International Geomorphology Week 2021

Virtual Round Table organised by the IAG Working Group on Denudation and Environmental Changes in Different Morphoclimatic Zones (DENUCHANGE)

4 March 2021, 15:00-17:30 CET

Meeting programme

Public discussions on:

- Presented DENUCHANGE field test sites (catchment systems), field activities, field measurements, and catchment information and data from these field test sites. Selected field test sites are presented by Achim A. Beylich, Irene Bollati, Dongfeng Li, Luca Mao and Olimpiu T. Pop;
- The creation of a DENUCHANGE field test site database, field test site volume and video/multimedia presentation;
- Multi-authored DENUCHANGE synthesis papers led by (i) Achim A. Beylich and (ii) Joanna Gudowicz, Małgorzata Mazurek, Zbigniew Zwoliński (SWAT modelling) on drivers of contemporary denudation rates in different morphoclimates including field data and information from DENUCHANGE field test sites;
- The multi-authored DENUCHANGE synthesis paper on *Denudation, global change and the Anthropocene* led by Antonio Cendrero, Juan Remondo and Luis Forte;
- Possible other DENUCHANGE synthesis or review papers prepared by the group.

Meeting summary

The IAG DENUCHANGE Virtual Round Table included a range of presentations and in-depth discussions. In total 23 scientists from 12 different countries participated in this virtual event.

Selected DENUCHANGE field test sites were presented by Achim A. Beylich (field test sites Erdalen, Bødalen and Upper Driva in Norway), Irene Bollati (field test site Alpe Veglia in Italy), Dongfeng Li (field test site Tuotuohe headwater of the Yangtze river in China), Luca Mao (field test site Estero Morales basin in Chile) and Olimpiu T. Pop (field test site Neagra catchment in Romania). The presented field sites showed examples of DENUCHANGE field test sites with existing (longer-term) data records on denudational processes (Erdalen, Bødalen, Tuotuohe headwater, Estero Morales basin) and field test sites that are either in an early stage of field measurements or where field studies on denudation are just starting (Upper Driva, Alpe Veglia, Neagra catchment).

By 1 April 2021 the following 31 DENUCHANGE field test sites have been accepted and included in the DENUCHANGE field test site network:

Alpe Veglia (Italy)

Austdalur (Iceland)

Hrafndalur (Iceland)

Bødalen (Norway)

Erdalen (Norway)

Bystrzanka catchment (Poland)

Chwalimski Brook catchment (Poland)

Młyński Brook catchment (Poland)

Upper Parsęta catchment (Poland)

Parsęta drainage basin (Poland)

Djankuat (Russia)

Estaña catchment (Spain)

Barués catchment (Spain)

Barasona catchment (Spain)

Estero Morales basin (Chile)

Homla (Norway)

Kidisjoki (Finland)

Latnjavagge (Sweden)

Mascarat (Spain)

Quisi and Pou Roig (Spain)

Neagra catchment (Romania)

Selbusjøen drainage basin (Norway)

Sulden/Solda river basin (Italy)

Roasco d'Eita River (upper Grosina Valley) (Italy)

Upper Orcia River Basin (Italy)

Sullivan Creek (USA)

Tuotuohe headwater of Yangtze River (China)

Upper Driva (Norway)

Upper Chochołowski Stream catchment (Poland)

Chochołowski Stream catchment (Poland)

Starorobaciański Stream (Poland)

All colleagues that participate with defined and accepted DENUCHANGE field test sites will be invited to include their submitted information and to provide further material for the creation of a DENUCHANGE field test site database, a field test site volume and a video/multimedia presentation of DENUCHANGE field test sites.

It is still possible to submit completed DENUCHANGE field test site fact sheets to Achim A. Beylich (achim.beylich@gmail.com). Detailed information on the planned DENUCHANGE field test site database, field test site volume and video/multimedia presentation will be provided during the next IAG DENUCHANGE business meeting on 13 April 2021.

Colleagues that are contributing with defined and accepted DENUCHANGE field test sites are invited to participate with their catchment information and data in multi-authored DENUCHANGE synthesis/review papers led by (i) Achim A. Beylich (Drivers and rates of denudation in different morphoclimates) and by (ii) Joanna Gudowicz, Małgorzata Mazurek, Zbigniew Zwoliński (Results of the application of SWAT modelling to the analysis of contemporary denudation rates in the 11 DENUCHANGE field test sites (catchments) that are providing the data that are required for SWAT modelling; The use of SWAT modelling to analyze the impact of climate change on contemporary denudation rates in these 11 DENUCHANGE field test sites / catchments).

The colleagues that have submitted their completed DENUCHANGE test site fact sheets will be contacted by Joanna Gudowicz (two multi-authored synthesis papers including SWAT modelling with data from 11 DENUCHANGE field test sites) and Achim A. Beylich (multi-authored synthesis paper including catchment information and data from the 30 DENUCHANGE field test sites) soon.

A new draft of the multi-authored DENUCHANGE synthesis paper on *Denudation, global change and the Anthropocene* led by Antonio Cendrero, Juan Remondo and Luis Forte was presented and discussed during the meeting. An updated draft of this DENUCHANGE synthesis paper and a call for further comments and inputs to this synthesis paper will be circulated by Antonio Cendrero soon.

Suggestions for additional DENUCHANGE synthesis or review papers are welcome.

The next IAG DENUCHANGE business meeting will take place on 13 April 2021, 15:00-17:00 CEST. The ongoing discussions and activities will be continued during this upcoming virtual business meeting. Achim A. Beylich will invite to this virtual business meeting in the end of March.

Further information on the IAG Working Group on Denudation and Environmental Changes in Different Morphoclimatic Zones (DENUCHANGE) is found at the DENUCHANGE website under http://www.geomorph.org/denuchange-working-group/.

Selbustrand, 1 April 2021

Achim A. Beylich

Appendices:

- IAG DENUCHANGE Working Group Objective (by November 2018)
- IAG DENUCHANGE Test Site Fact Sheets A and B

IAG DENUCHANGE Working Group Objective (by November 2018)

The key question of DENUCHANGE is:

What are the contemporary chemical and mechanical denudation rates in different morphoclimatic zones on the Earth?

Denudation, including both chemical and mechanical processes, is of high relevance for Earth surface and landscape development and the transfer of solutes and sediments from headwater systems through main stem of drainage basin systems to the world oceans. Denudation is controlled by a range of environmental drivers and can be significantly affected by anthropogenic activities.

The better understanding of possible effects of ongoing and accelerated environmental changes on present-day denudation requires systematic and quantitative studies (environmental monitoring) on the actual drivers of denudational processes. Only if we have an improved knowledge of drivers and quantitative rates of contemporary denudational hillslope and fluvial processes as well as of the (dis)connectivity in landscapes and between hillslope and fluvial systems across a range of different selected climatic environments, possible effects of global environmental changes on denudation can be better assessed. Special focus will be given to selected morphoclimatic zones that are expected to react particularly sensitively to ongoing and accelerated environmental changes, and the key focus of DENUCHANGE will therefore be on (i) cold regions (including glacierized, glaciated and unglaciated cold climate environments), (ii) temperate regions, (iii) arid / semi-arid regions and (iv) tropical regions. The different morphoclimatic zones are defined by morphometric characteristics/signatures detected in the various zones.

DENUCHANGE will

- Provide a detailed compilation and comparison of contemporary chemical and mechanical (drainage-basin wide) denudation rates in selected and clearly defined drainage basin systems in selected cold regions, temperate regions, arid / semi-arid regions and tropical regions worldwide. As denudation is scale-dependent, the selected drainage basin systems will be of a defined and comparable size to allow direct comparisons between the drainage basin systems situated in the different morphoclimatic zones. The existing/available and compiled data on contemporary chemical and mechanical denudation must be based on comparable sampling periods, sampling frequencies, and on comparable monitoring methods and techniques applied.
- Provide a process-oriented, coordinated and integrated analysis and compilation of the respective key drivers of contemporary denudation occurring under the different present-day morphoclimates.
- Based on the previous two compilations: Address the key question how environmental changes are affecting contemporary denudation rates in different morphoclimates. This also includes human activities in different morphoclimatic zones, in the context of environmental changes in the Anthropocene.

Table 1. IAG DENUCHANGE Test Site Fact Sheet A (compiled by A.A. Beylich)

Parameter	***Information***	***Additional comments (if applicable)***
DENUCHANGE test site (catchment/field site name and country where the test site is located)		
Climatic zone/region		
Responsible investigator (name, postal and e-mail address of contact person)		
Are the requested data for SWAT modelling available (see **Table 2**) (yes/no)? If **yes**, please complete also **Table 2**.		
Period of (field) investigations (years, seasons)		
Geographical coordinates for studied catchment/field site		
Catchment area (km^2)		
Lithology within the catchment area		
Elevation range of catchment (m a.s.l.)		
Topographic relief (m)		
Mean slope angle within the catchment (°)		
Relevant sinks / storage elements within the catchment area (both natural and man-made sinks, e.g. reservoirs)		
Glacier coverage (yes/no); if yes, surface area with glacier cover (% of total catchment surface area)		
Surface area with bedrock surfaces (% of total catchment surface area)		
Surface area with sedimentary covers (% of total catchment surface area)		
Vegetation coverage in surface areas with sedimentary covers (type of vegetation and % of surface area covered by vegetation)		

Permafrost (yes/no); if yes, surface area with permafrost (% of total catchment surface area)		
Is environmental change visible (yes/no); if yes: Type of climatic changes visible; types of land use; Direct human impact (yes/no); if yes, please describe briefly		
Mean annual air temperature (°C)		
Annual precipitation (mm)		
Runoff period		
Runoff regime		
Annual solute yield (atmospherically corrected) ($t\ km^{-2}yr^{-1}$)		
Annual suspended sediment yield ($t\ km^{-2}yr^{-1}$)		
Annual bedload yield ($t\ km^{-2}yr^{-1}$)		
Description of types of data used for quantifying denudation rates; methods and techniques applied or reference(s) to published methods descriptions (methods/techniques used for quantifying fluvial transport and/or yields)		
Most important slope processes within the catchment		
Most important sediment sources for fluvial transport		
Any other relevant catchment information		
Relevant publications and/or sources related to the information/data provided		

Table 2. IAG DENUCHANGE Test Site Fact Sheet B: Requested catchment data for SWAT modelling (Table compiled by Joanna Gudowicz, Małgorzata Mazurek and Zbigniew Zwoliński)

1. Hydrological data: daily discharge and suspended load at the closing point of catchment - based on this data the model will be verified:

NO	
YES	Average daily discharge [m^3 s^{-1}] - time range of measurements: from ..... to ..... Concentration of suspended load [mg dm^{-3}] - time range and frequency of measurements: from ..... to .....; frequency (daily, monthly etc.): ..... Other ..... (e.g. concentration of dissolved load, concentration of bed load, organic nitrogen, organic phosphorus, mineral phosphorus, nitrate, nitrite, ammonium) Yes / No - time range and frequency of measurements: from ..... to .....; frequency (daily, monthly etc.): ..... - time range and frequency of measurements: from ..... to .....; frequency (daily, monthly etc.): ..... ….

2. Meteorological data:

NO	
YES	Sum of precipitation falling during the day [mm]: Yes / No - time range of measurements: ..... Daily minimum temperature [°C]: Yes / No - time range of measurements: ..... Daily maximum temperature [°C]: Yes / No - time range of measurements: ..... Daily average wind speed [m s^{-1}]: Yes / No - time range of measurements: ..... Daily average relative humidity [%]: Yes / No - time range of measurements: ..... Daily total solar radiation [MJ m^{-2}]: Yes / No - time range of measurements: .....

For modeling to be comparable among different catchments, the spatial input data, i.e. DEM, soils, types of land cover and land use should have the same quality. The following questions will help to unify the structure of input data to the model, which will allow comparability of results between catchments:

1. Digital Elevation Model (DEM)

NO	
YES	Data based on: LIDAR / contour map / field measurements / other: ..... Spatial resolution of data: .....

2. Land Cover and Land Use map (LULC)

NO	
YES	Data based on: database / satellite image / aerial photo / topographic map / field measurements / other: ..... Spatial resolution (raster data) or scale of data (vector data): .....

3. Soil map

NO	
YES	Data based on: database / satellite image / aerial photo / thematic map / field measurements / other: ..... Spatial resolution (raster data) or scale of data (vector data): .....

4. Hydrographic network

NO	
YES	Data based on: database / satellite image / aerial photo / topographic map / field measurements / other: ..... Spatial resolution (raster data) or scale of data (vector data): .....