Digging deeper

Connecting social and natural sciences for working carbon management options

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SP04

Carbon stocks, turnover and nutrient budget in soil along land-use and climatic gradients

Main Objectives:

(1) Determine the native C and nutrient stocks

(2) Analyze the temporal change in C and nutrient stocks

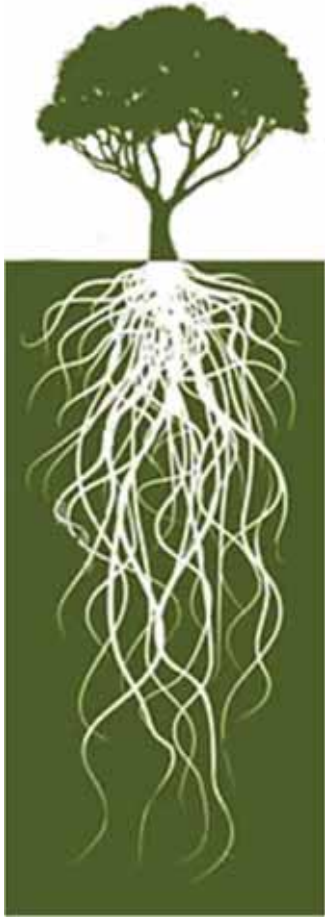
(3) Quantify SOM fractions und turnover rates

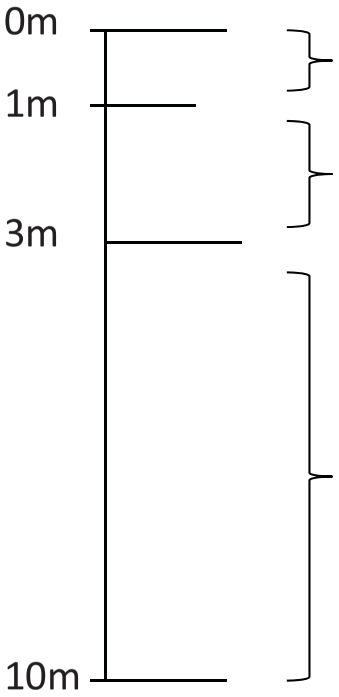
(4) Asses the influence of climatic and land-use change of SOM stocks and turnover-rate

Land use and carbon stocks

versus

Deep soil organic carbon





How much carbon is underestimated in global budgets by fixing a lower boundary at 1 m?

to be continued ;-)

?

Project description I

What is /are…

- the stocks of organic carbon?
- turnover rates / mean residence time of organic carbon?
- differences in the main organic matter fractions?
- factors influencing the availability of subsoil organic matter?
- stabilisation and destabilisation processes of soil organic matter?
- the fate of organic matter when soils are getting cultivated?

SP14

Analysis of challenges and chances of social transformation for GHG-optimized land and natural resource management strategies

Main Objectives:

(1) Work out a holistic understanding of societal processes in Carbiocial's research area

(2) Stakeholder involvement and communication

(3) Identification of change agents & stakeholder analysis

(4) Identification of relevant knowledge technologies

(5) Cooperation with diverse subprojects in the construction of viable future scenarios for the area of BR 163

Above the ground …

What are the…

- structures and channels of knowledge circulation and social innovations?
- strategies and experiences with participation in Public Policies?
- conditions of landuser‘s decisions?
- perspectives for the future of landusers at BR163?
- main actors of landuse (change), their networks and interactions?
- legal frameworks for land use?

Expedition – Digging deeper

Sample design I

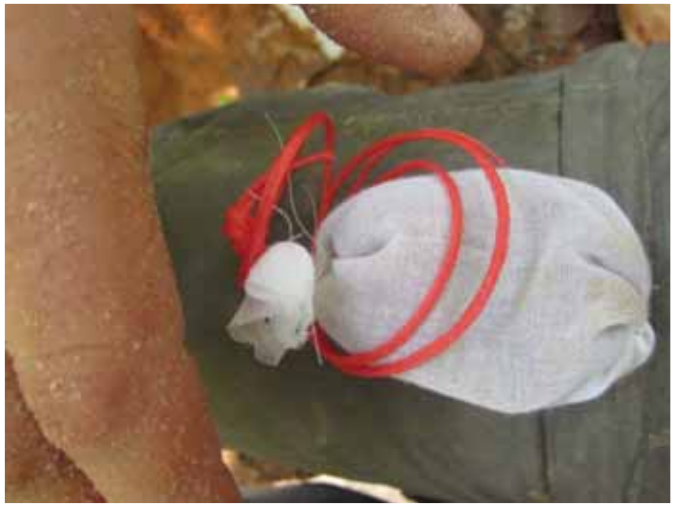
Soil profile description

Bulk densitiy determination down to 1m every 10 cm

9 auger holes down to 1m on a plot 100 x 100m in grid of 25m distance

Self-integrating accumulators - SIAs

SIA down to 10,50m



SIA close to the surface

SIAs

The 10m hole

Sample design II

Science and Technology Studies:

Researching knowledge production among soil scientists

Next steps

- Re-opening of 10-meter-hole to take out the SIA‘s
- Development of joint perspective on carbon management options
- Continuation of study on knowledge production among soil scientists
- Joint presentation and contextualization of results on deep carbon in indigenous villages

Interdisciplinarity

Natural Sciences follow space-related ecological questions

Social Sciences pose actor-related sociological questions

Interdisciplinarity

Natural Sciences follow space-related ecological questions

Consults Natural Science team on ecological system services

Consults Social Science team on societal processes

Social Sciences pose actor-related sociological questions

Interdisciplinarity

Social Sciences get sophisticated insights in ecological consequences of actors‘ behaviour

Consults Natural Science team on ecological system services

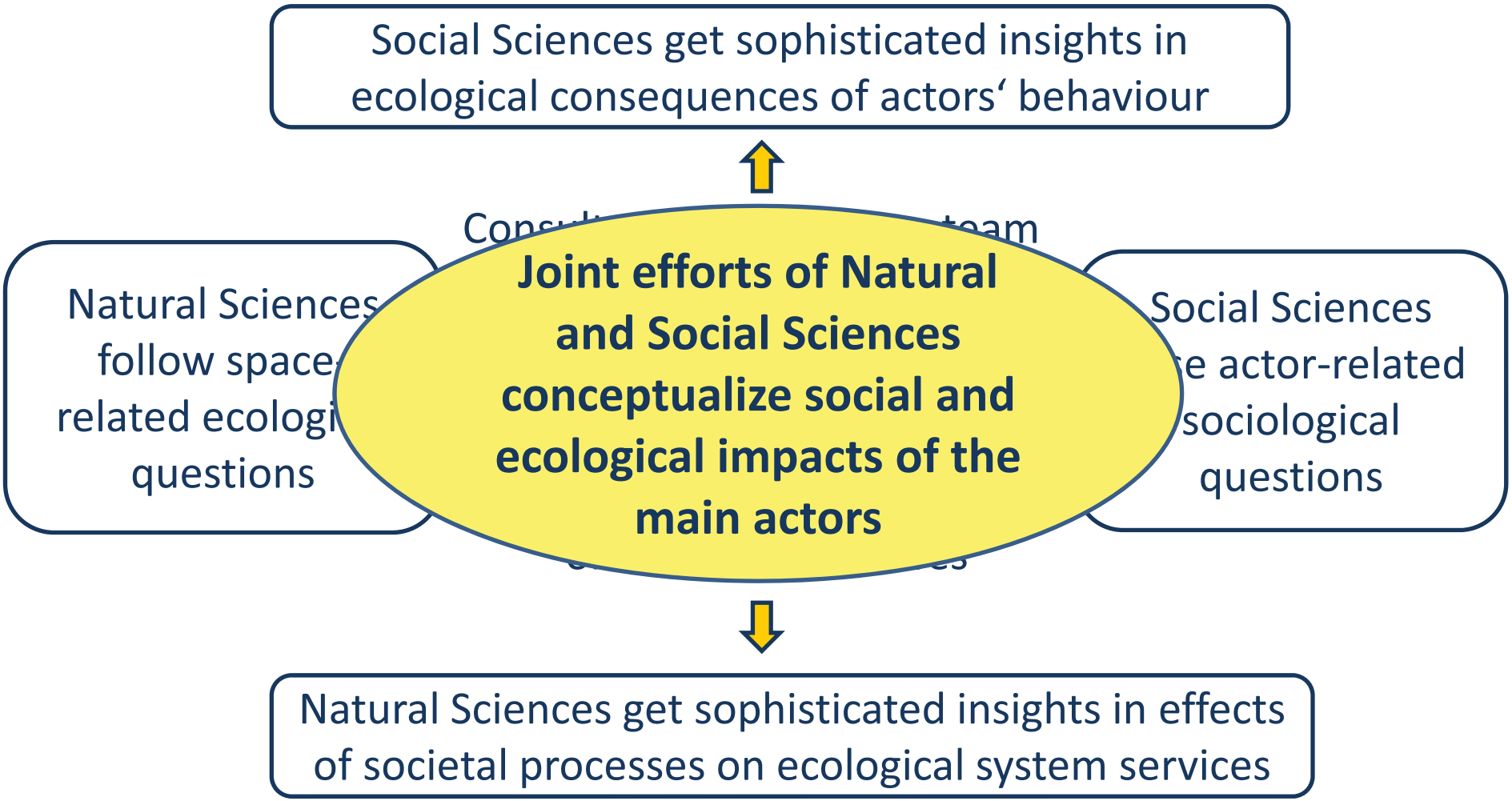
Natural Sciences follow space-related ecological questions

Social Sciences pose actor-related sociological questions

Consults Social Science team on societal processes

Natural Sciences get sophisticated insights in effects of societal processes on ecological system services

Interdisciplinarity



Interdisciplinarity

Joint efforts of Natural and Social Sciences conceptualize social and ecological impacts of the main actors

Natural Sciences realize the meaning and development trend of societal processes

Social Sciences realize the ecological effects of actors' behaviour

Interdisciplinarity

Joint efforts of Natural and Social Sciences conceptualize social and ecological impacts of the main actors

Natural Sciences realize the meaning and development trend of societal processes

Social Sciences realize the ecological effects of actors' behaviour

Natural Sciences are able to define more precisely optimum land use systems with respect to current and future social scenarios

Social Sciences are able to localise relevant actors with regard to ecological consequences of their behaviour on social processes

Interdisciplinarity

Natural Sciences are able to adopt choice of position and selection of sampling areas precisely to current and future social scenarrios

Social Sciences are able to localise relevant actors with regard to ecological consequences of their behaviour on social processes

More precise research with higher representativity and new research opportunities through synergy effects

Enabling of responsible research through joint efforts

Open questions for Carbiocial:

- Consequences for the discussion on land use change?
- Consequences for internal Carbiocial cooperations?

Carbiocial

NACHHALTIGES LANDMANAGEMENT

Thank you – the Digging deeper team

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

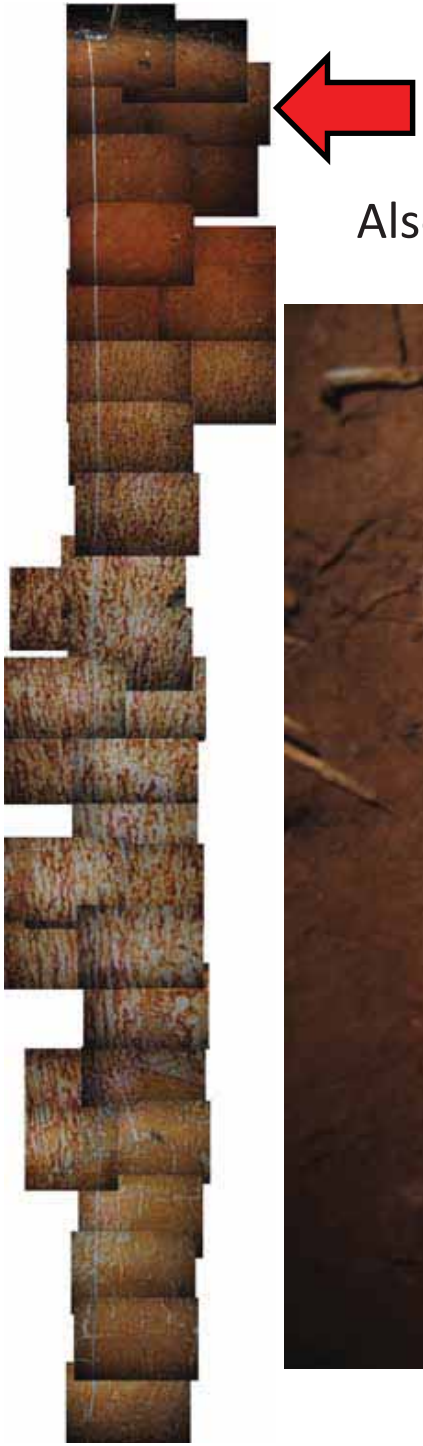
Leibniz Universität Hannover

Freie Universität Berlin

Join us now with the exploration of the deep hole

Exploration of the deep hole

Also under rain forest most of the carbon is found here



Exploration of the deep hole

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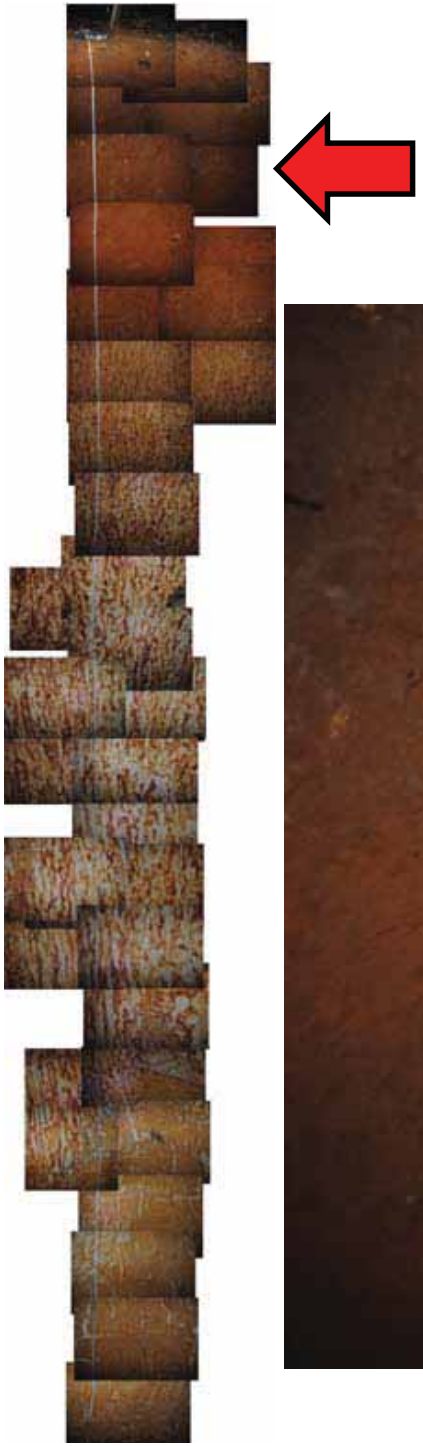

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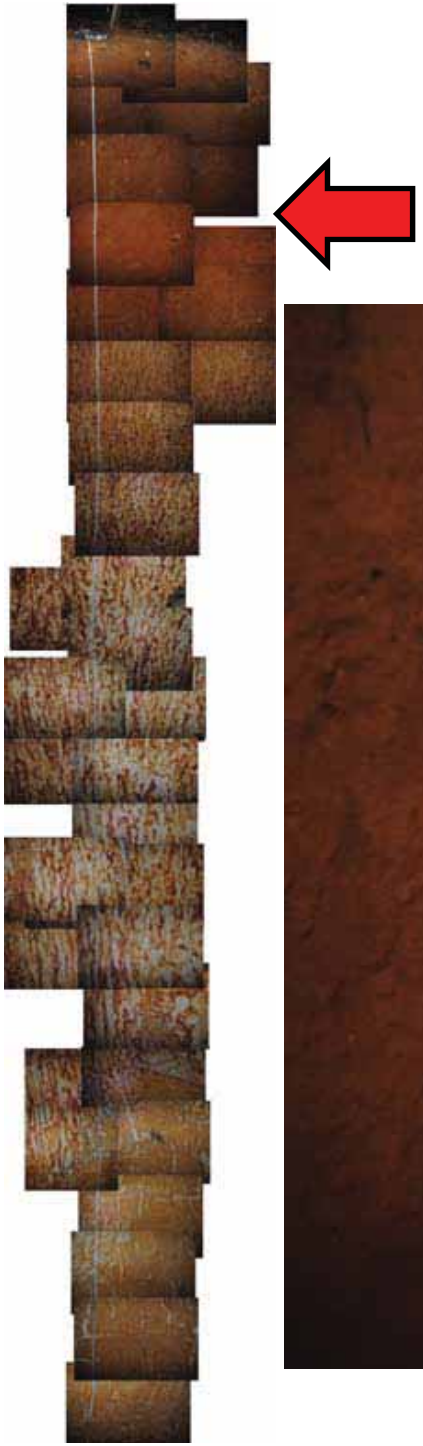

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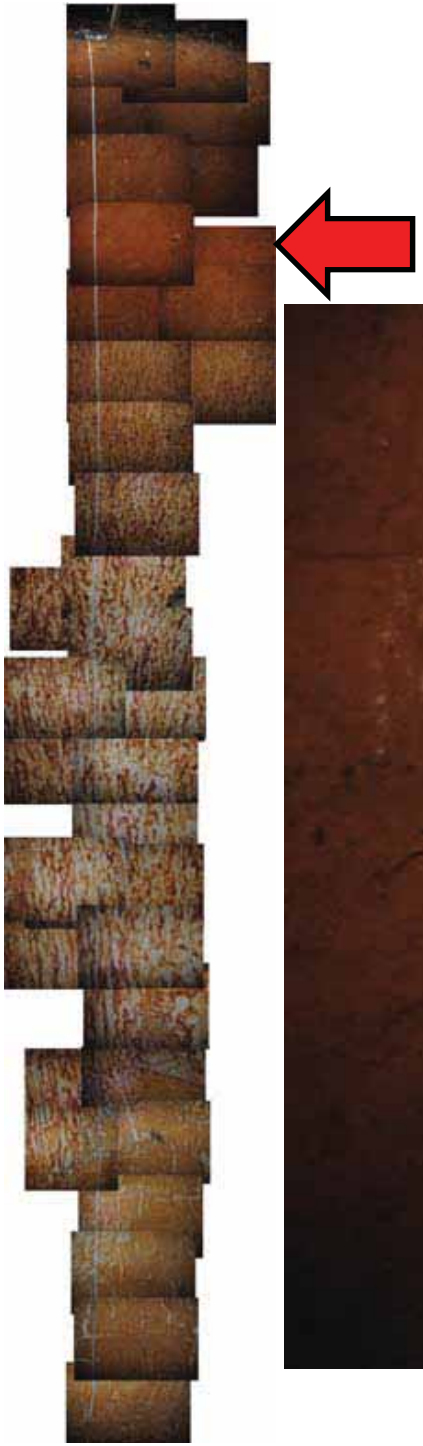

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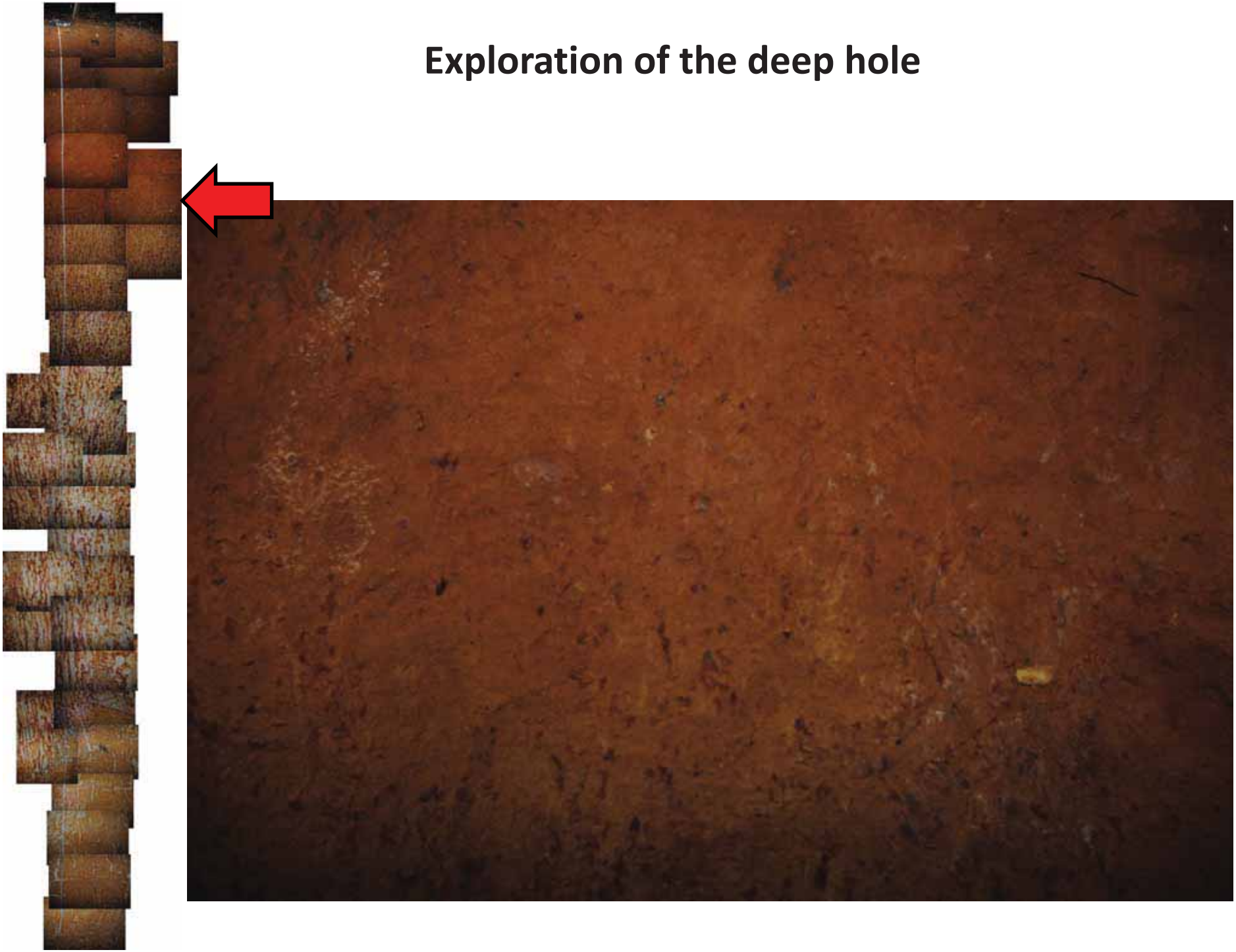
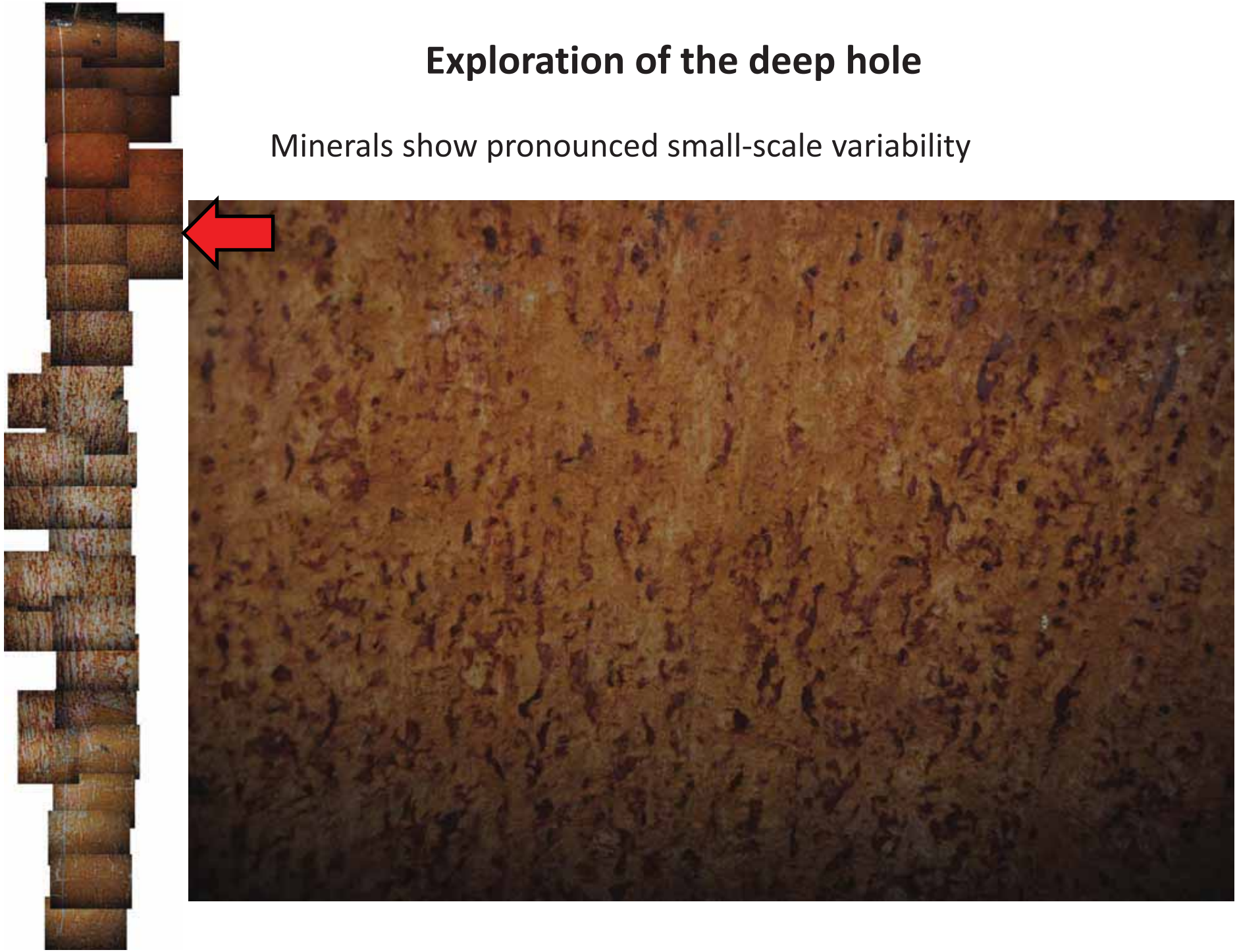


Exploration of the deep hole

Minerals show pronounced small-scale variability



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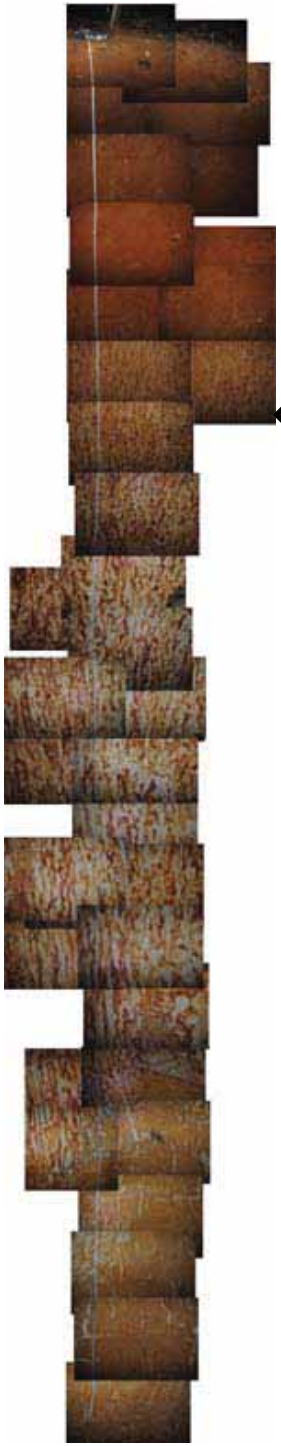
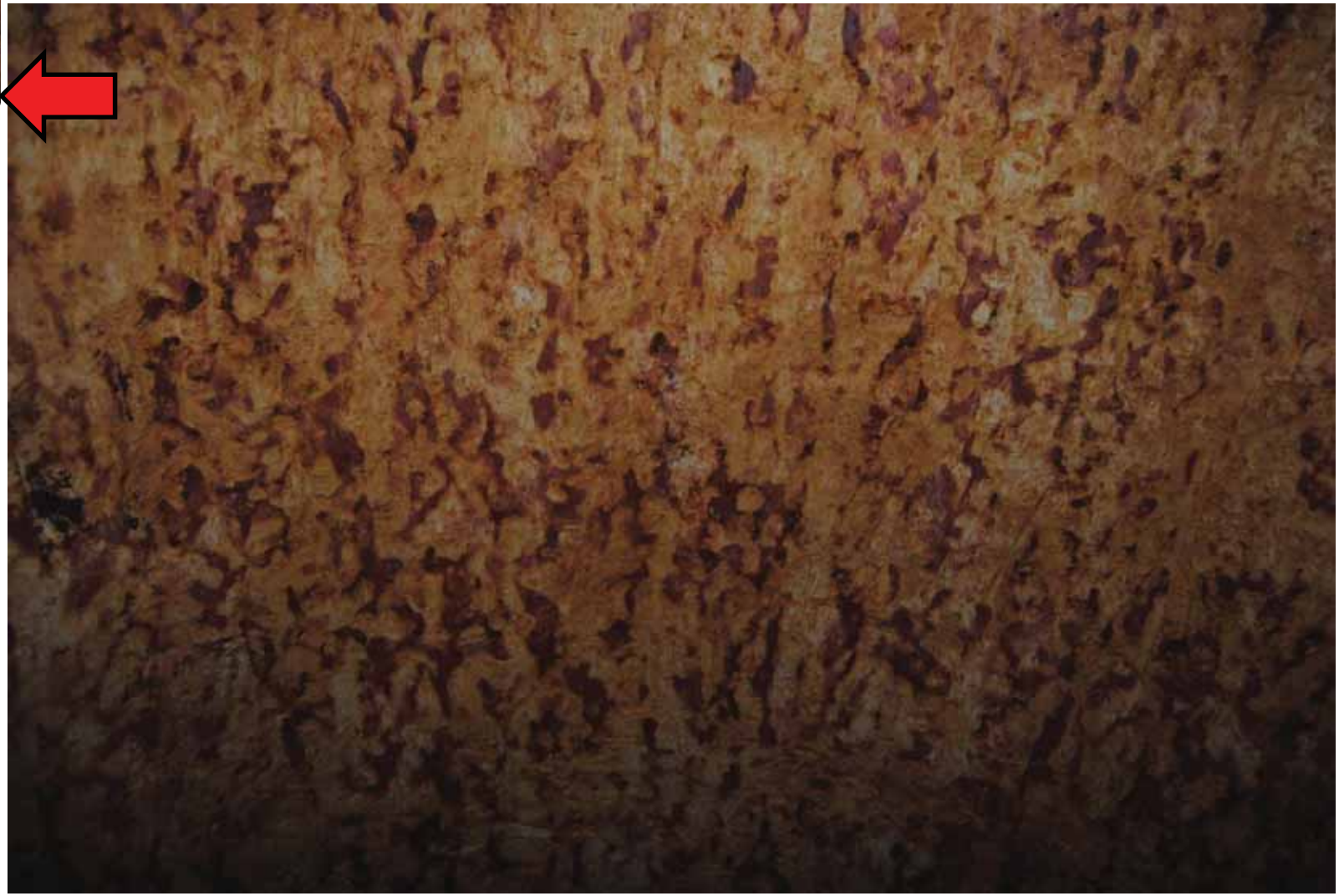
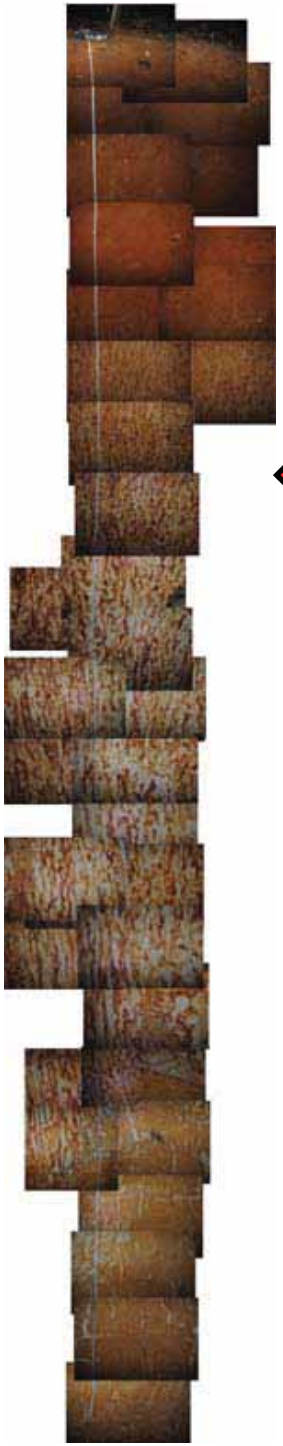
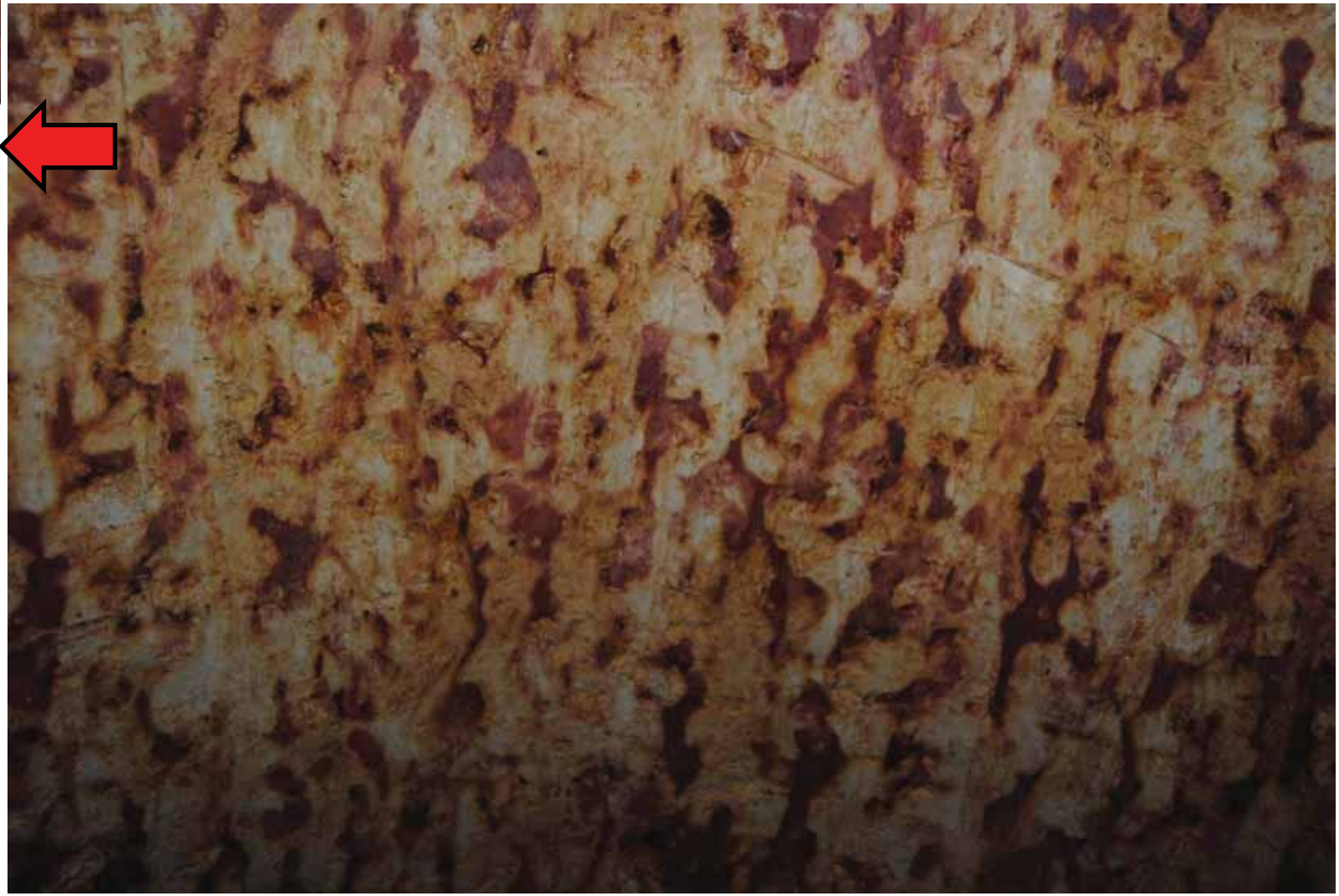




Exploration of the deep hole

Different iron oxides, aluminium oxide, and kaolinite





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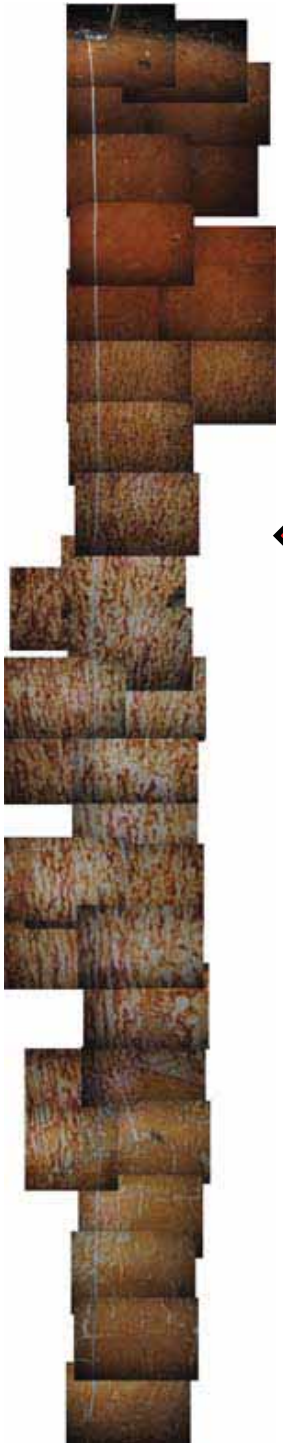
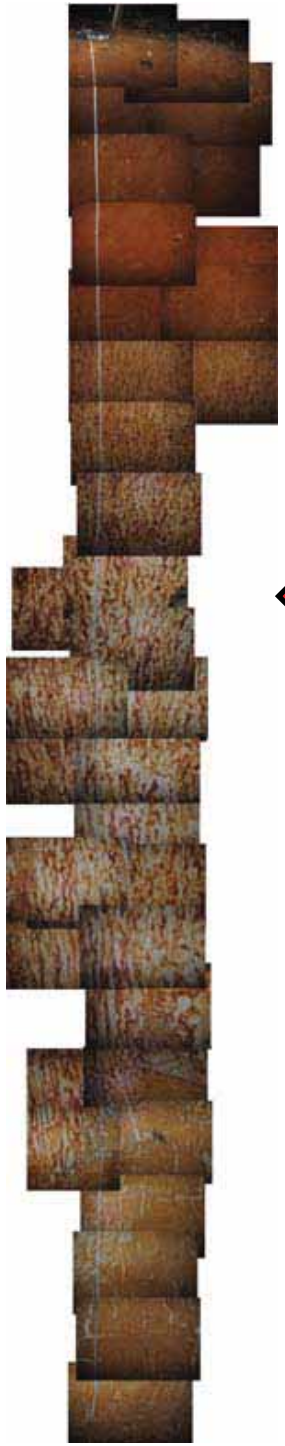
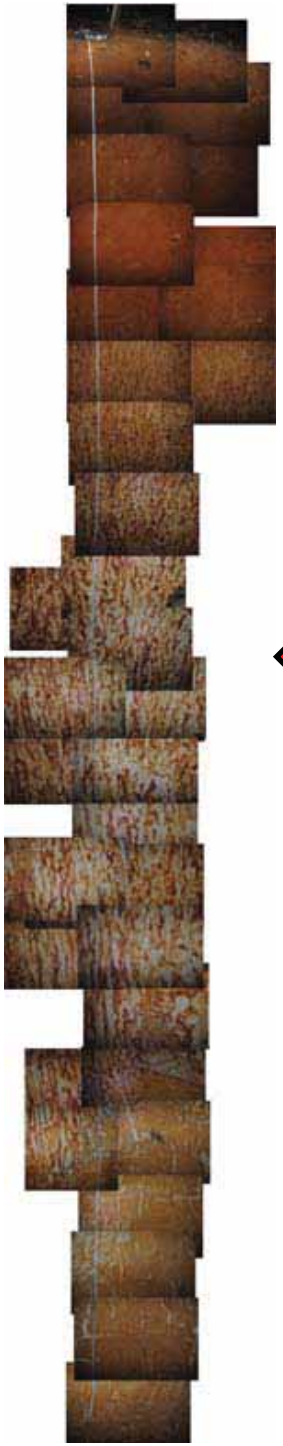


Exploration of the deep hole

Roots are still present

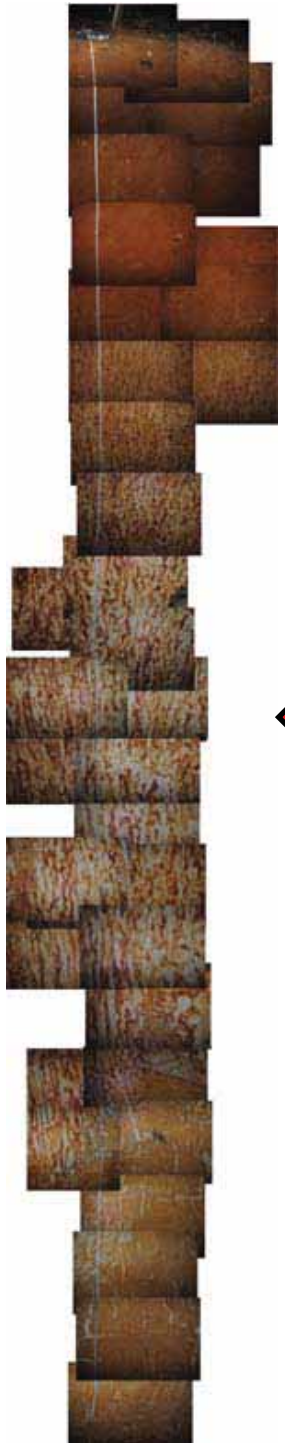




Exploration of the deep hole

From here on fungal partner are exploiting the soil

Exploration of the deep hole



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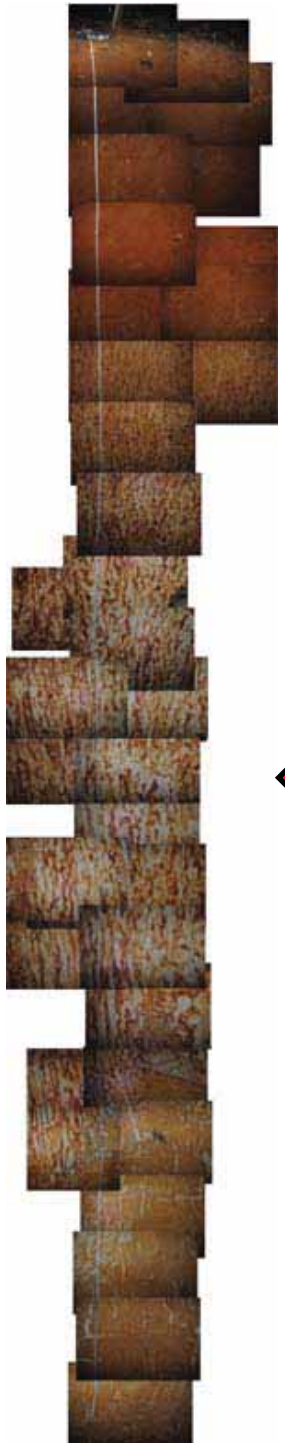

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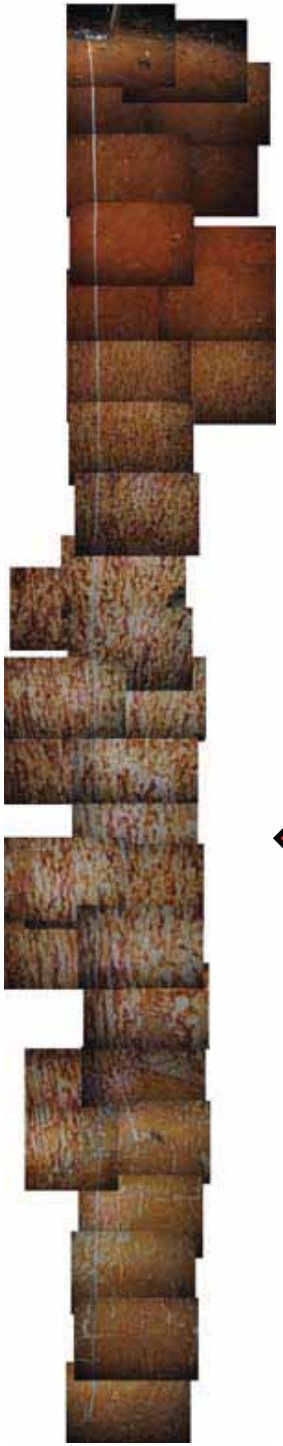

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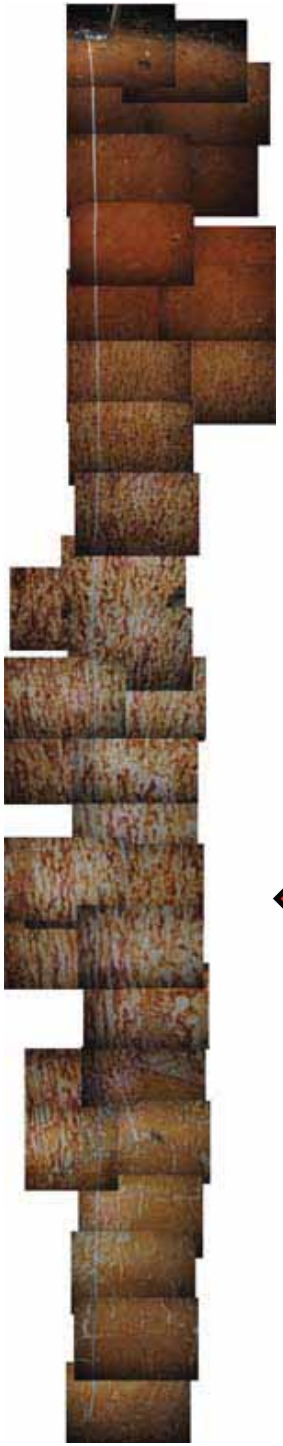

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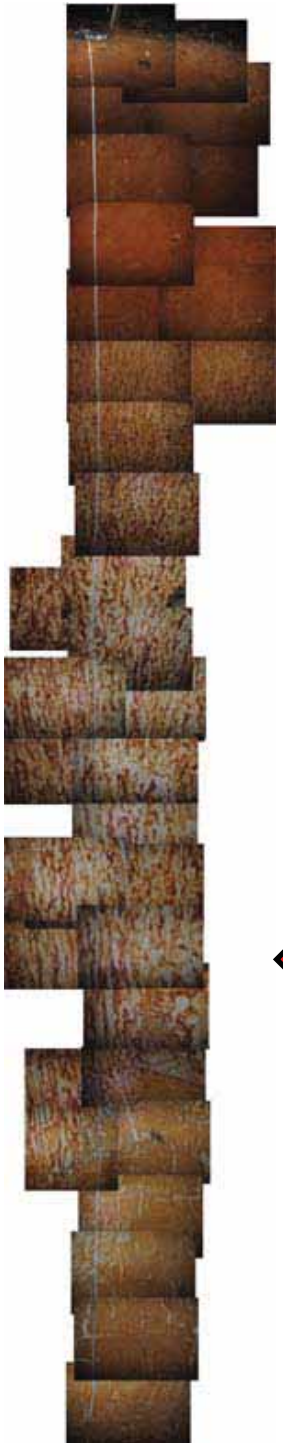

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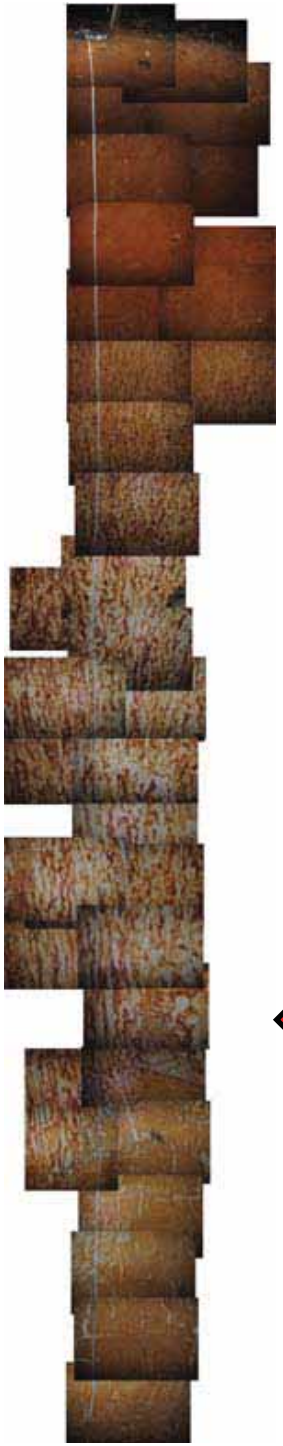

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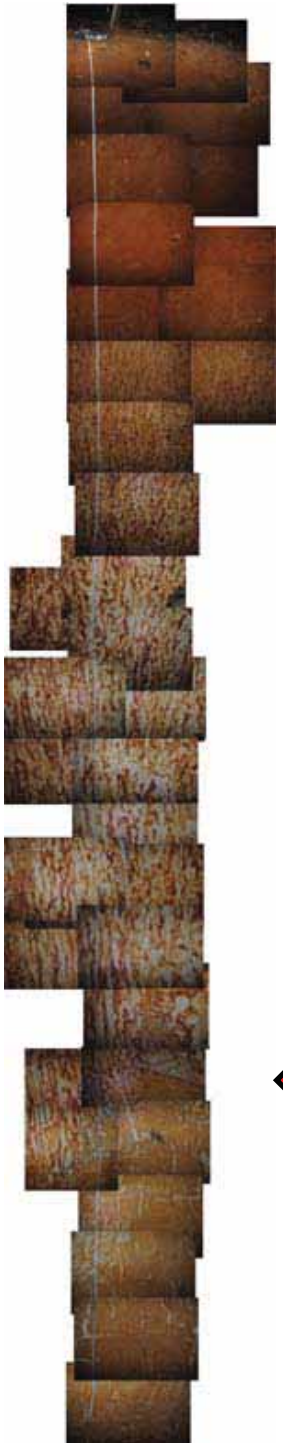

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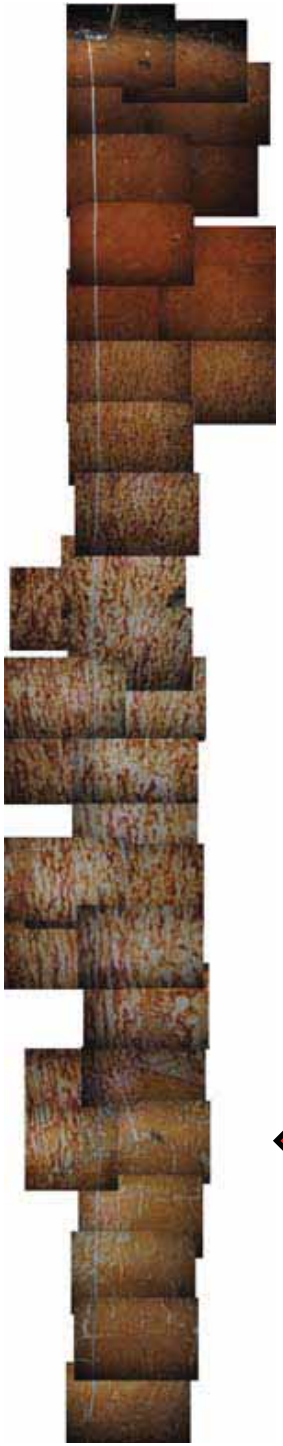

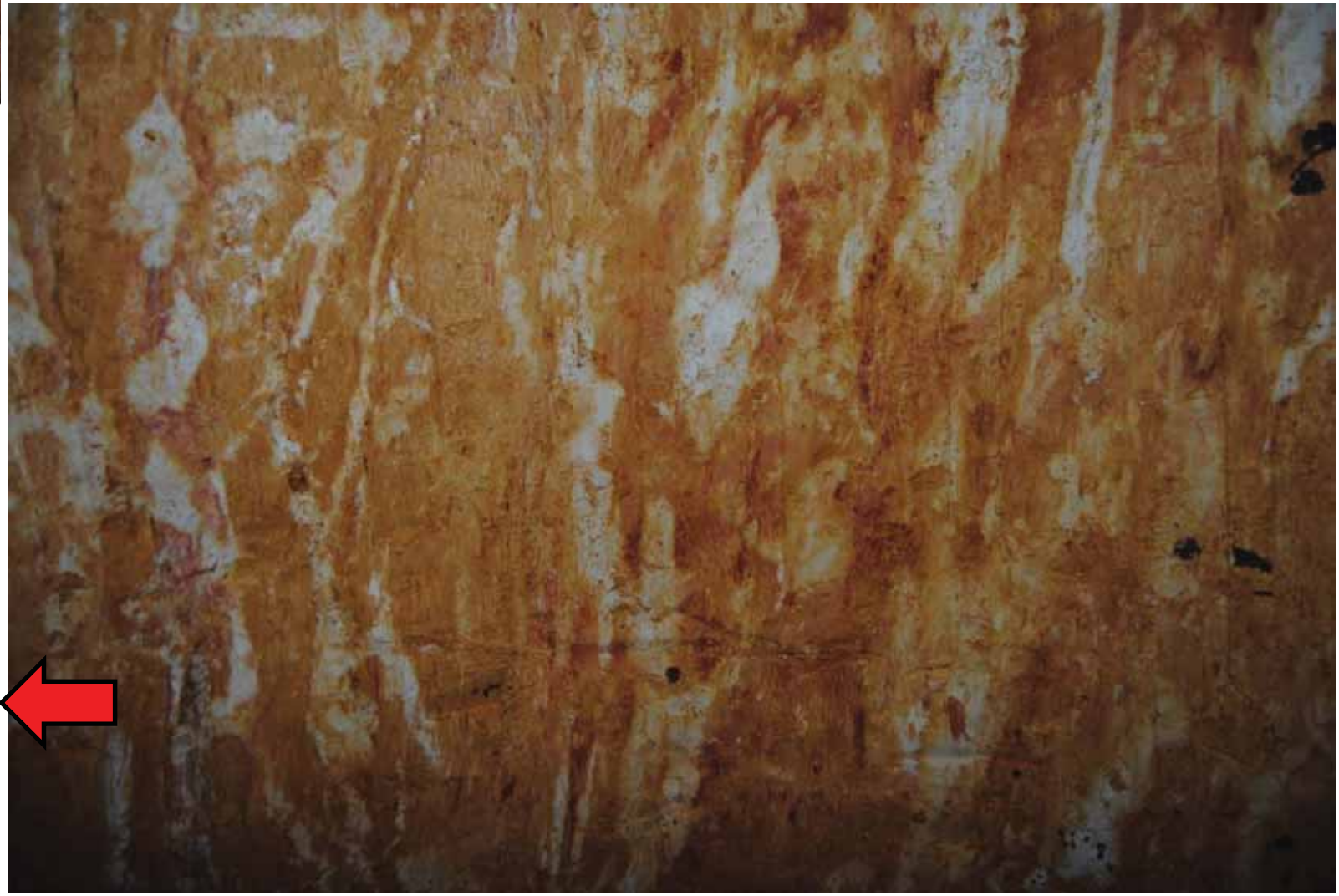

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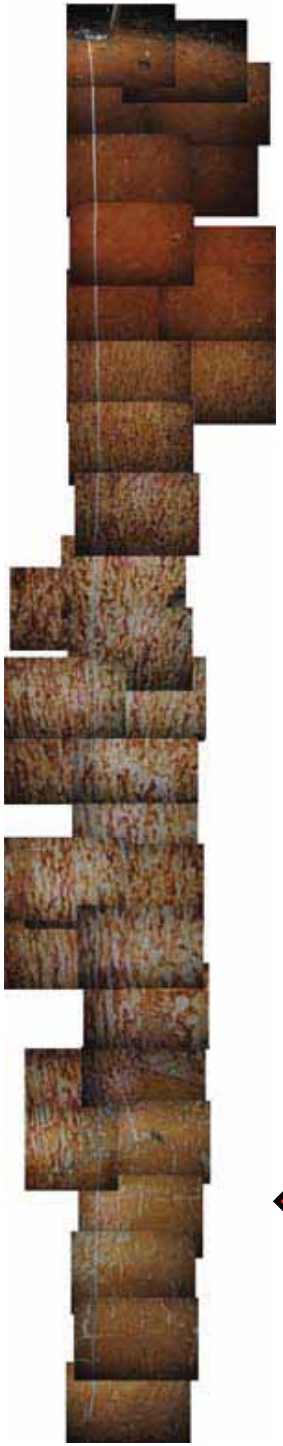
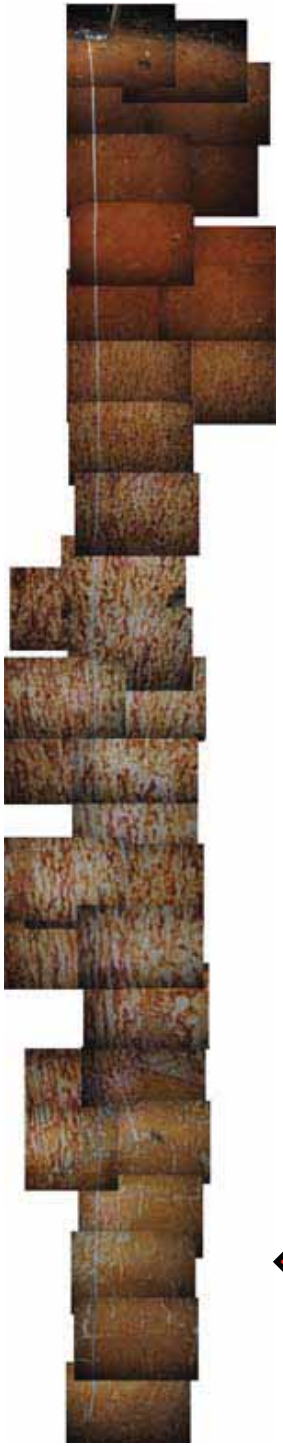


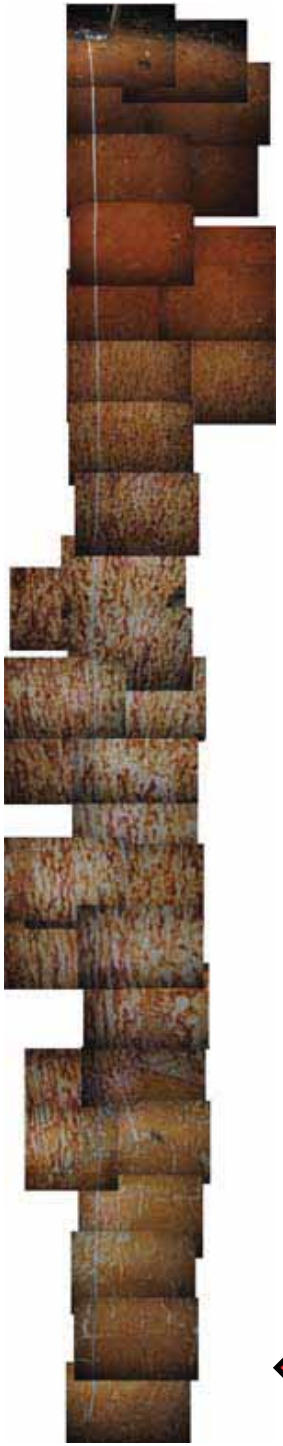
Exploration of the deep hole

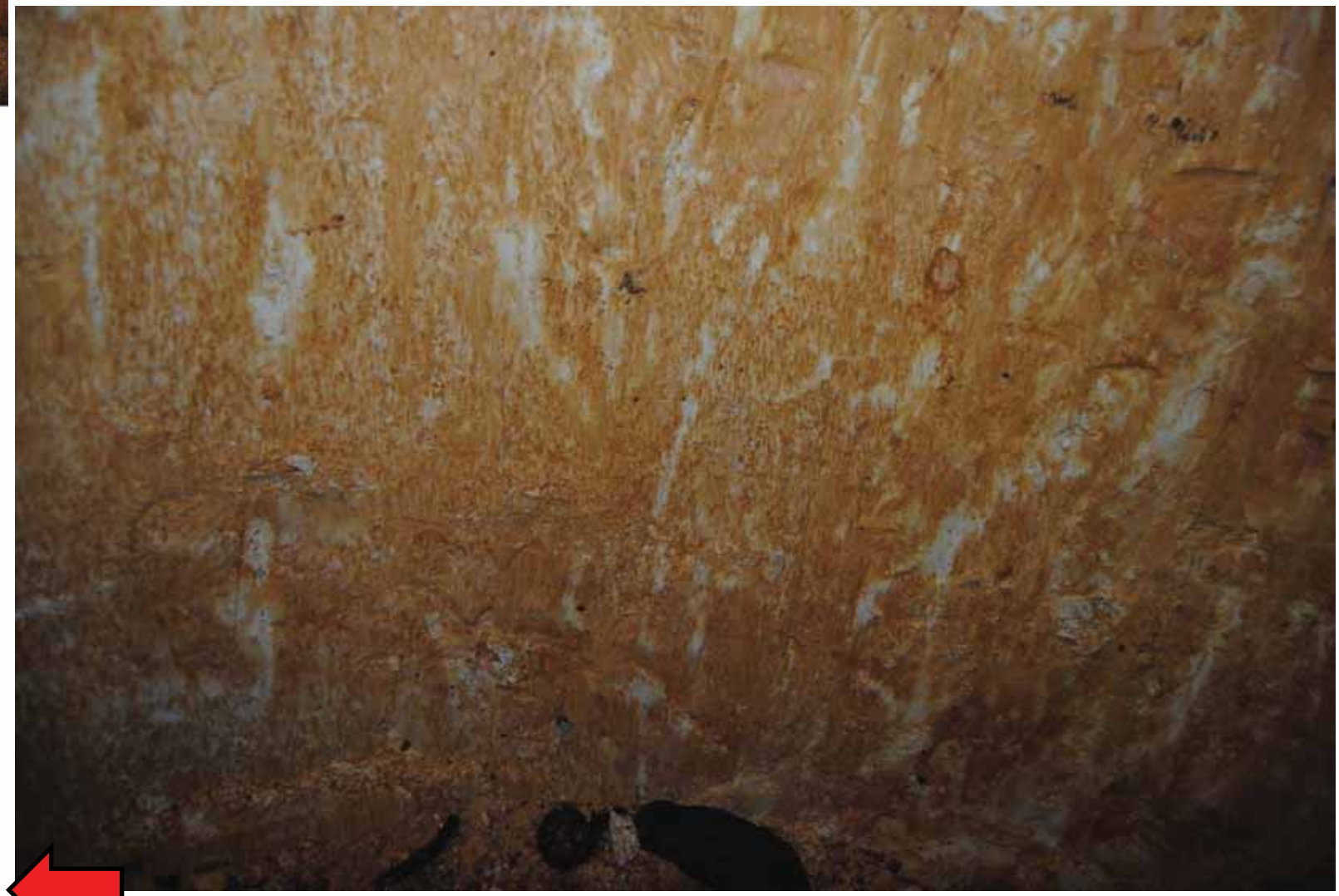
First indication of weathered rocks

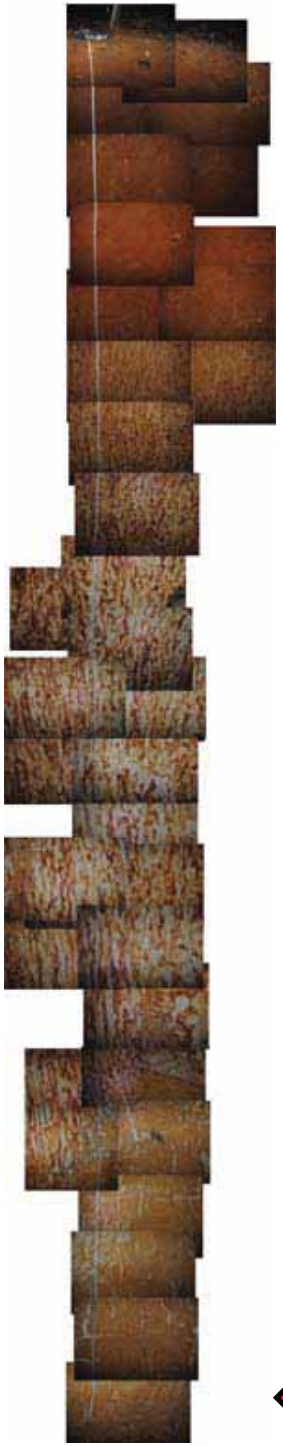


Exploration of the deep hole

Weathered rock:
Well digger: „Here fungi are eating nutrients“

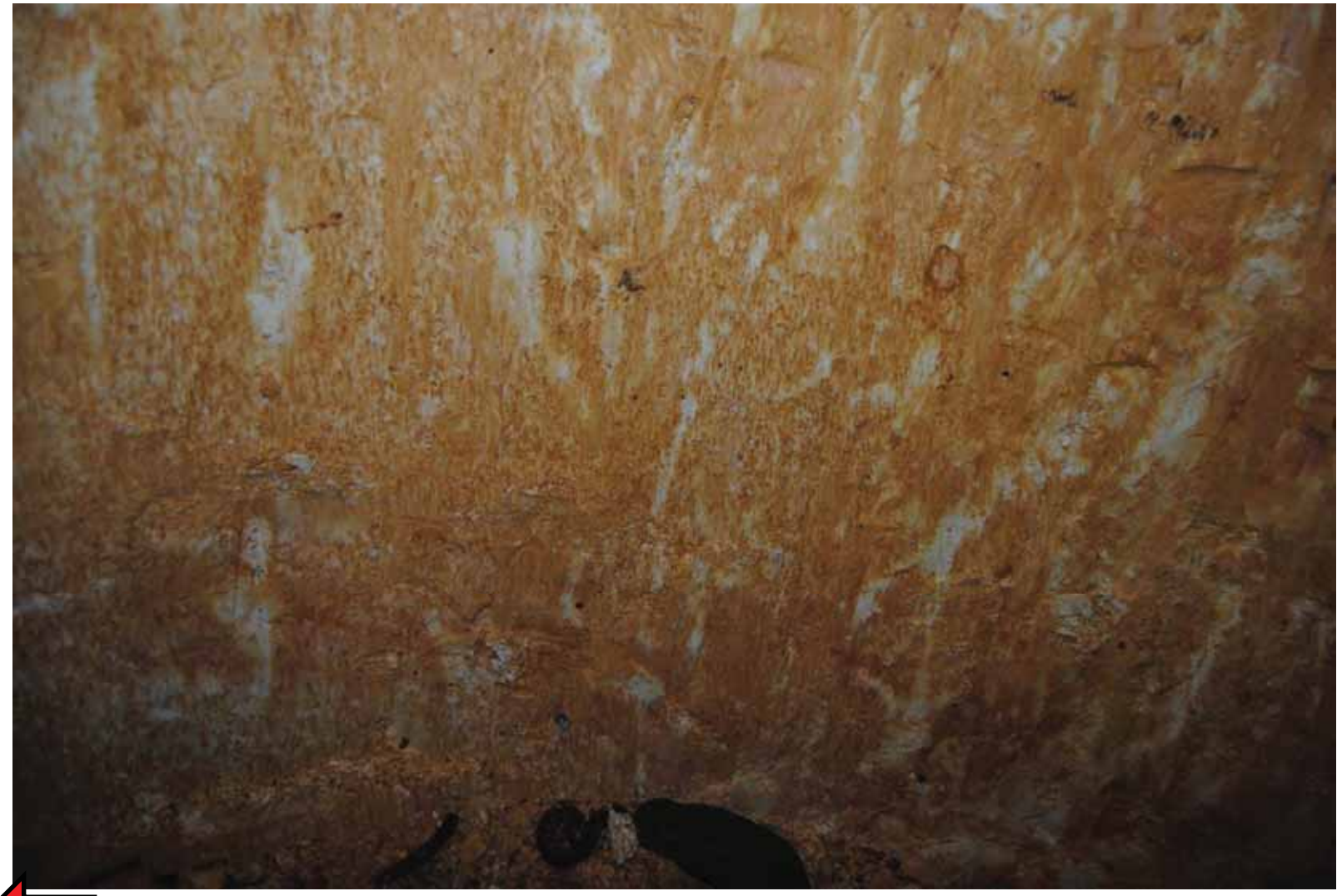


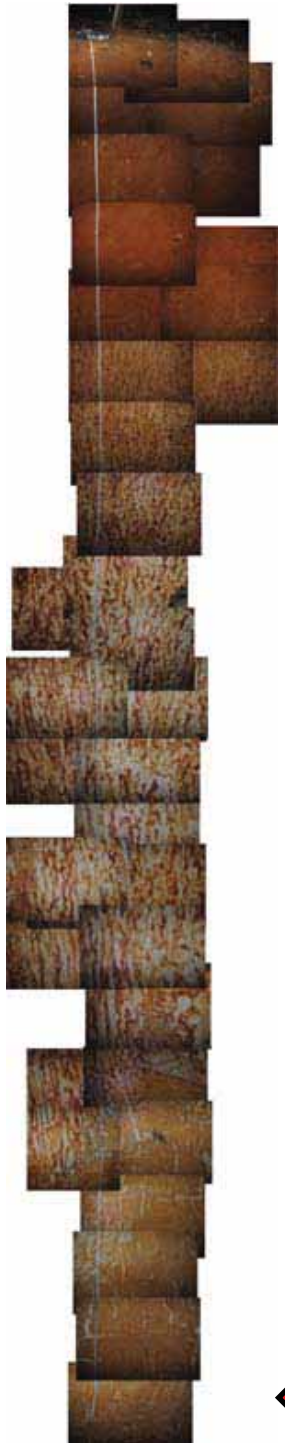




Soil organic carbon in the deep hole

Total soil organic carbon: 223 tons per hectare
56% of it below one meter!





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