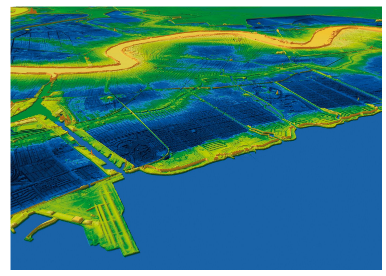
Huch, M., Wolodtschenko, A.

Selected Landscapes of the USA











Dresden
2017

a

b

The mini-photoatlas concept is based on eleven locations from the United States of America including Alaska and Hawaii showing famous geological sites.
The 11 selected images from the Geological Calendar 2002-2014 show some well-known touristic attractions, but they are also sites of special geological interest in terms of the dynamic processes on the Earth.
By grouping them in relation to their geological setting they were divided into three thematic clusters: plate tectonics, erosion & sedimentation, climate change and their combinations.
This photoatlas is, together with our first thematic photoatlas „Der Geologische Kalender 2002-2014“, part of the meta-project «Iconic Atlassing». Other thematic photoatlases one can find at:
http:// rcswww.urz.tu-dresden.de/~wolodt/BILD-ATLAS/

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Dresden
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a

b

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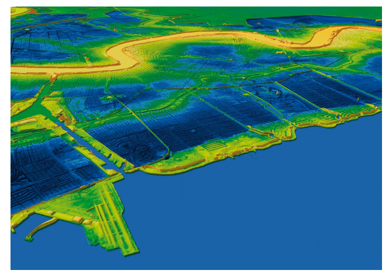



Dresden
2017

a

b

2. Clusters/Themes of photoatlas

Plate tectonics:
1 GK-2010-09_Hawaii-Lava
2-GK-2010-10_Subduktion
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10-GK-2007-02_White Sand Dunes
Climate Change:
11-GK-2008-06_Alaska-Permafrost

3.1. Plate tectonics

Hawaii-Lava
Autor: B. Bachmann. (from GK-2010-09)

a

4

b

When Hawaii's Kilauea (Big Island) is flowing the lava often reaches the ocean, like 2001, shown on the photograph. The island is the highest volcanic edifice on Earth with ca 7000 m below and 4000 m above sea level.

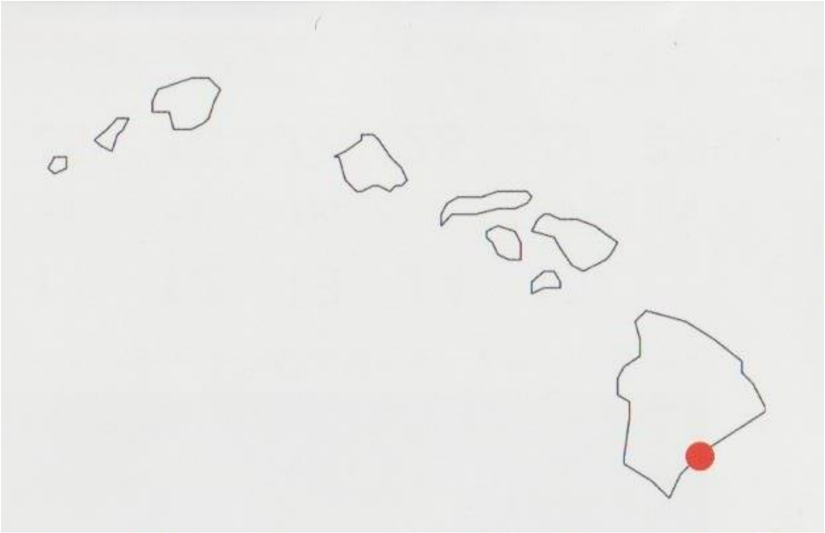


Plate tectonics relation: The volcanoes along the Emperor Seamount chain are marking a hot spot beneath the ocean floor. Volcanism is active today on Big Island.

3.2. Plate tectonics

Subduktion
Autor: geoskript (from GK-2010-10)

a

b

The Pacific Highway No. 1 is running through chaotically mixed rocks. Between Monterey and Santa Barbara they are forming steep sloping coastlines which are not very stable because of the soft rocky material.
Plate tectonics relation: Along the Pacific coast of North America subduction takes place, accompanied by strike-slip faulting (San Andreas fault system) and adjacent magmatism (e.g. Yosemite granites). Further east the Earth surface underlies stretching until a depth of several kilometers (see Death Valley).

3.3. Plate tectonics

Devils Tower

Autor: K. Goth (from GK-2014-10)

a

b

Like a gigantic conically striped cupola the rock of Devil's Tower (Wyoming) is pointing into the sky. The monolith is ca 265 m high with a diameter of about 150 m. The first mounting took place on 4th July 1893 using a wooden ladder.

Plate tectonics relation:

The magmatic origin of the rock is connected to the rise of the Rocky Mountains chain about 60 million years ago. East of the rising mountain chain the stretching of the Earth crust formed smaller mountains and elongated valleys and gave way to the magma creating volcanoes.

3.4. Plate tectonics/Erosion & Sedimentation

Minerva Terrassen Yellowstone
Yellowstone National Park, Mammoth Hot Springs, Montana. Autor: geoskript (from GK-2005-12)

a

b

The travertine terraces of Mammoth Hot Springs are resulting from slowly but steady running hot water enriched by carbon dioxide (CO_2) from the surrounding volcanic rocks. This acidic water leaches calcium carbonate ($CaCO_3$) from relatively soft calcitic rocks. When the water cools the carbonate precipitates as travertine.

Plate tectonics relation: The Yellowstone volcanism results from a hot spot (like the one of Hawaii, but beneath a continent) with its older part in the West, the Columbia River basalts.

Erosion & Sedimentation:Today's volcanic activity in the Yellowstone area is restricted to gases and hot water eruptions (geysir). The hot slowly running water gets acid by volcanic gases and while circulating through calcitic rocks it solves carbonate which precipitates after cooling forming travertine.

3.5. Plate tectonics/Erosion & Sedimentation/Climate Change

Zabriskie Point
Autor: geoskript (from GK-2012-08)

a

b

Coming from the east along the Highway 190 Zabriskie Point is the first view point into the Death Valley (California). The pronounced spike of Manly Beacon is situated among the lake sediments of the Pliocene Furnace Creek formation.

Plate tectonics relation: The North-South trending valley is due to to the stretching of the Earth's surface east of the subduction zone of Pacific oceanic crust and the North American continental crust. The valley floor marks the deepest point on the North American continent (-86 m).
Erosion & Sedimentation: Subsidence of the valley floor led to the accumulation of sediments originating from the surrounding mountains.
Climate Change aspects: The valley is one of the hottest and driest places on the continent (56,8°C/134°F). Precipitation is sparse and rainfalls are evaporating to build rare salt deposits.

3.6. Plate tectonics/Erosion & Sedimentation/Climate Change

Bryce Canyon

Bryce Canyon National Park, Utah, USA. Autor: geoskript (from GK-2005-12)

a

9

b

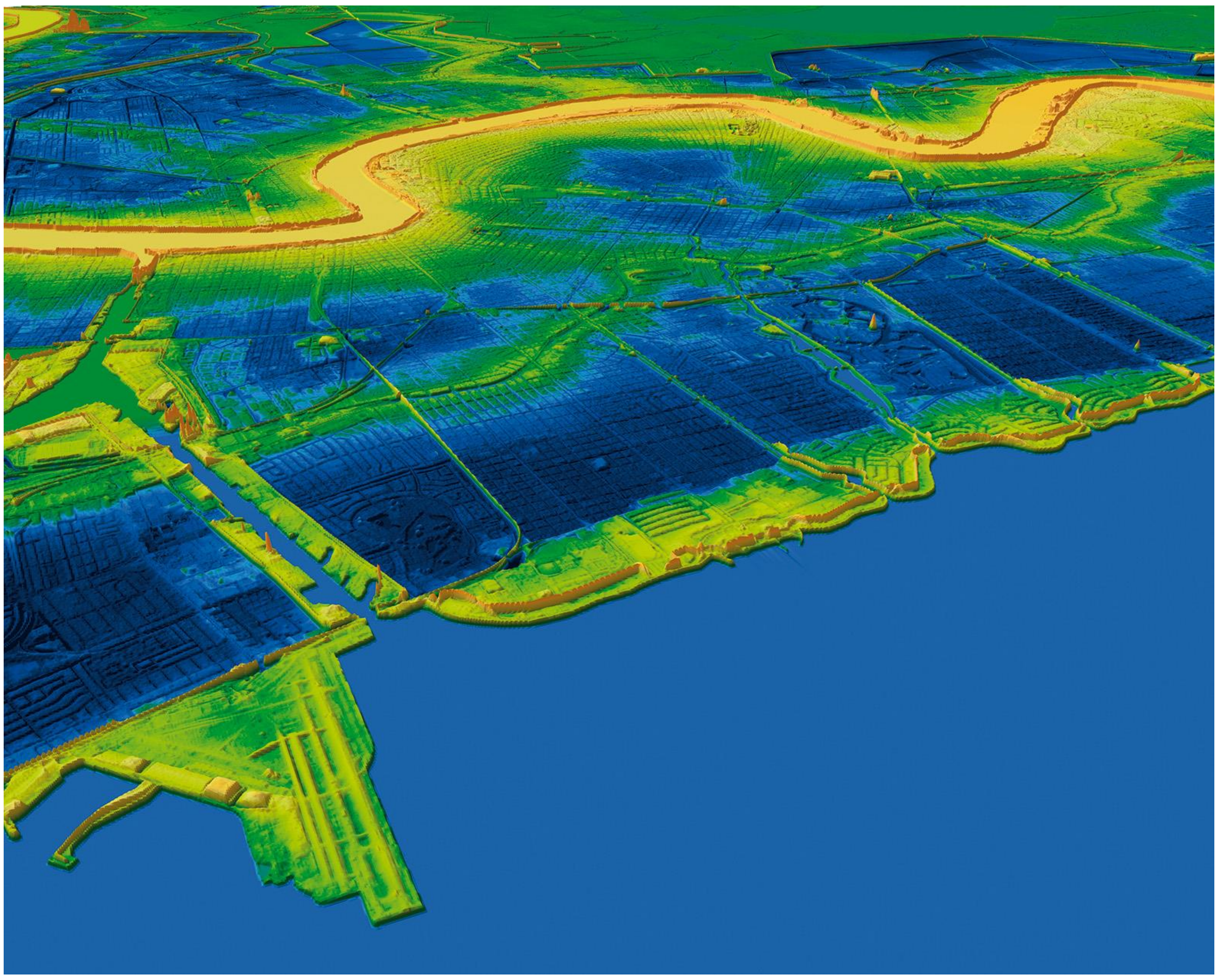
Depending on the resistance against weathering the different sediment layers are eroded more or less rapidly. The harder a layer the longer it takes to remove it. Those hard layers protect the underlying more softy layers against destruction and the columns last longer.

Plate tectonics relation: When the Colorado Plateau was uplifted (around 60 million years ago) and the Rocky Mountains came up deep reaching faults were created, too. They cut the Colorado Plateau and the drainage system of the rivers had changed dramatically. At the place of today's Bryce Canyon a lake was build and over several million years filled with sediments.

Erosion & Sedimentation: The former lake sediments are weatherd by rain and wind forming irregularly shaped columns according to the resistance of the different layers against erosion.

Climate Change aspects: The different layers of the lake sediments tell stories about wetter and dryer climate in the past. Today the regional climate system is semi-arid with long periods of draught and short but heavy rainfall within only a few months.

3.7. Erosion & Sedimentation



Mississippi-Delta-Schema

Autor: USGS NED 1999/DLR (from GK-2010-03)

a

b

The colored contour model shows the surroundings of New Orleans, the city area lying below sea level (blue color). The airport area, reaching into Lake Pontchartrain, is heaped up. Color scheme: light blue = sea level; green and yellow = above sea level; blue = below sea level.

Erosion & Sedimentation:

The 6420 km long Mississippi River drains the Great Planes in the central USA thereby taking fine sediments along its way carrying them to the mound into the Bay of Mexico south of New Orleans. In front of the coast the sediments piled up to a cone of 12 km heights. This accumulated weight presses the crust down, resulting in a slow downgoing of the adjacent land with the city of New Orleans.

3.8. Erosion & Sedimentation/Climate Change

Niagara Falls
Ontario, Kanada and New York, USA. Autor: geoskript (from GK-2005-00)

a

b

View from the viewpoint platform on the Canadian side of the river to the east over the Horseshoe Falls.

Erosion & Sedimentation: The short river (less then 60 km) between Lake Erie and Lake Ontario drains the Great Lakes and runs over rocky layers of Paleozoic age consisting of (from top to down) dolomitic and calcarious carbonates, shists and sandstones. The dolomites are more resistant against erosion than the underlying shists. When the dolomites build a hanging wall it needs not much force to break this layer by retreating the Falls further west and the river-length is shortend again.

Climate Change aspects: After deglaciation of the northern hemisperic ice-sheet the melting water was collected in depressions and created the five Great Lakes in the northern USA - the Lakes Superior, Michigan, Huron, Erie and Ontario.

3.9. Erosion & Sedimentation/Climate Change

Utah
Autor: D. Bannert (from GK-2007-11)

a

b

For the Navajos the 90 m high natural bridge formed in light-red Navajo sandstone is a sanctuary called Rainbow Bridge. Visiting is only permitted by the Navajo people.

Erosion & Sedimentation: The sediments forming the Navajo sandstone were built 300 million years ago in a desert environment. Due to the weight of overlaying sediments in deeper layers compaction structures occurred resulting in arch-like features. After exposing the rock to the surface again the river washed out the sediments but this arch-like structure was left because of being hardened by the compaction and therefore more resistant against erosion by the running river.

Climate Change aspects: Today the climate regime in this region is characterized by long periods of draught and short but heavy rainfalls within only a few months. These heavy rainfalls wash away every loose sediment and wash out the riverbeds.

3.10. Erosion & Sedimentation/Climate Change

White Sand Dunes
Autor: T. Thielemann (from GK-2007-02)

a

b

The landscape in the Tularosa Valley (New Mexico) is dominated by up to 15 m high dunes of gypsum covering an area of 600 square kilometers.

Erosion & Sedimentation: Surrounding the Tularosa Valley are sediments of Permian age (about 250 million years old) containing gypsum evaporated from brackish lagoon water long time ago. A certain amount of the gypsum in the Tularosa Valley was weathered and eroded from these Permian sediments and accumulated first in lake water and later in lake sediments.

Climate Change aspects: Few millions years ago the climate in this region was much wetter than today and there was a lake instead of a desert. The lake dried out and a white layer of gypsum remained. Today's dry climate and the wind conserve the desert condition.

3.11. Plate tectonics/Erosion & Sedimentation/Climate Change

Alaska-Permafrost
Imnavait Creek, Brooks Range, Alaska. Autors: J. Boike und P.P. Overduin
(from GK-2008-06)

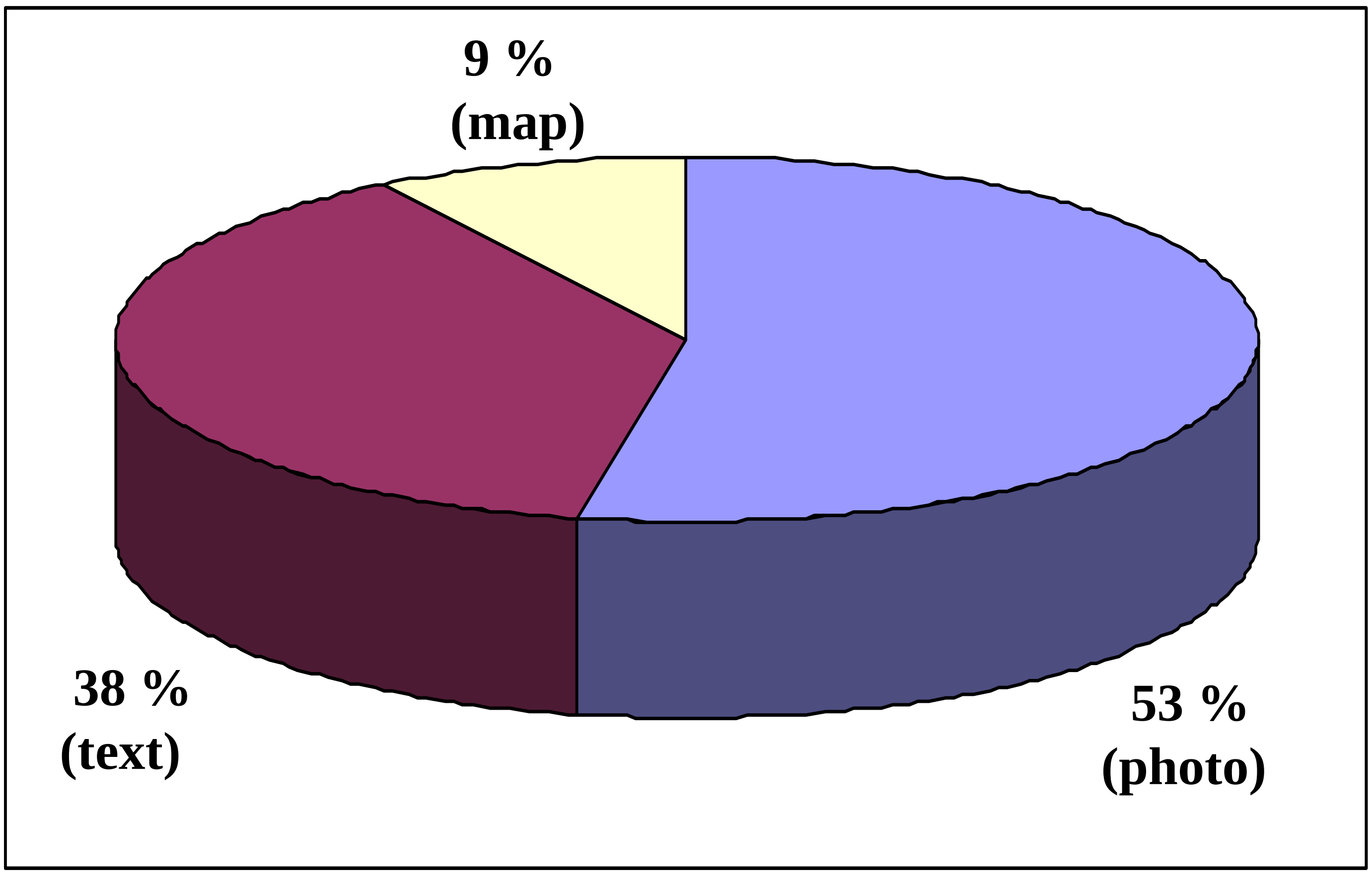
a

b

View from a camera fixed on a balloon flowing high above the Imnavait Creek in early summer when the water of thawing permafrost is collecting in water-holes down to 2 m deep. This phenomenon is called beaded stream.

Climate Change aspects:
Those beaded streams are common in Arctic summer when the upper layer of the frozen soil is thawing.

4. Semiotic potencial of the photoatlas



a

b

Syntactic profile of the photoatlas

facade
18 %

core
69 %

addition
13 %

5. About the authors/Impressum/References

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a

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b

Impressum

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Dresden 2017, 16 p.

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