

Master thesis:

Soil erosion rates in an old-growth mountain temperate forest driven by tree uprooting dynamics in the Wind River (State Washington, US)

Background and aim of the thesis

Tree uprooting (as macro-bioturbation process) may distinctly affect soil and landscape dynamics. Little is known so far about the corresponding soil redistribution rates (soil erosion, soil accumulation). Tree uprooting disrupts the progressive process by affecting organic matter decomposition, mineral alteration, leaching, water flow and physical processes in soils. Tree uprooting represents a crucial biomechanical effect of biota in many forested landscapes, particularly in regions having old-growth and primeval forests. Even in flat areas with no overall lateral movement, uprooting affects main soil characteristics by mixing soil horizons that were originally systematically stratified.

The thesis therefore should aim at quantifying soil erosion and deposition caused by tree uprooting in an old-growth forest in the Wind River (state Washington, USA). Erosion and redistribution rates will be detected by using Pu- (no worries – no danger in the lab!) and ^{10}Be .



Fig. 1. Undisturbed and disturbed soil profiles in a primeval forest together with an example of a tree uprooting

Framework of the study

The thesis is embedded in a running project (funded by the Czech National Foundation) with partners from the University of Zurich (Prof. Markus Egli), the University of Brno (Prof. Pavel Samonil; <https://www.naturalforests.cz/samonil-pavel>) and several partners of the Global Forest Research Network (see below).

The project has the title “The mystery of biogenic soil creep: the biogeomorphic role of trees in

temperate and tropical forests and its ecological consequences". The general aim of this project is to assess the ability of trees to drive, modify and record hillslope processes under various disturbance regimes and to create a general conceptual model of biogenic creep.

The thesis is related to the following networks and institutions:

- Global Forest Research Network: <https://forestgeo.si.edu/>
- One plot of this global network is the Wind River Plot: <http://wfdp.org/>
- The Czech Research Institute for Forest Ecology (Silva Tarouca Research Institute); please see: <https://www.naturalforests.cz/>

What

If somehow feasible, your task would be to participate at the field campaign in the Wind River (state Washington, US). The field trip is planned for the following period: June 5 – 25, 2019.

In the field, soil profiles will have to be described (together with Prof. P. Samonil), coordinates be measured, settings to be described and samples to be taken. The soil samples can be processed thereafter upon personal temporal availability. The following analyses are planned: determination of bulk density, CN-analyses, ²³⁹⁺²⁴⁰Pu analyses (preparation of the samples; the analyses will be performed by a lab chemist). Based on the analytical results, erosion/deposition rates will have to be calculated.

Supervision

In the field: Prof. P. Samonil. The lab analyses will be carried out at the University of Zurich (under the supervision of Prof. M. Egli).

Requirements

We are looking for a motivated and pro-active student who likes to work in an international environment (communication basically in English; the thesis however can be written in German). Basics in soil science are necessary. An introduction into and guidance through all working steps will be given. Working place (lab): University of Zurich.

Most of the field and travelling costs will be covered.

Further information

If you are interested in joining this exciting project then please send a message to Prof. Markus Egli: markus.egli@geo.uzh.ch