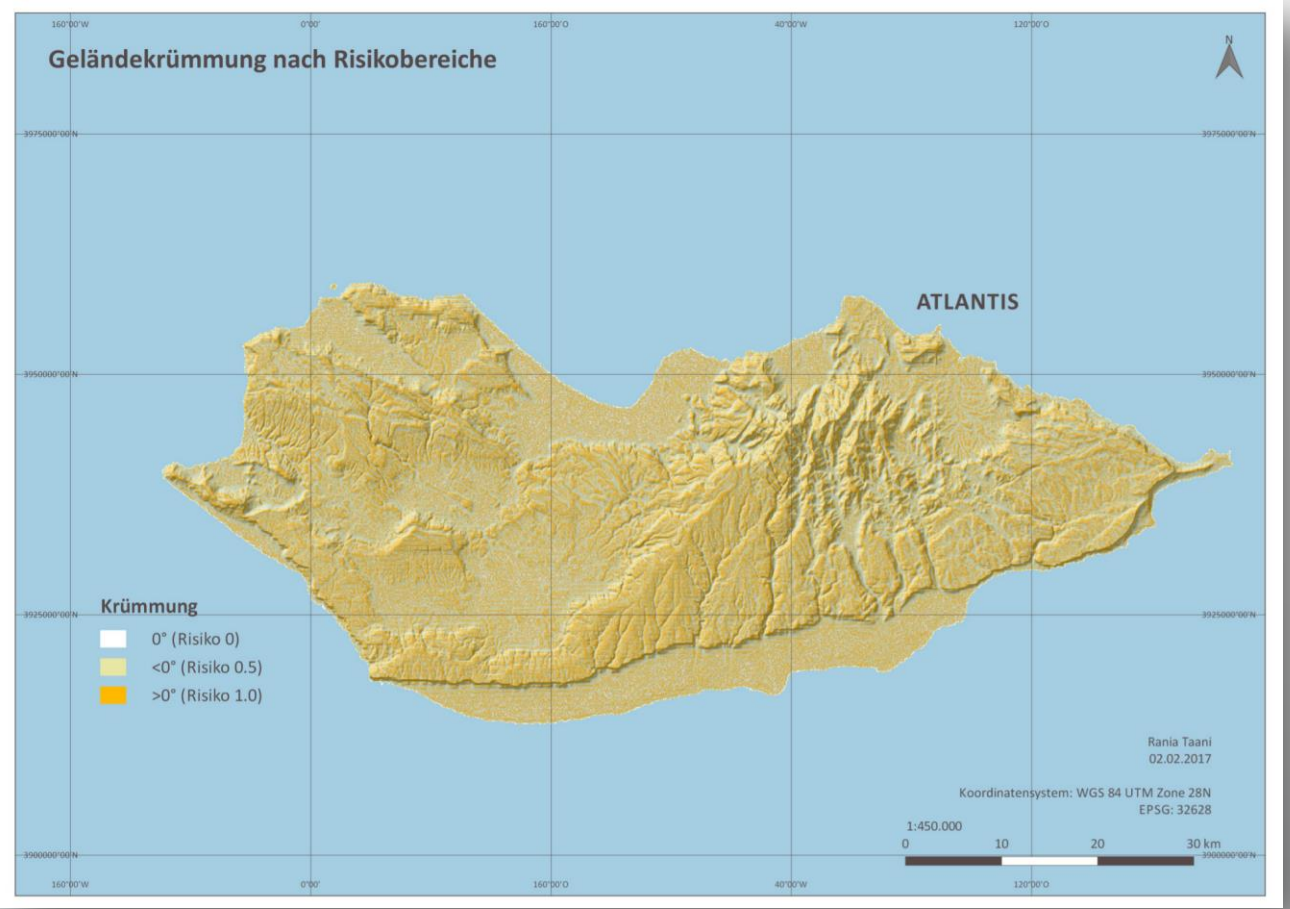
Risk areas based on terrain alignment…



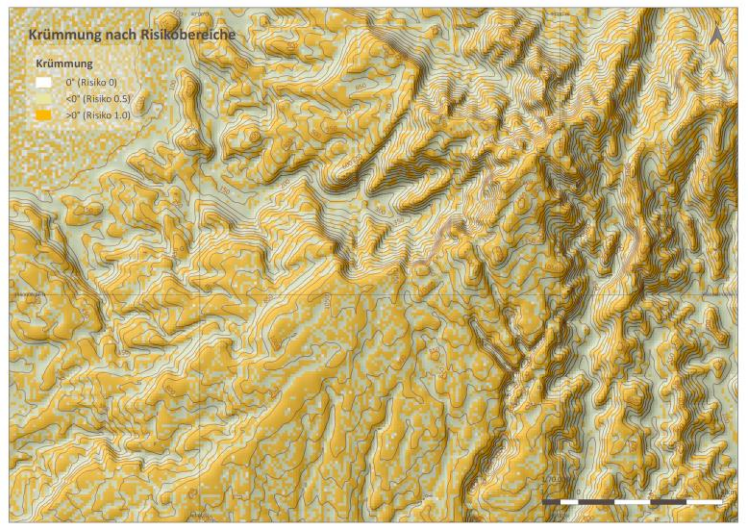
north slope (315°-45°) highest risk, west slope (225°-315°) second highest risk, south slope (135°-225°) third highest risk and east slope (45°-135°) lowest risk



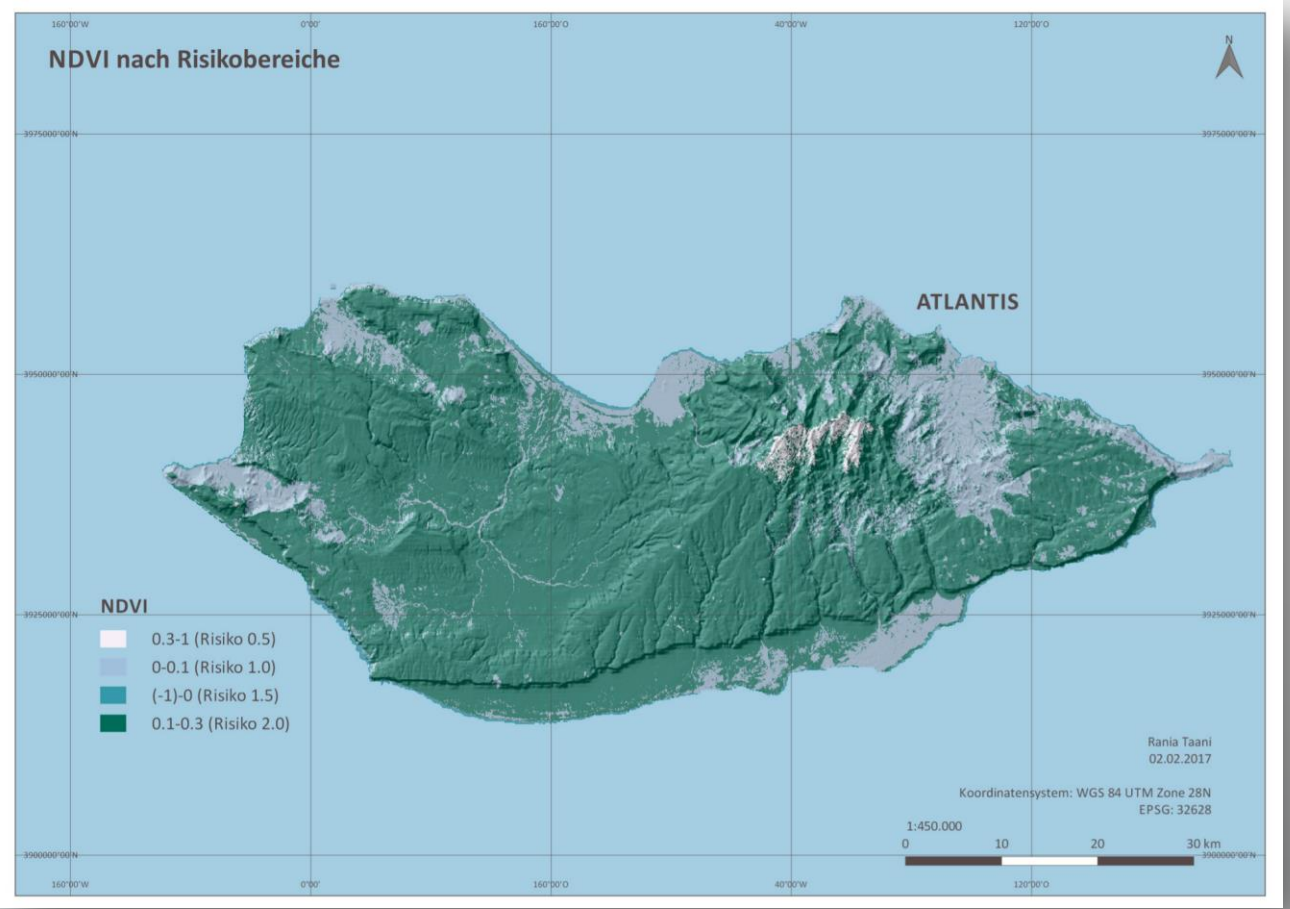
Risk areas based on vertical curvature…



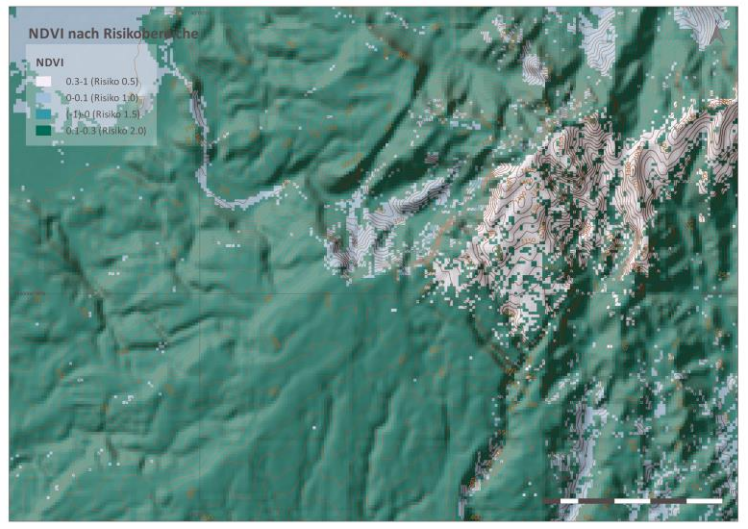
convex surfaces have higher risks, concave surfaces are more stable



Risk areas based on surface roughness…



calculation of the Normalized Difference Vegetation Index (NDVI), lower values – higher risk



Classification based on multi criteria analysis…

slope	risk
< 25	0.4
25 - 30	1.2
30 - 35	1.6
35 - 45	2.0
> 45	0.8

v. curvature [°]	risk
0	0
< 0	0.5
> 0	1.0

terrain alignment	risk
N (0 -22.5) + (337.5 – 360)	1.7
NE (22.5- 67.5)	2.0
E (67.5 – 112.5)	1.0
SE (112.5 - 157.5)	0.7
S (157.5 – 202.5)	0.8
SW (202.5 – 247.5)	1.2
W (247.5 – 292.5)	1.5
NW (292.5 – 337.5)	0.6

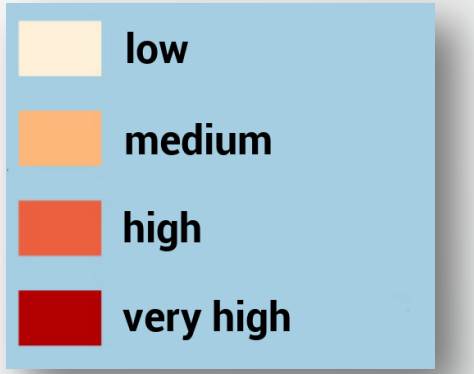
height	risk
< 700	0.0
700 – 950	0.5
950 - 1200	1.0
> 1200	2.0

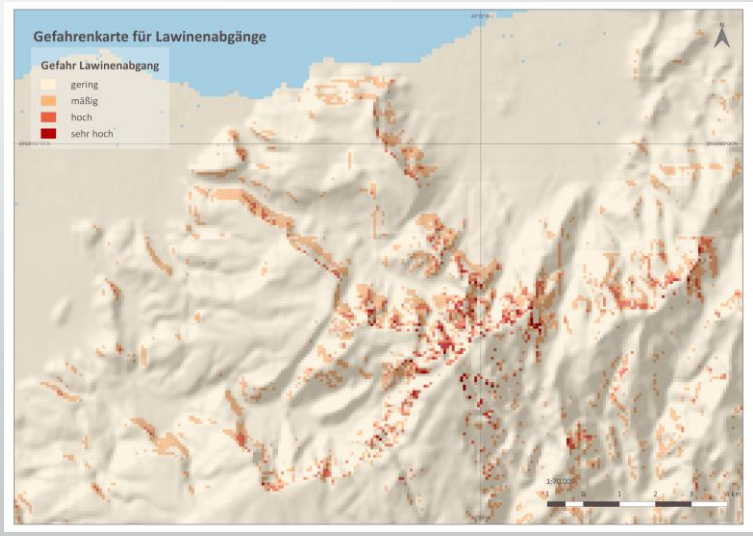
roughness (NDVI)	risk
< 0	1.5
0 – 0,1	1.0
0,1 – 0,3	2.0
> 0,3	0.5

demolition sites	risk
0 - 7	1 (low)
7 - 11	2 (medium)
11 - 15	3 (high)
15 - 19	4 (very high)

demolition sites = (height + alignment + curvature) * slope * roughness

The resulting risk areas…





Rania's conclusion…

- the resulting map indicates higher avalanche risks in the north-western part of Atlantis.
- avalanches demolition areas are not the actual danger zones. Lead-out areas have to be included, too.
- the identified "danger zones" have to be identified and monitored.

My conclusion…

AtlantGIS is cool! use and extend it!

Avalanches on Atlantis

Real or Fake? The "true" story!

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http://docs.linkedgeodesy.org

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- https://en.wikipedia.org/wiki/Atlantis
- https://de.wikipedia.org/wiki/Sokotra
- https://docs.qgis.org/2.6/en/docs/user_manual/working_with_raster/raster_calculator.html