Effect of peat properties on production quality

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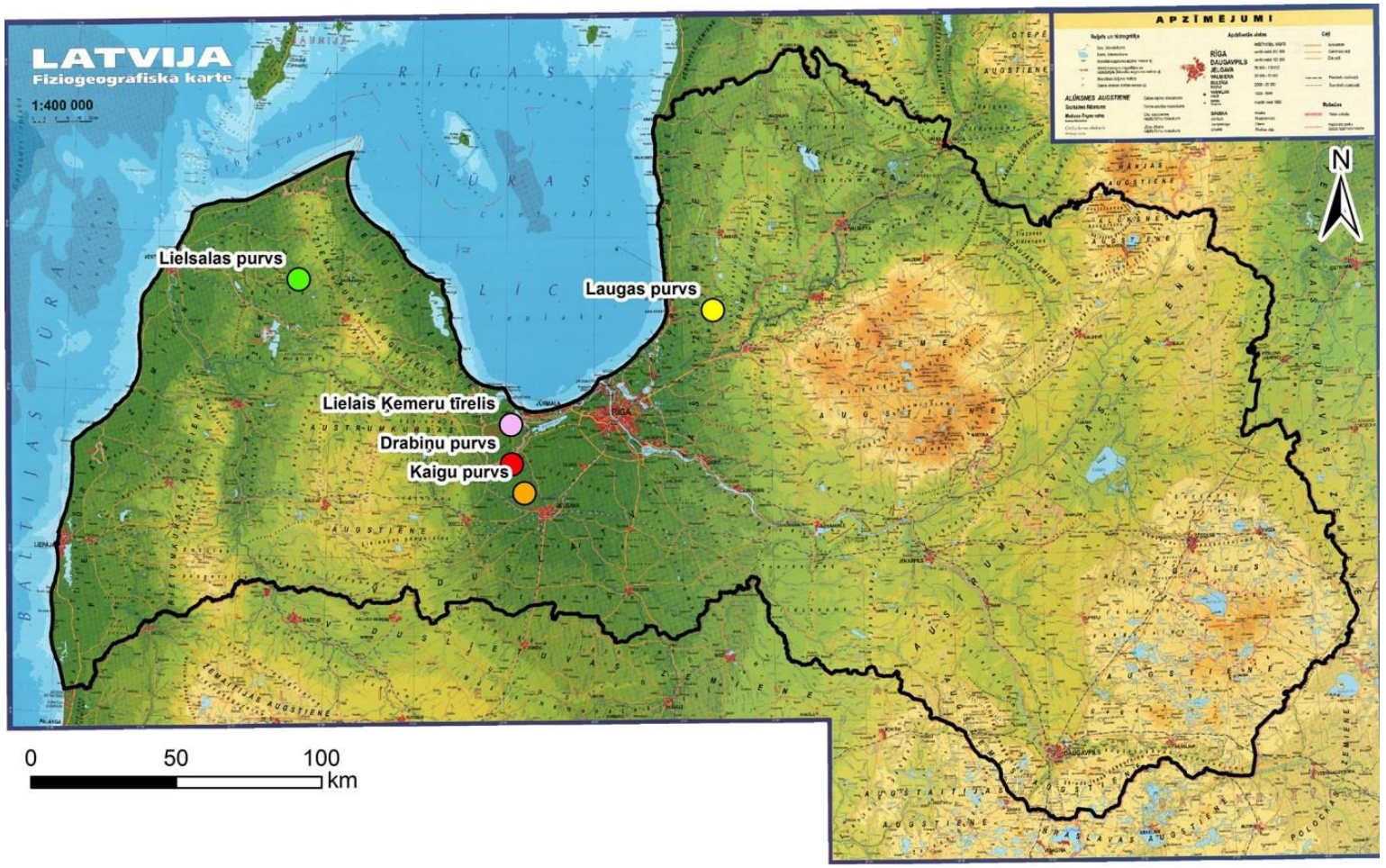
Actuality and study aim

Peat physical properties, moisture, water level in peatland are closely related and affect each other. Sphagnum peat has been the most important for many types of peat use, but it is especially growing medium constituent for many decades because its properties are the best available.
Therefore, we wanted to find out if and how the quality of production is affected by changes in peat properties in the deposit layer, which in turn were affected by environmental conditions during the development of the peatland,

The aim of the study is to find out the effect of changes in peat moisture and other physical properties on the peat product.
The study includes the analysis of changes in moisture content, density and other properties in the section of the peat deposit, taking into account multidisciplinary research, as well as the sphagnum pore size determined using a scanning electron microscope Phenom ProX.

Sampling Sites:



<u>Lielsala and Sēme peatland</u> - N 57°20’69381”, E 22°17’35940” are raised bogs located in Kursa Lowland, the northern part of Venta-Usma depression, north-western Latvia

<u>Drabiņas and Kaigu peatland</u> - N 57°47’88352”, E 23°31’32978” raised bogs are located in the north-western part of Tīreļi Plain, Middle Latvia Lowland.

<u>Lielais Ķemeru Bog -</u> located in the Middle Latvia Lowland, Tīreļi Plain; its northeastern part borders with Coastal Lowland.

<u>Laugas peatland -</u> located on the border between Coastal Lowland and Idumeja Upland, in southern part of Metsepole Plain, east of Bīriņi Ridge.

Study methods

Field studies and sampling

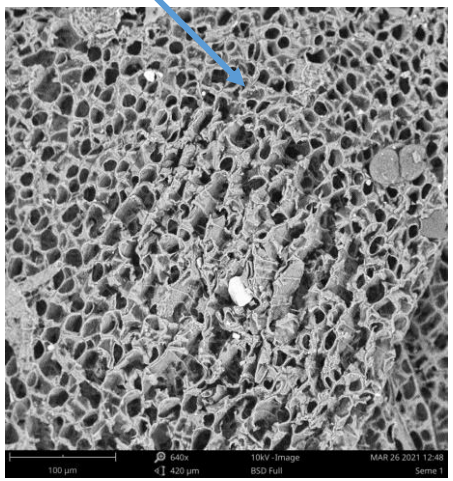
Study methods

Laboratory analyses

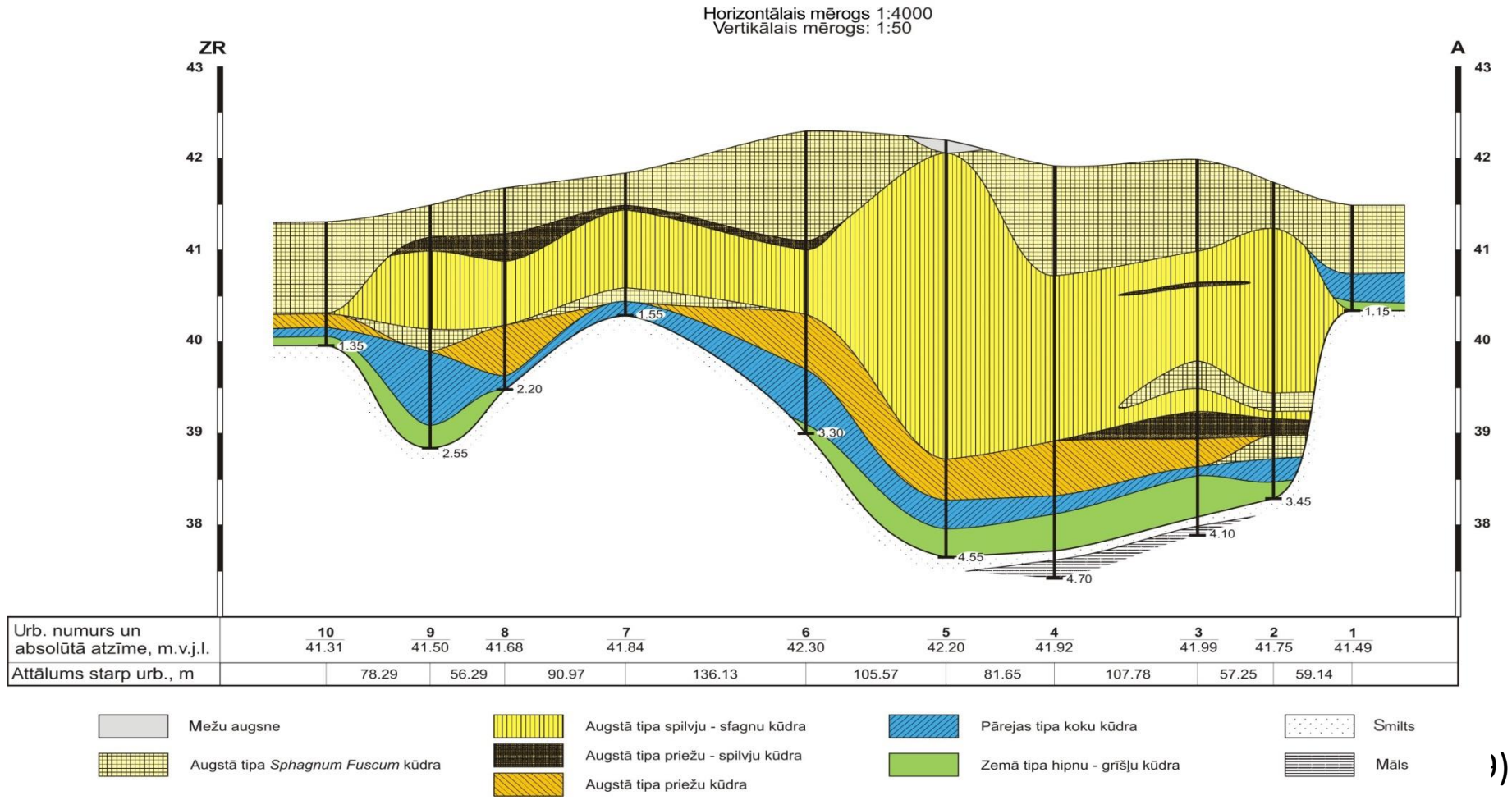
Loss-on-ignition (LOI) analysis
determination of moisture (%),
ash (%), pH, Bulk density,
Peat botanical composition and decomposition degree

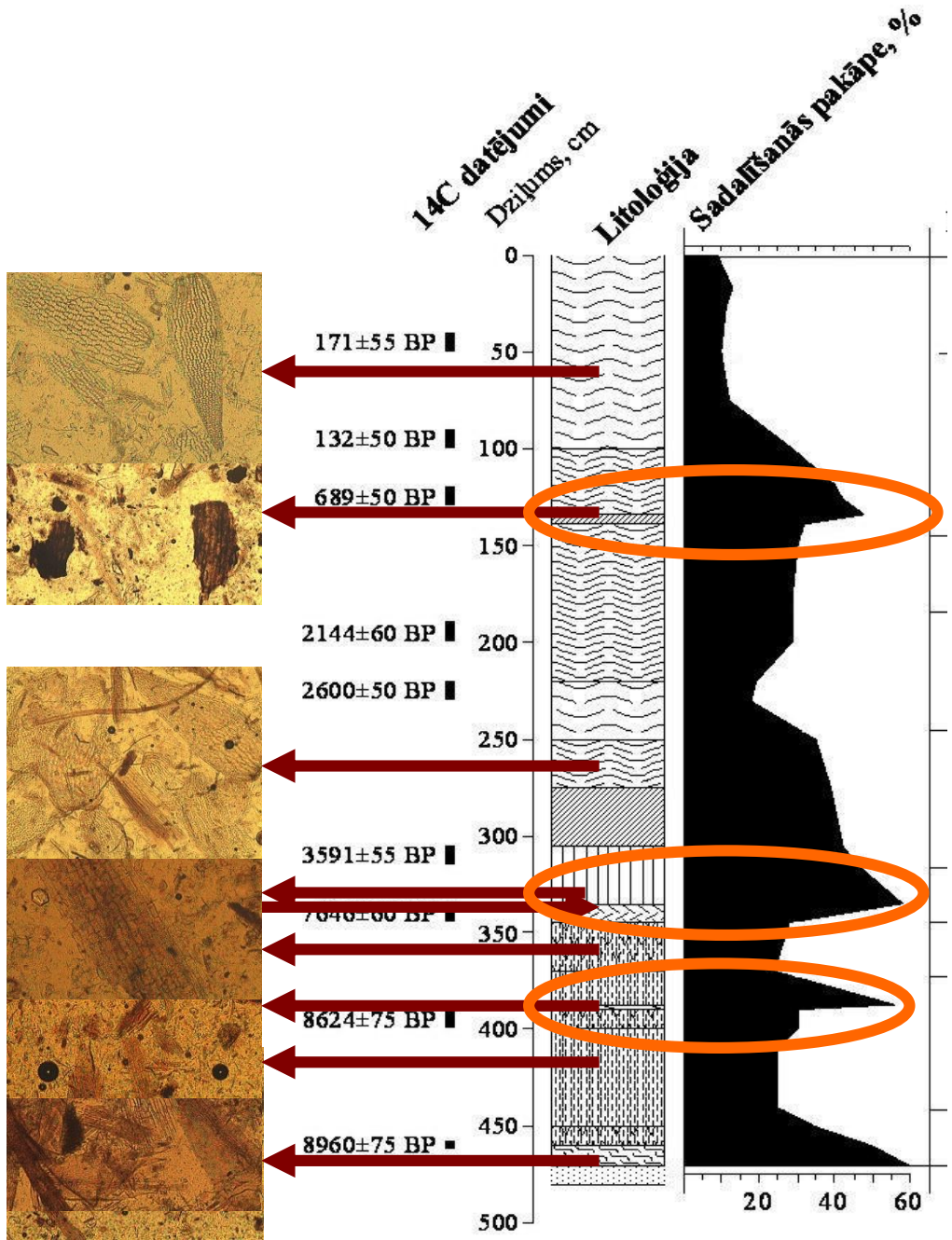
Studies of peat structure, pore size by Scanning electron microscopy (SEM)

ATS Max 60 ÷ 210g 0,01%



Principial geological crossection of Eipurs peatland

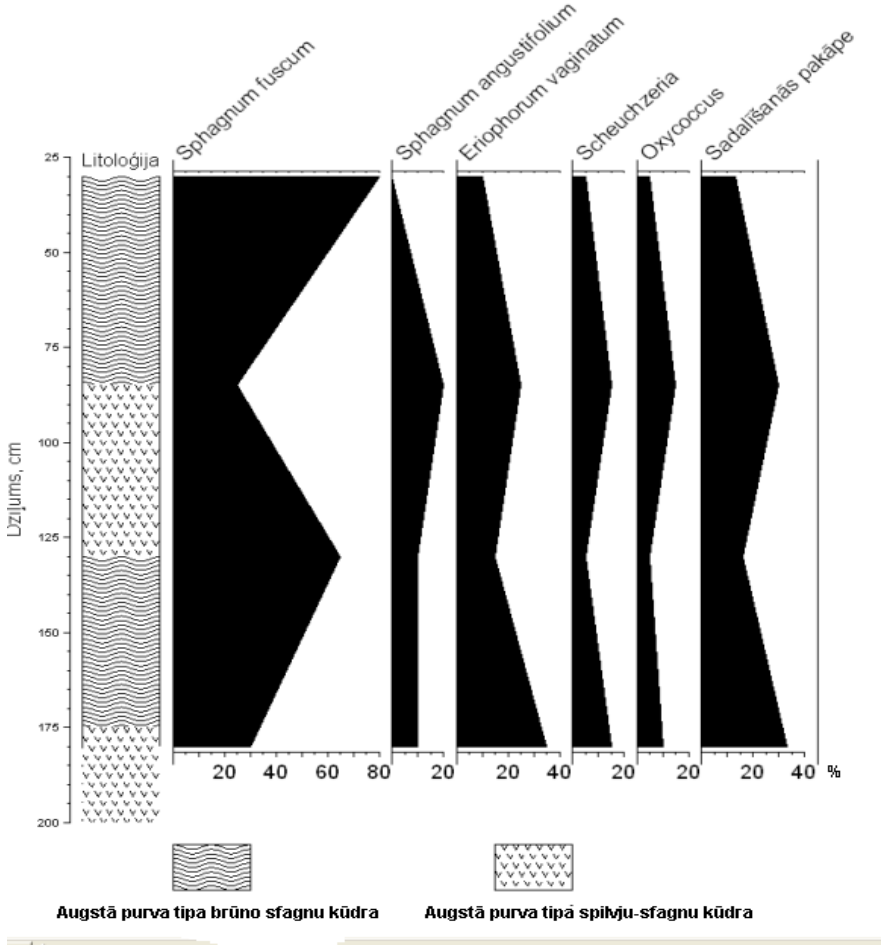




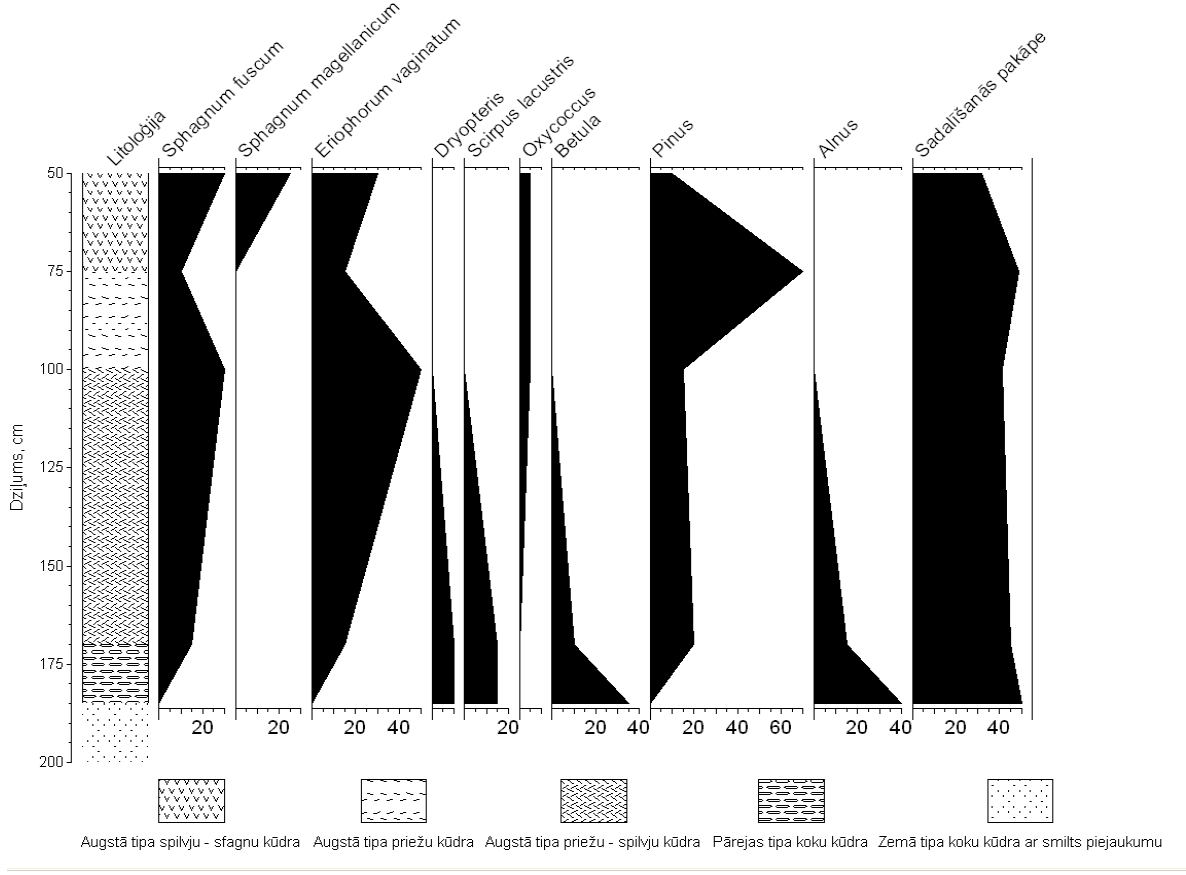
Leģenda

- Sfagnu-Spilvju augstā tipa kūdra
- Spilvju augstā tipa kūdra
- Grīšļu-Sfagnu pārejas tipa kūdra
- Grīšļu-Priežu zemā tipa kūdra
- Grīšļu-Zāļu zemā tipa kūdra
- Grīšļu zemā tipa kūdra
- Hipnu-Grīšļu zemā tipa kūdra
- Grīšļu-Hipnu zemā tipa kūdra
- Smilts

Results
Effect of botanical composition on peat properties

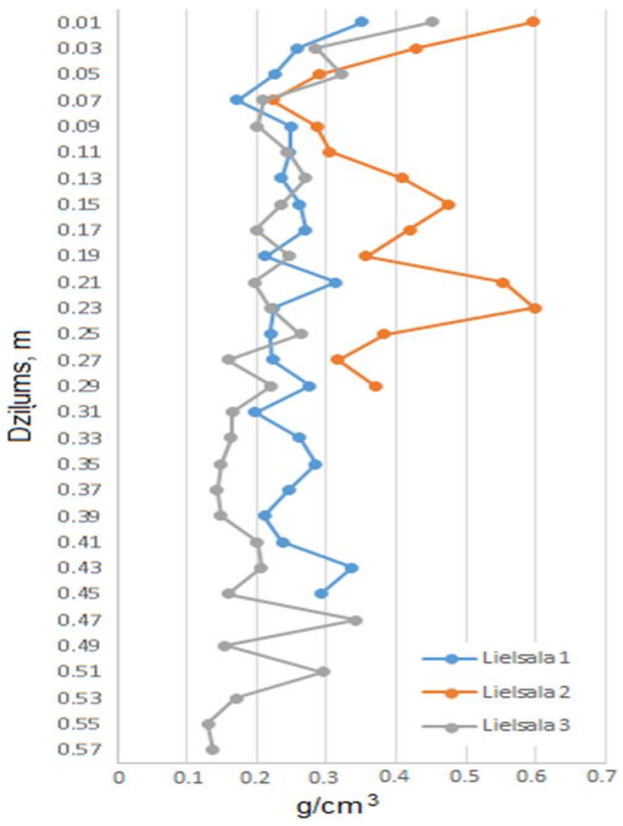


Drabiņu peatland

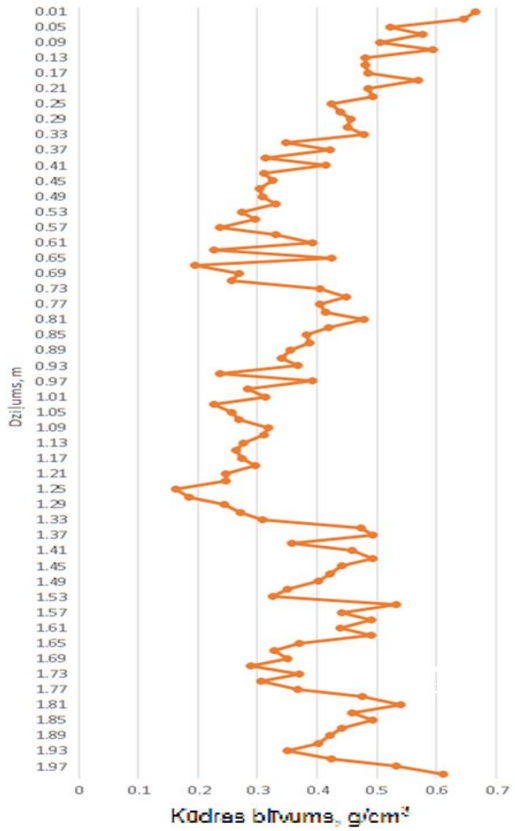


Kaigu peatland

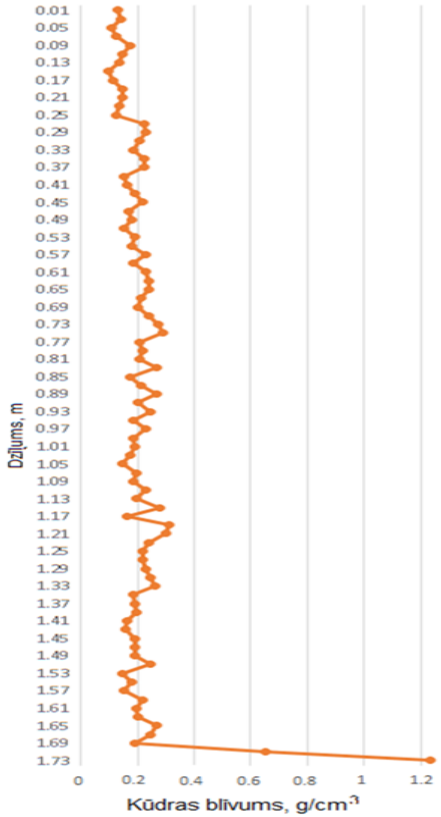
Results
Effect of natural density on peat properties



Lielsalas peatland



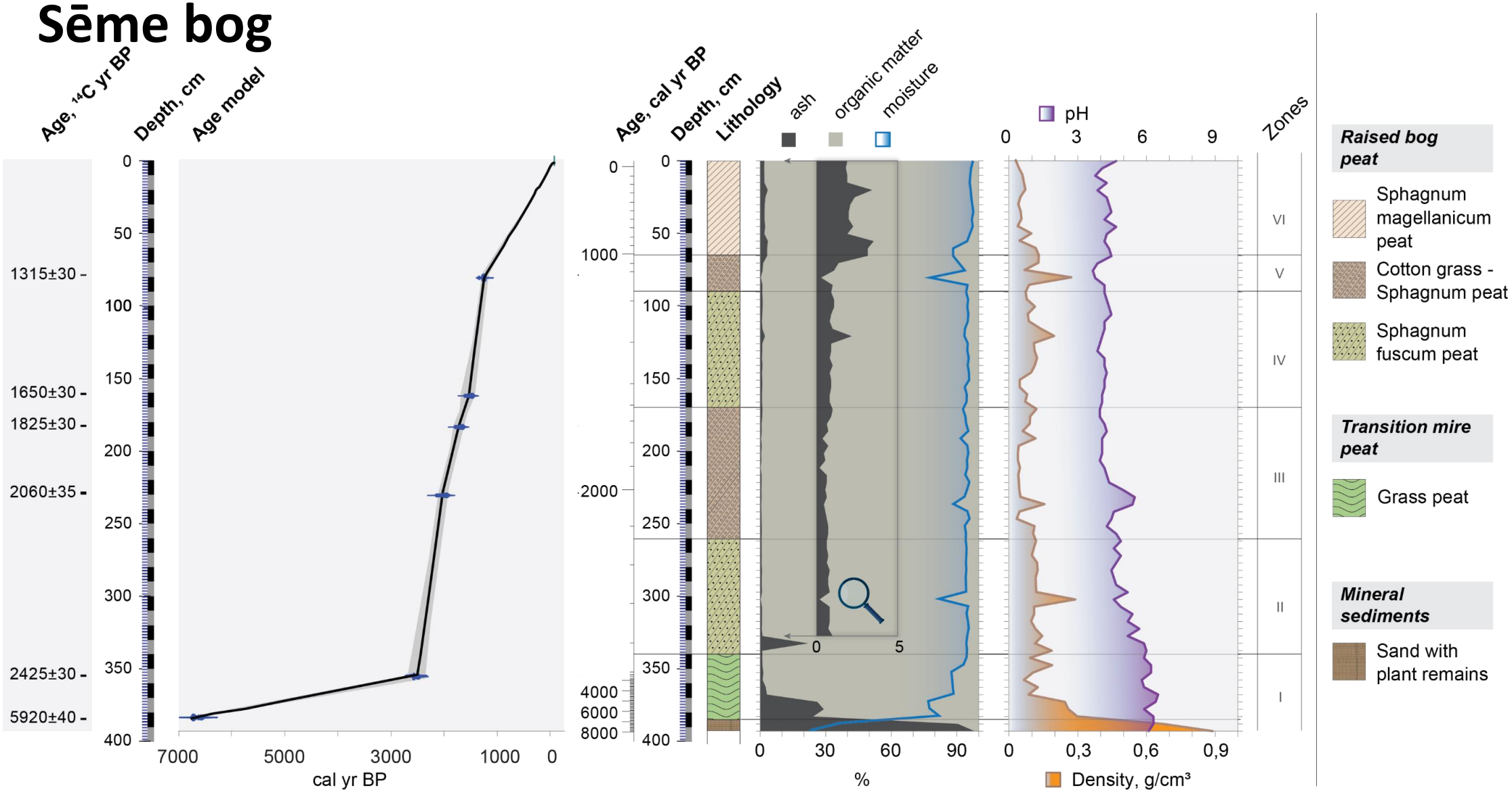
Drabiņu peatland



Kaigu peatland

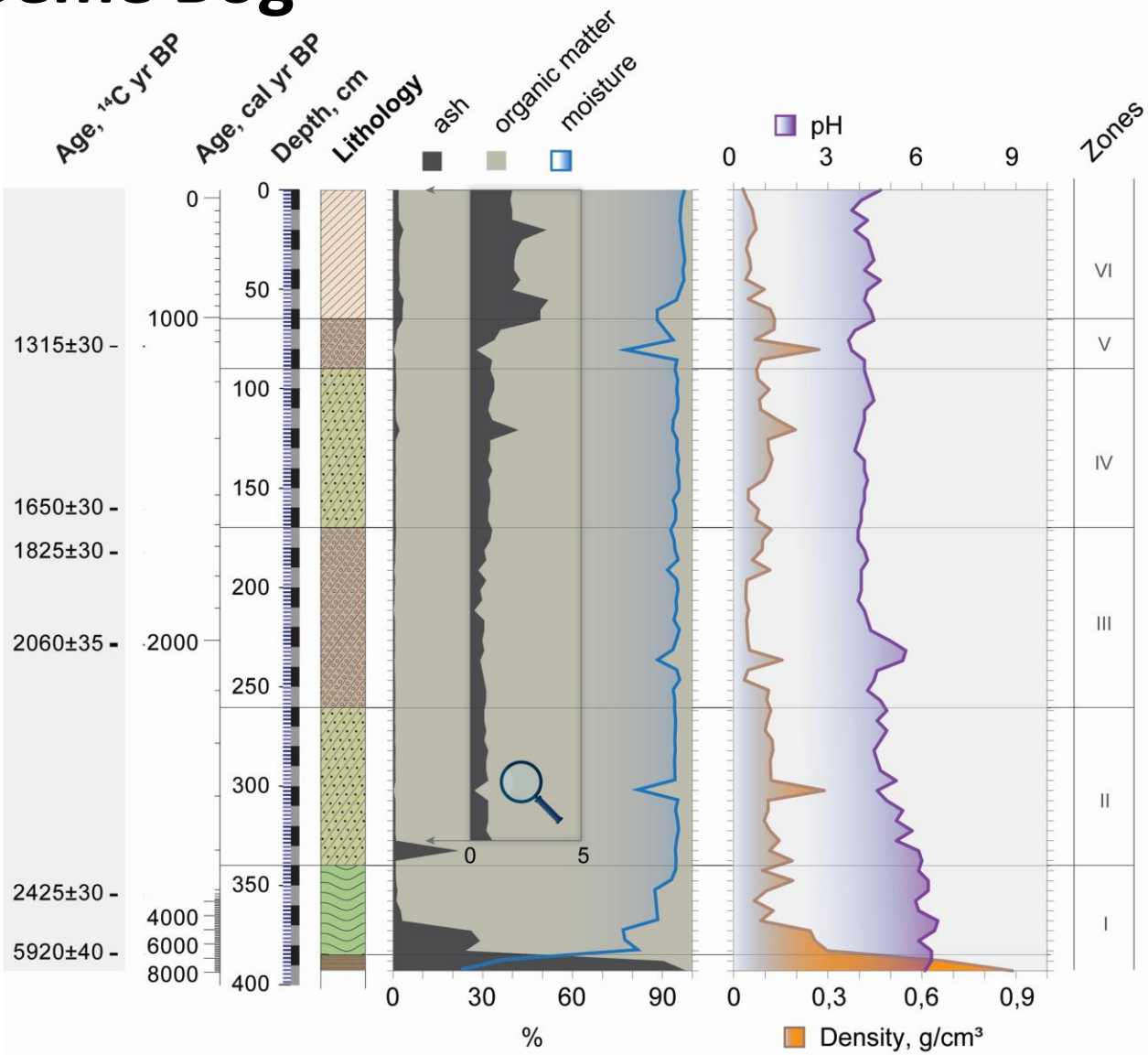
Results

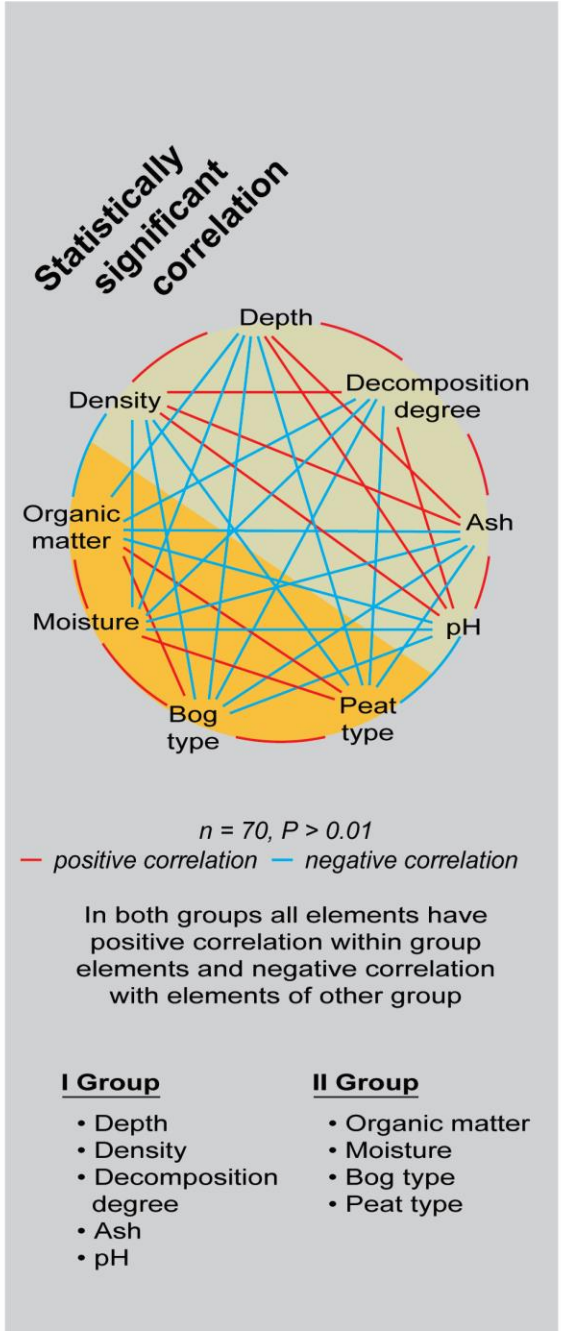
Sēme bog



Age-depth model and changes in properties of peat section of Sēme1

Sēme Bog





Raised bog peat

- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

Transition mire peat

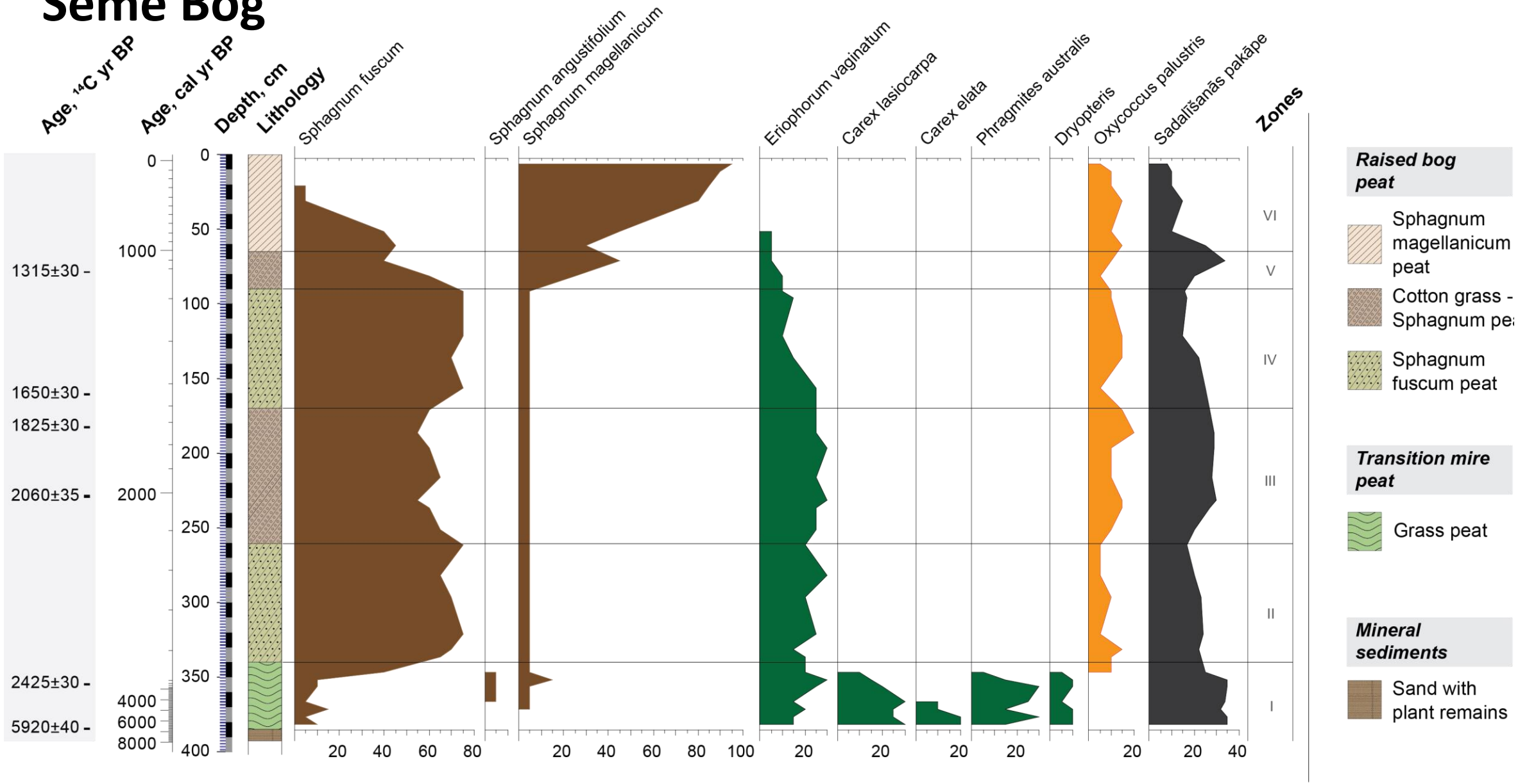
- Grass peat

Mineral sediments

- Sand with plant remains

Comparison of peat properties and data statistic analysis from core Sēme1 (natural part of Sēme Bog)

Sēme Bog



Peat botanical composition and decomposition degree (%) from core Sēme1

Sēme Bog

Raised bog peat

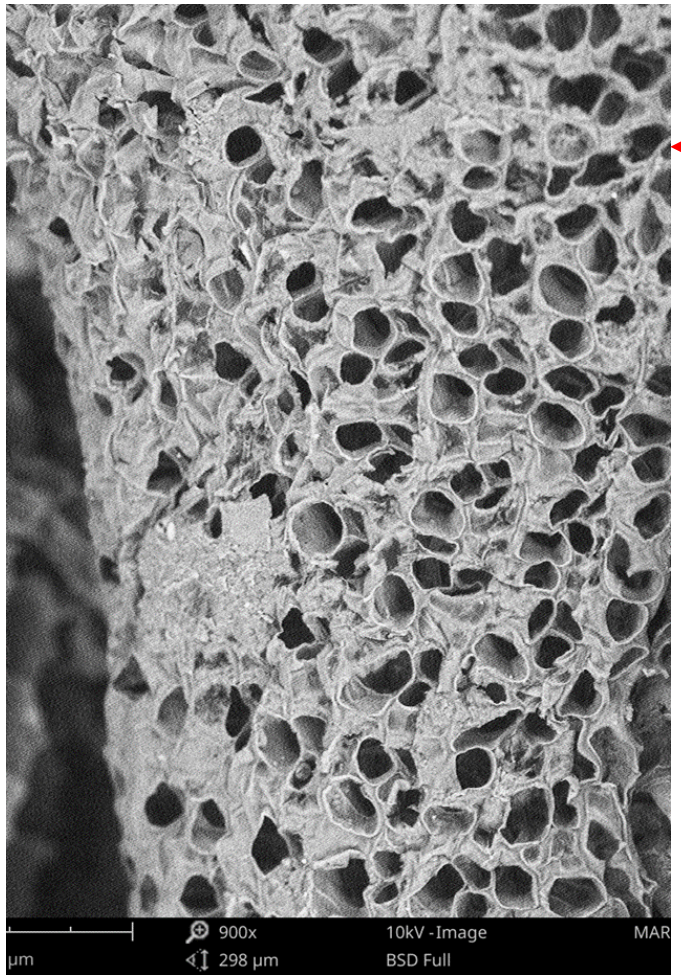
- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

Transition mire peat

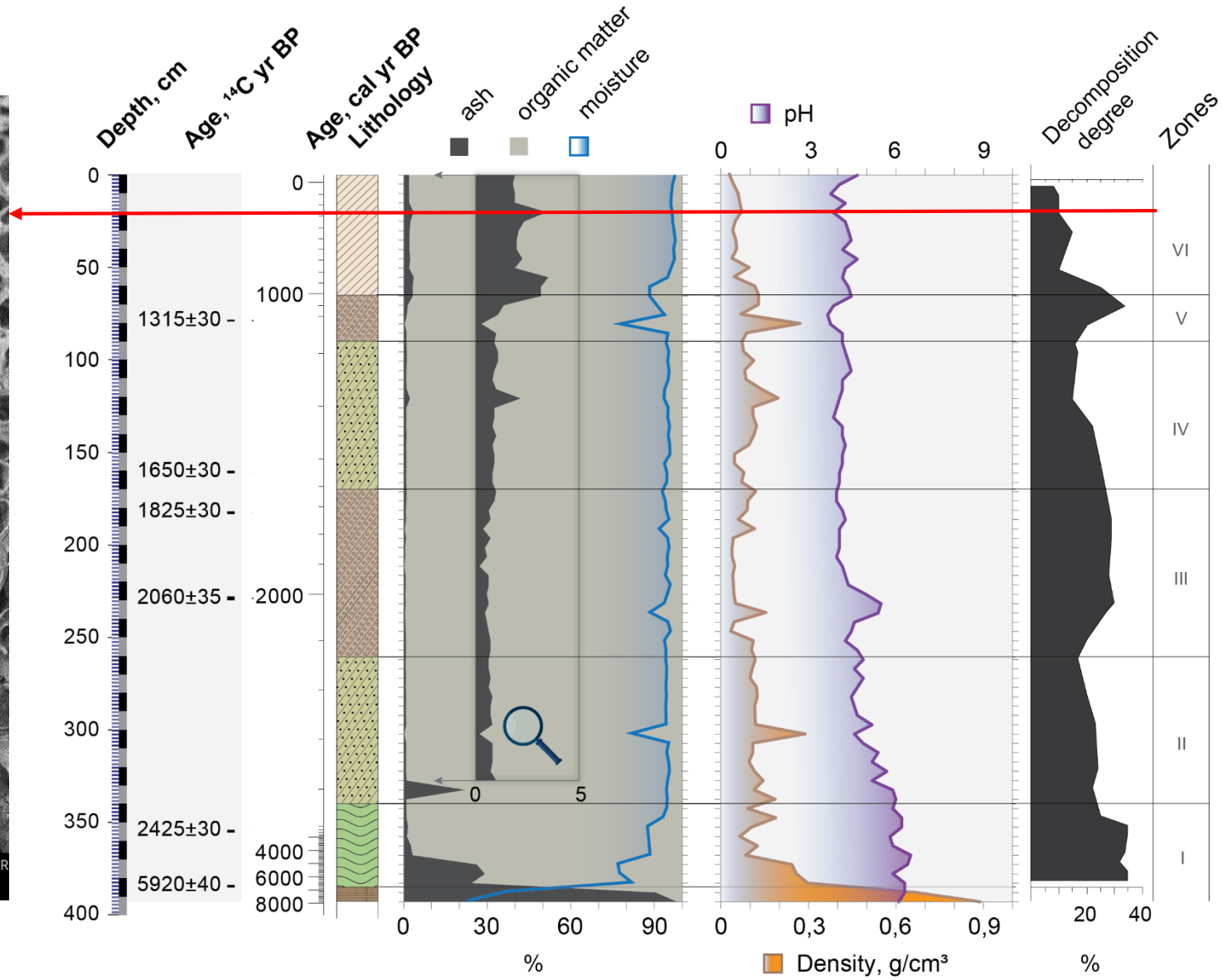
- Grass peat

Mineral sediments

- Sand with plant remains



Medium pore size 17.70 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 25 cm

Sēme Bog

Raised bog peat

- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

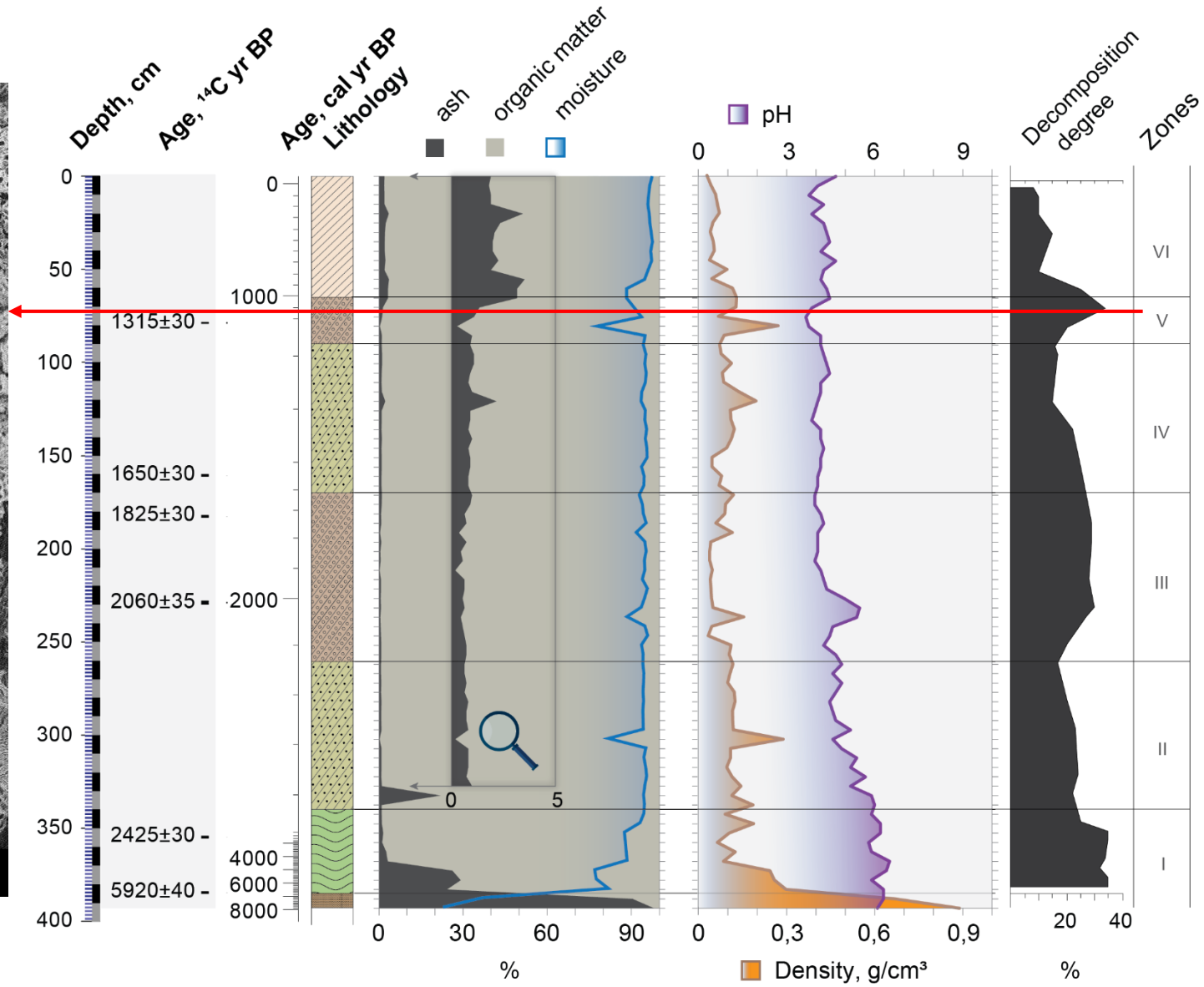
Transition mire peat

- Grass peat

Mineral sediments

- Sand with plant remains

Medium pore size 12.50 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 75 cm

Sēme Bog

Raised bog peat

- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

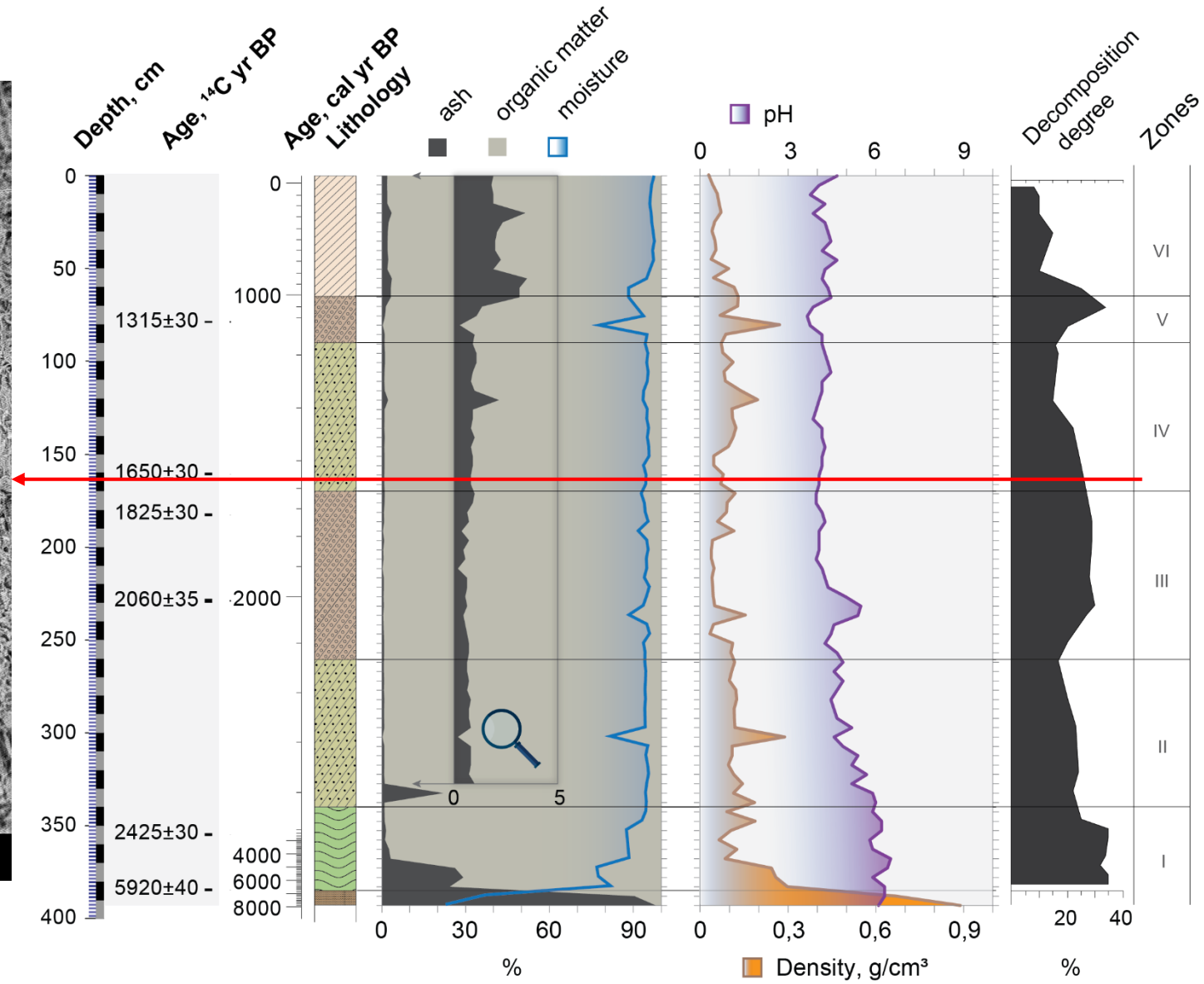
Transition mire peat

- Grass peat

Mineral sediments

- Sand with plant remains

Medium pore size 13.70 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 155 cm

Sēme Bog

Raised bog peat

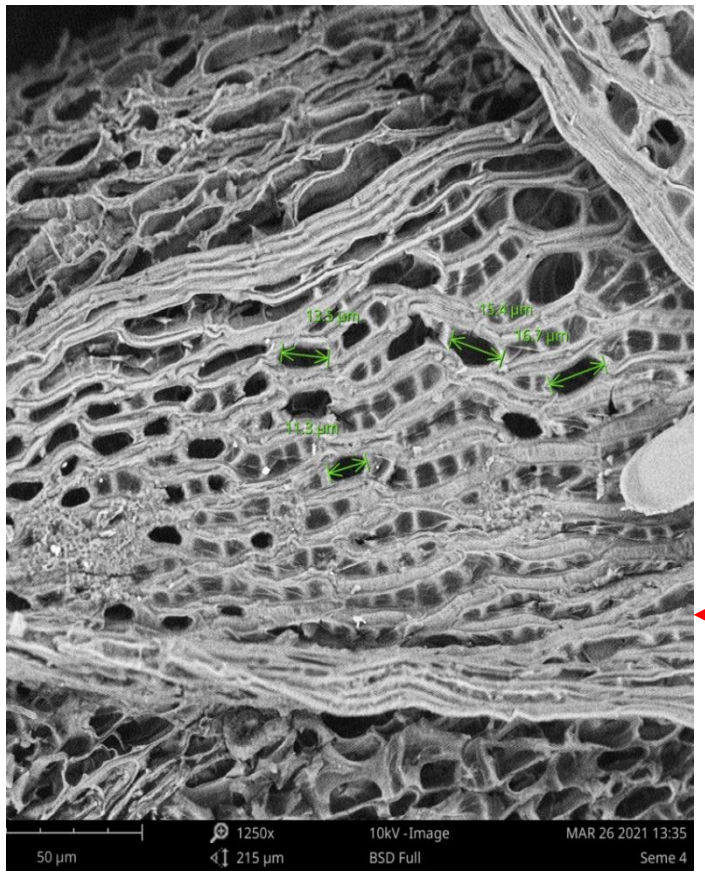
- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

Transition mire peat

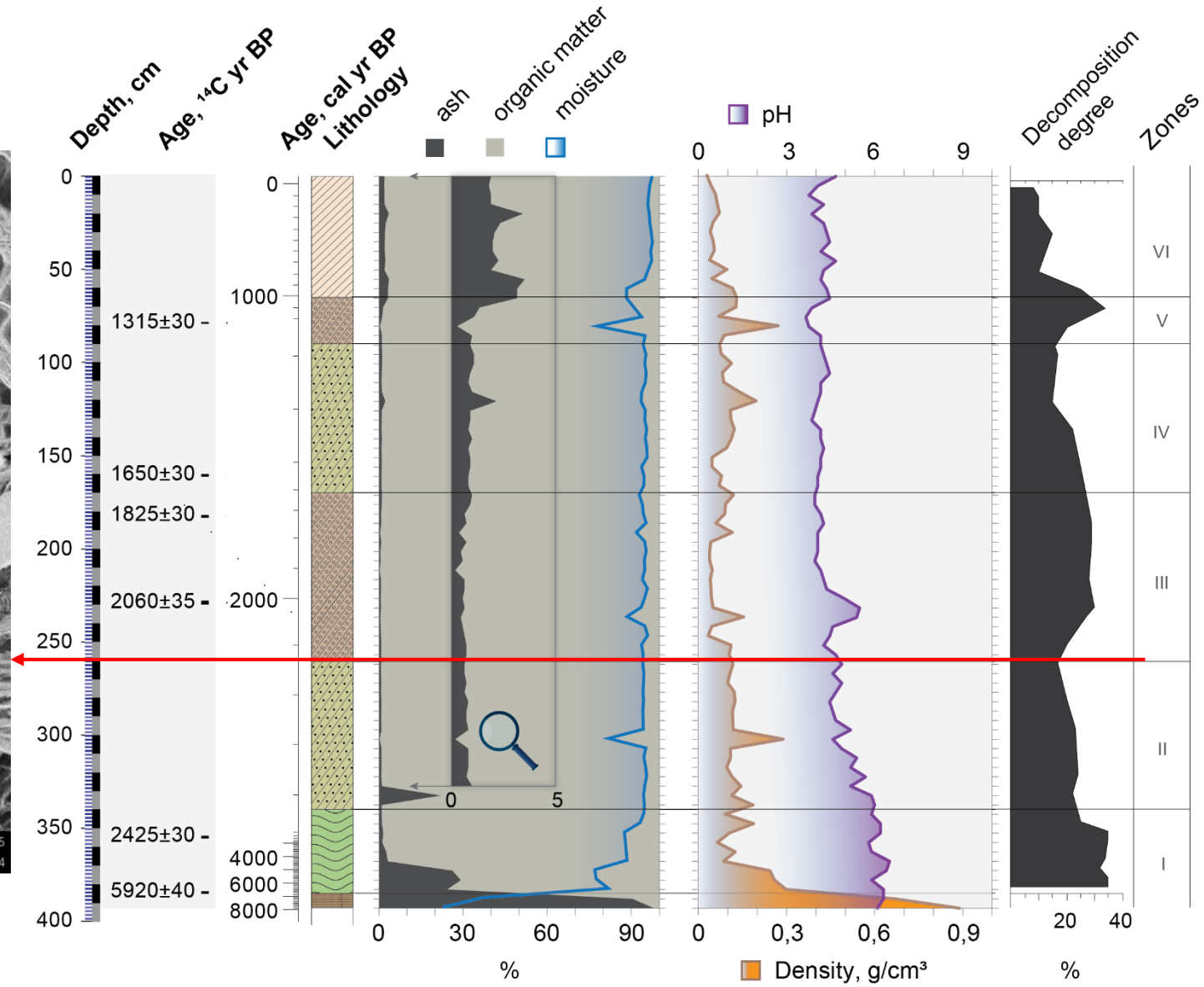
- Grass peat

Mineral sediments

- Sand with plant remains



Medium pore size 15.25 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 255 cm

Sēme Bog

Raised bog peat

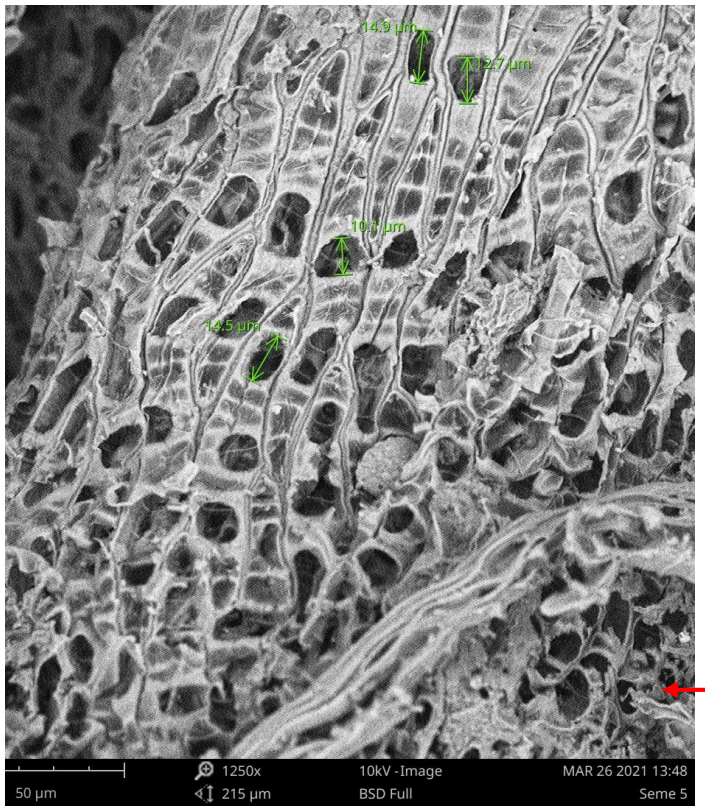
- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

Transition mire peat

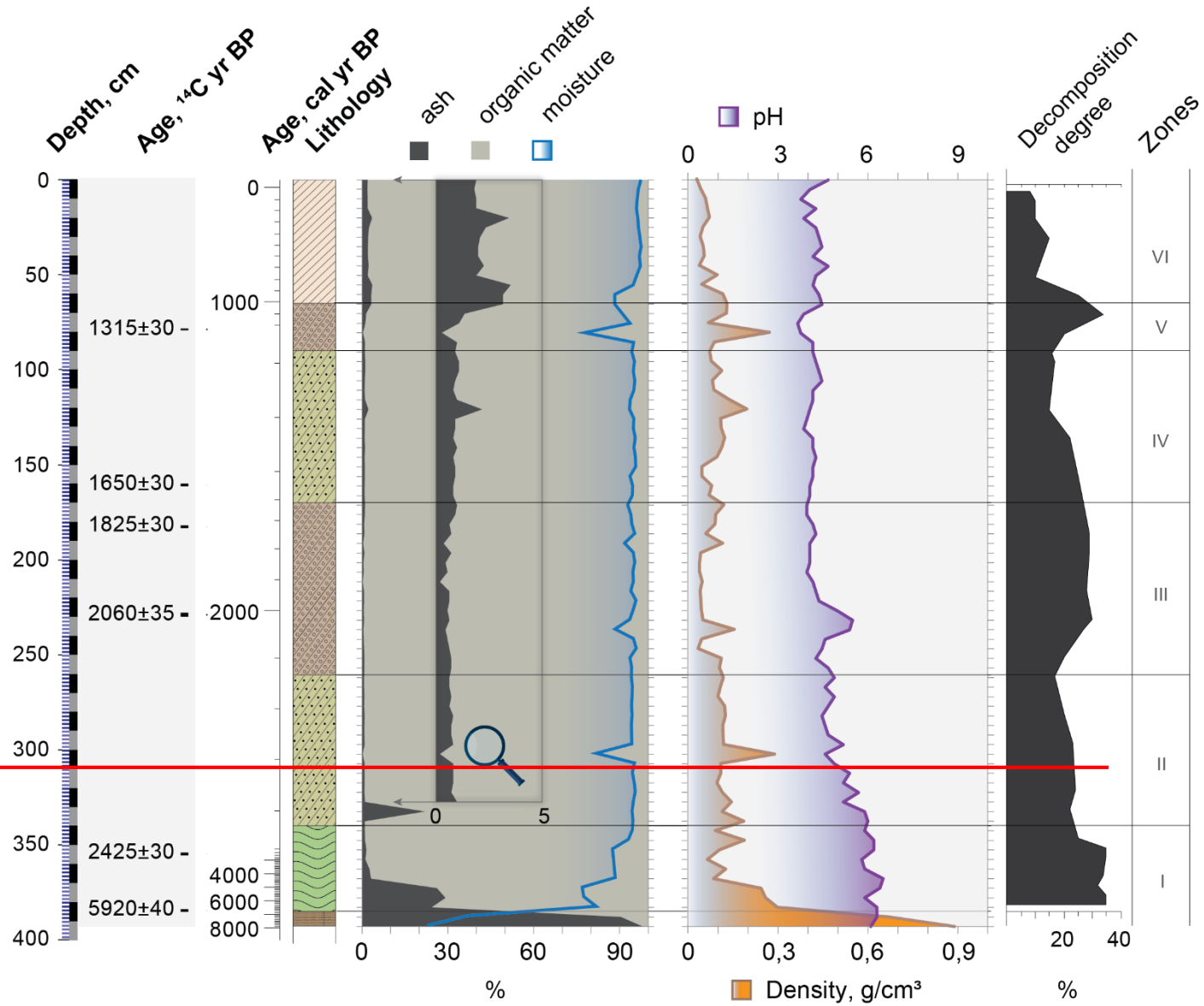
- Grass peat

Mineral sediments

- Sand with plant remains



Medium pore size 13.05 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 310 cm

Sēme Bog

Raised bog peat

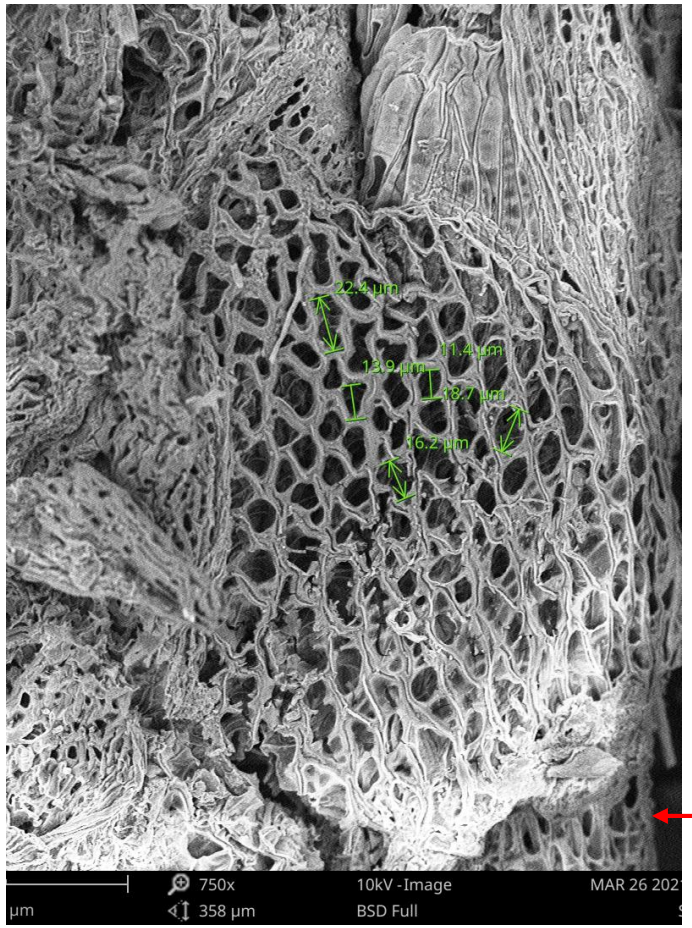
- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

Transition mire peat

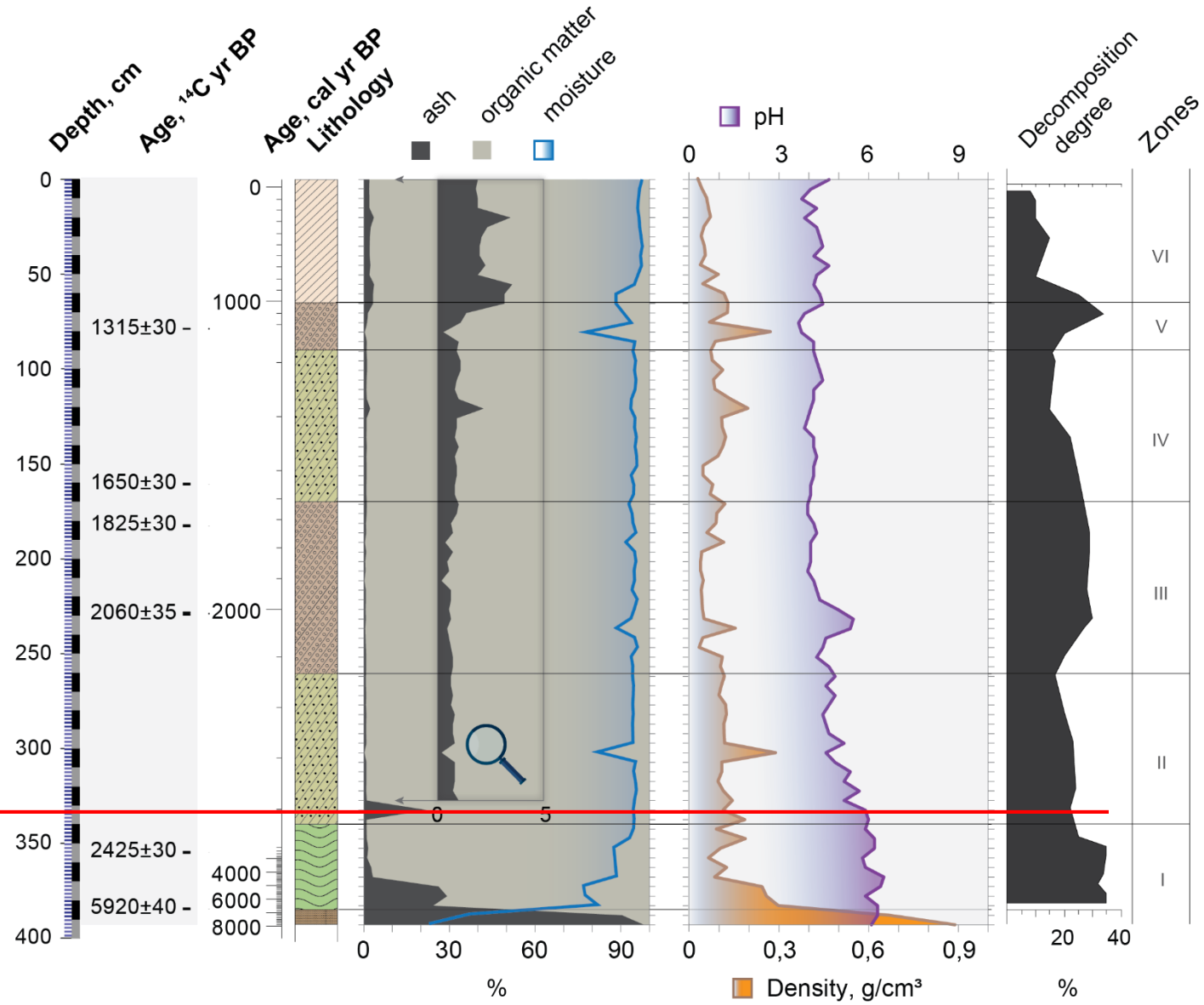
- Grass peat

Mineral sediments

- Sand with plant remains



Medium pore size 13.52 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 345 cm

Sēme Bog

Raised bog peat

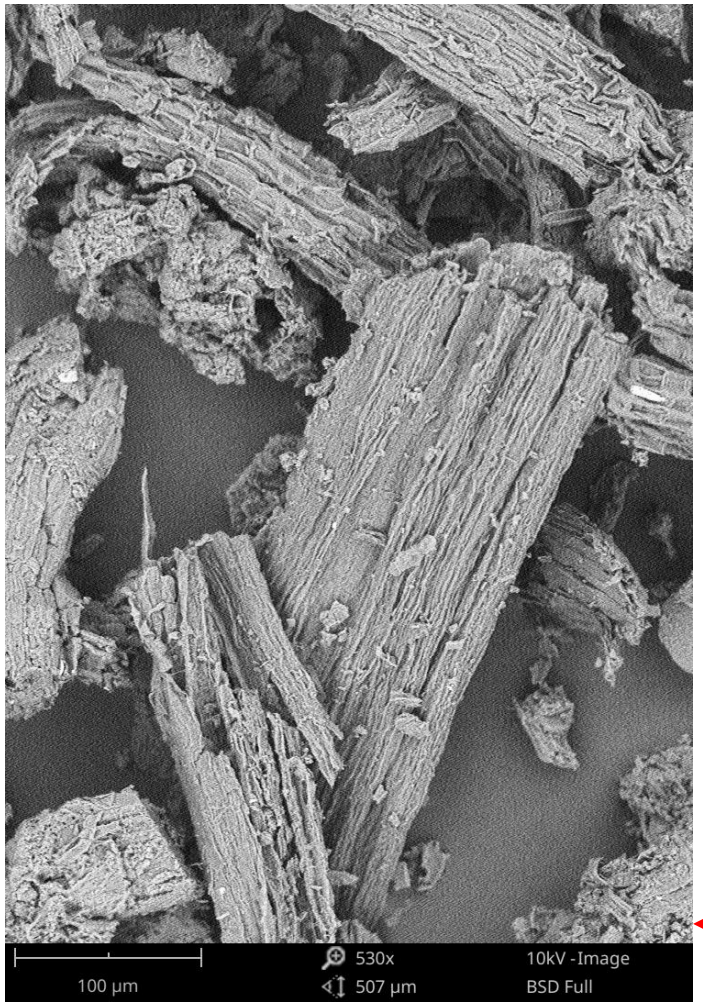
- Sphagnum magellanicum peat
- Cotton grass - Sphagnum peat
- Sphagnum fuscum peat

Transition mire peat

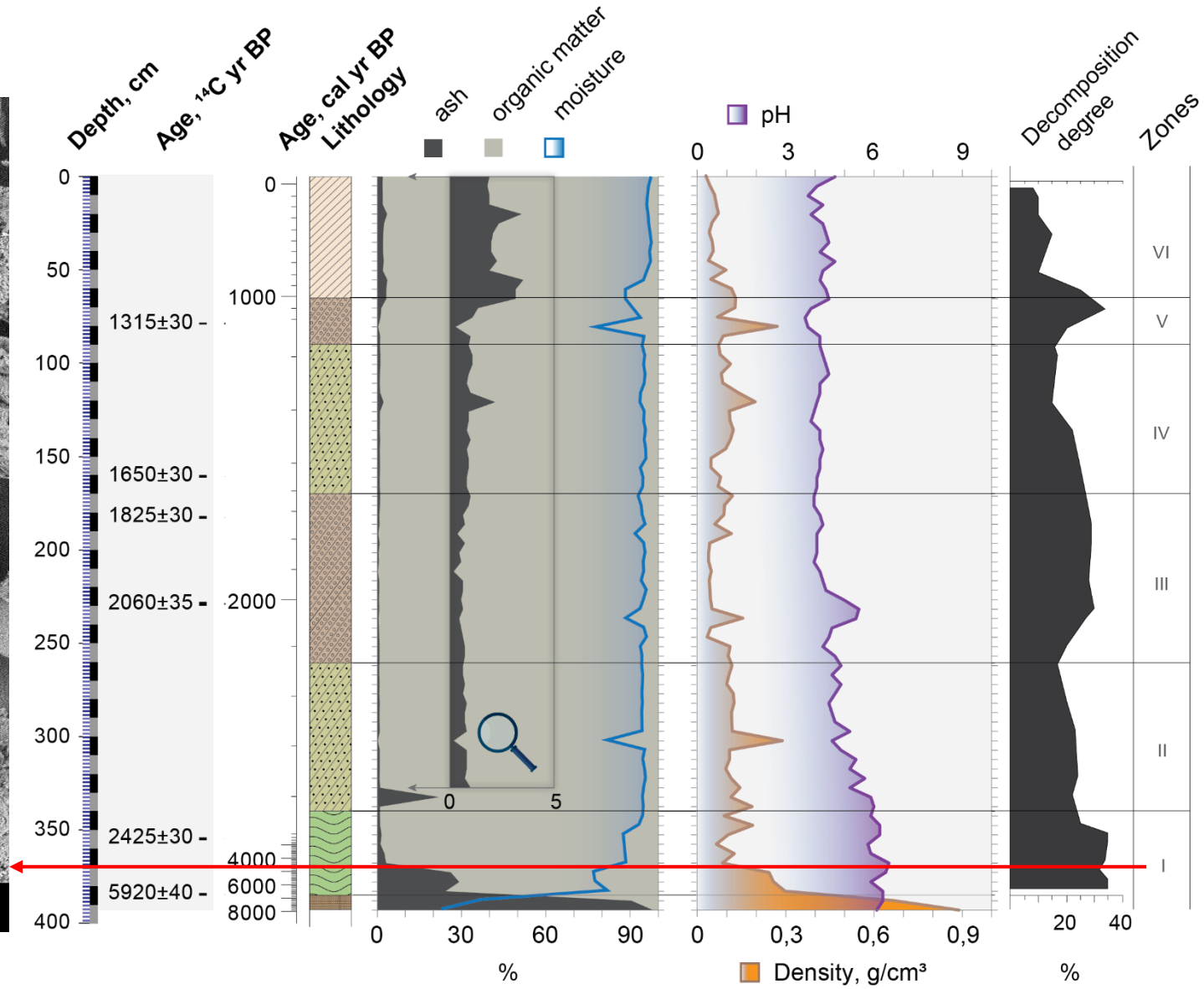
- Grass peat

Mineral sediments

- Sand with plant remains

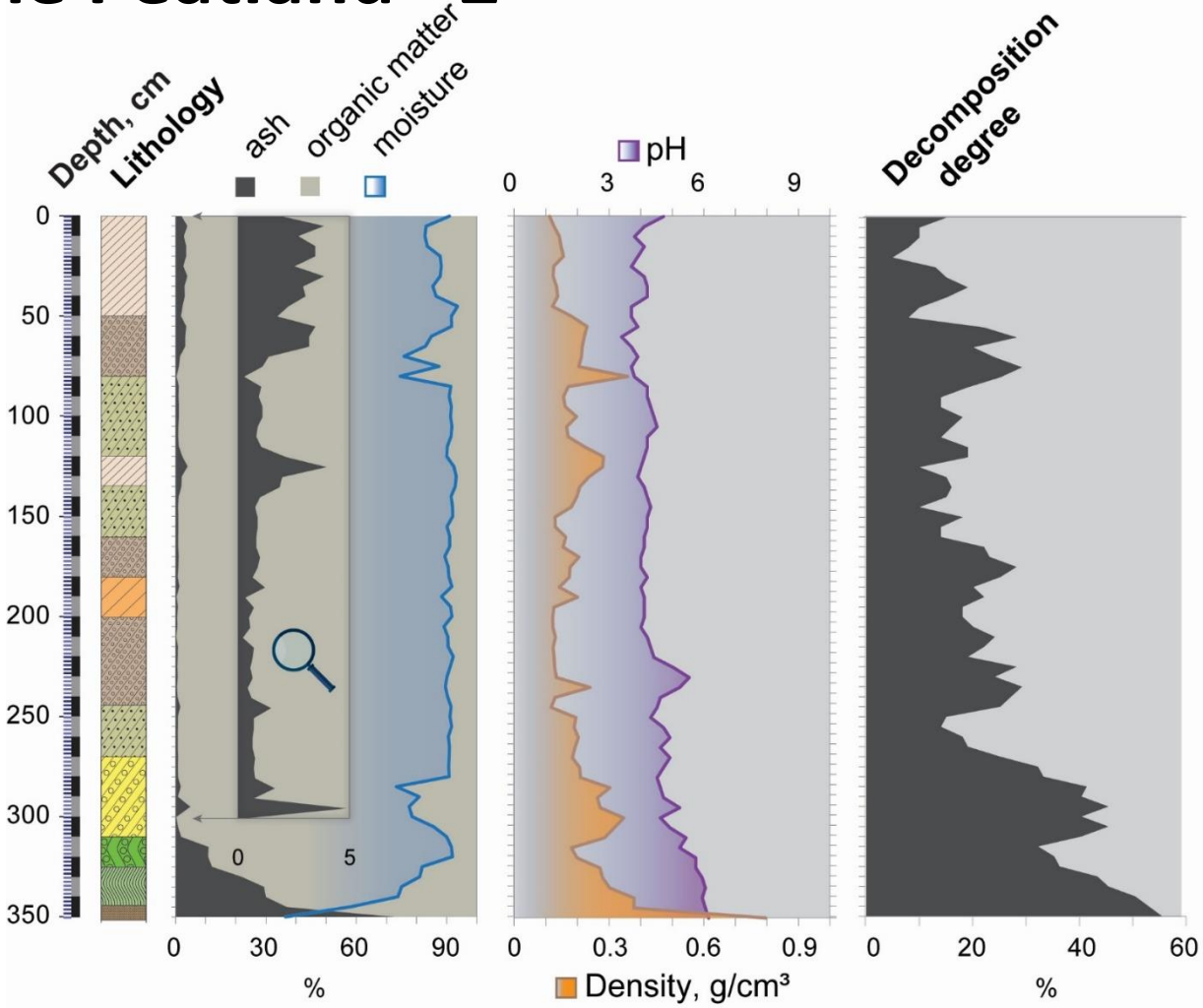


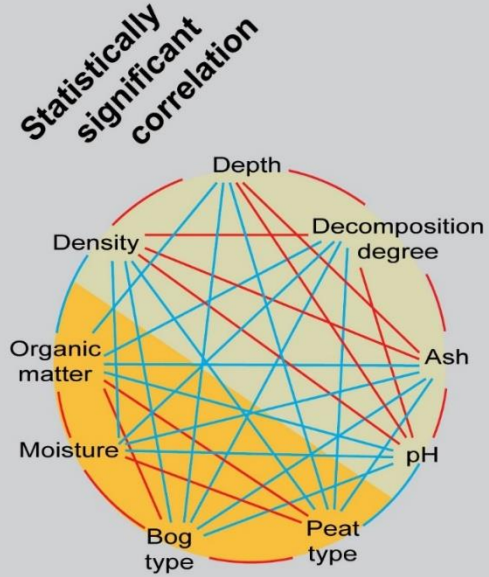
Medium pore size 5.05 µm



Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 375 cm

Sēme Peatland - 2





n = 70, P > 0.01

positive correlation — *negative correlation*

In both groups all elements have positive correlation within group elements and negative correlation with elements of other group

I Group
- Depth
- Density
- Decomposition degree
- Ash
- pH

II Group
- Organic matter
- Moisture
- Bog type
- Peat type

Raised bog peat
- Sphagnum peat
- Sphagnum magellanicum peat
- Sphagnum fuscum peat
- Cotton grass - Sphagnum peat

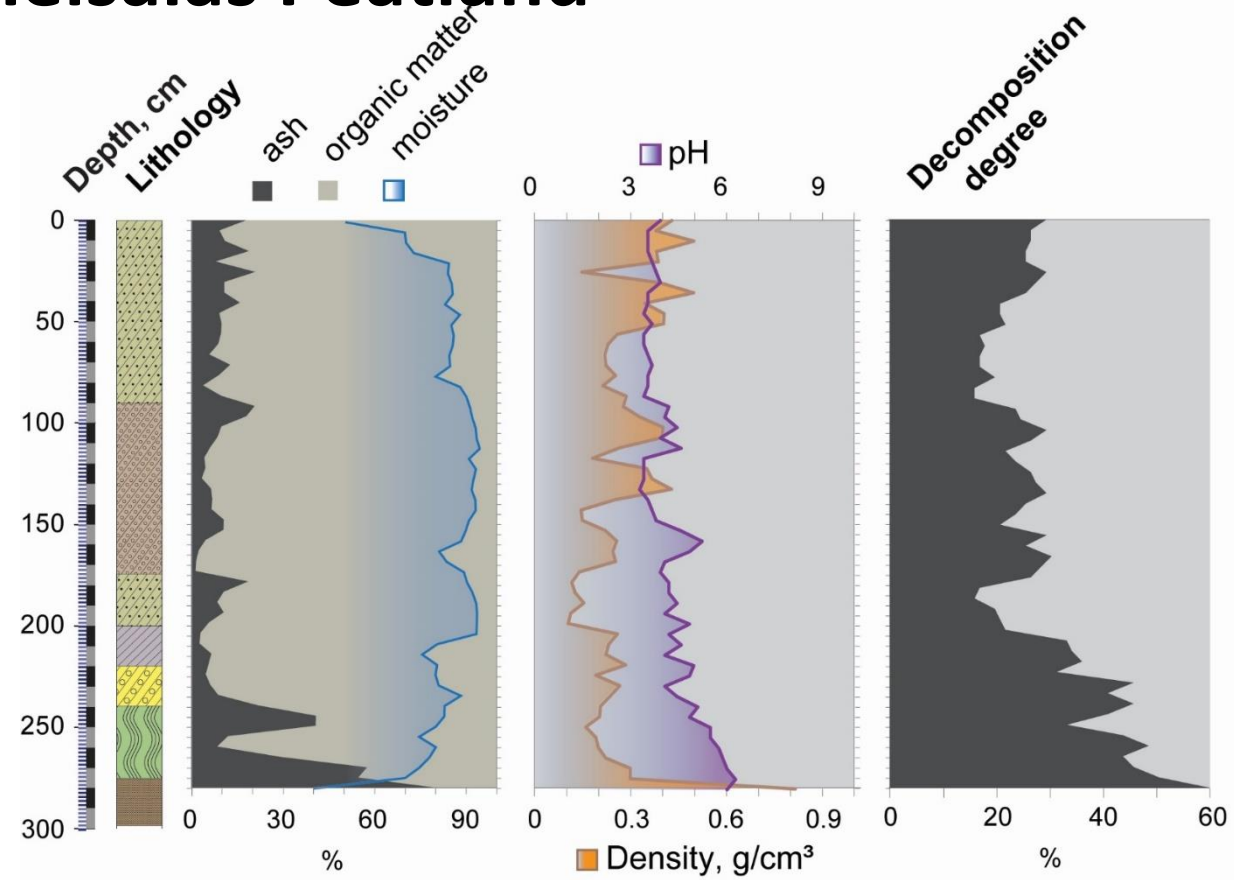
Transition mire peat
- Sedge - Sphagnum peat

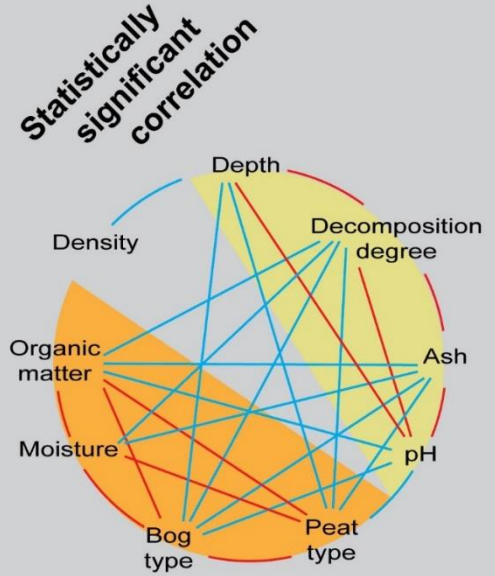
Fen peat
- Wood - sedge peat
- Reed - sedge peat

Mineral sediments
- Sand with plant remains

Comparison of peat properties and data statistic analysis from core Sēme2 (semi-natural part of Sēme Bog)

Lielsalas Peatland





n = 55, P > 0.01

positive correlation — *negative correlation*

In both groups all elements have positive correlation within group elements and negative correlation with elements of other group

I Group
- Depth
- Decomposition degree
- Ash
- pH

II Group
- Organic matter
- Moisture
- Bog type
- Peat type

Raised bog peat

Sphagnum fuscum peat

Cotton grass - Sphagnum peat

Pine - Sphagnum peat

Transition mire peat

Sedge - Sphagnum peat

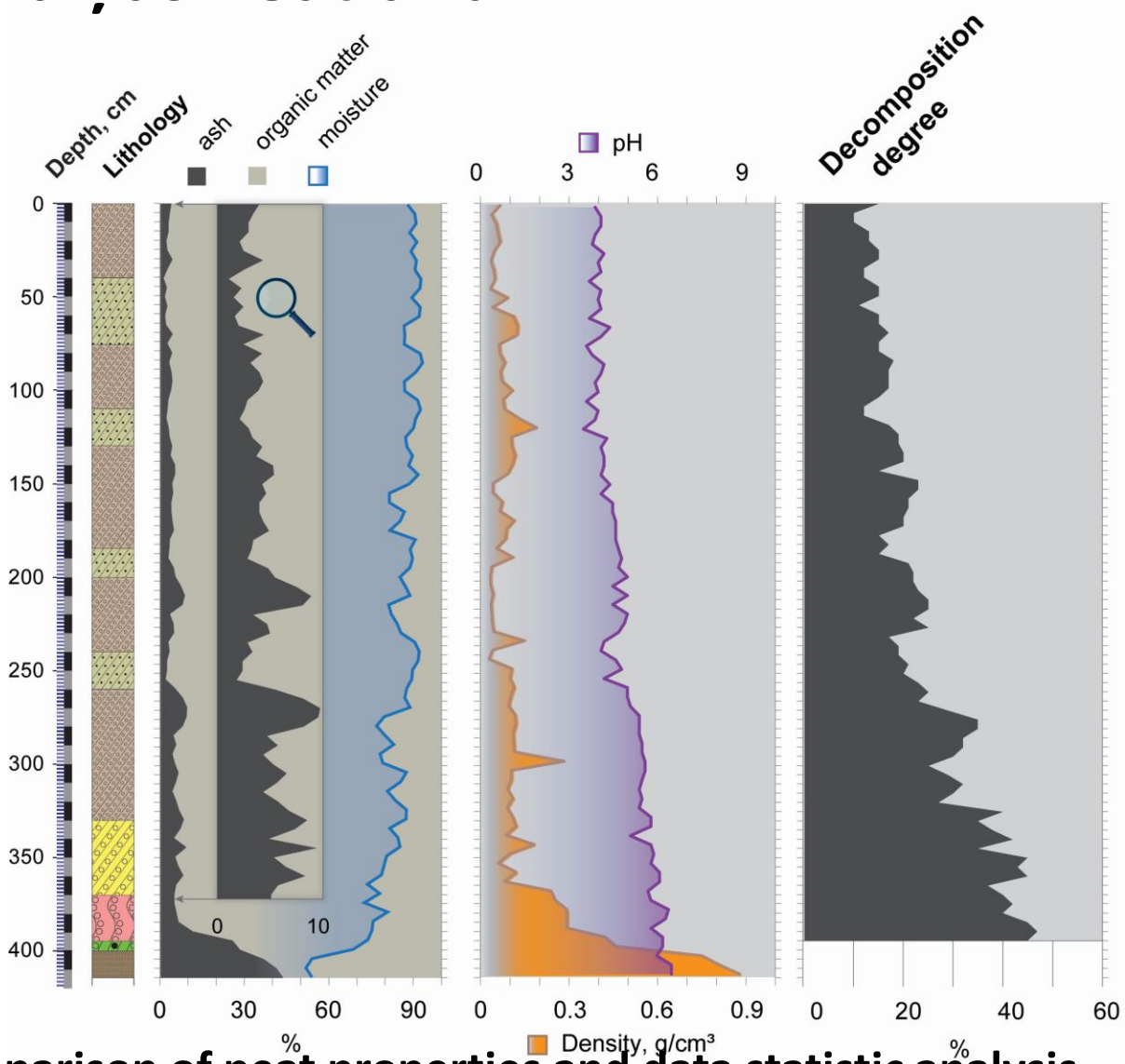
Wood - grass peat

Mineral sediments

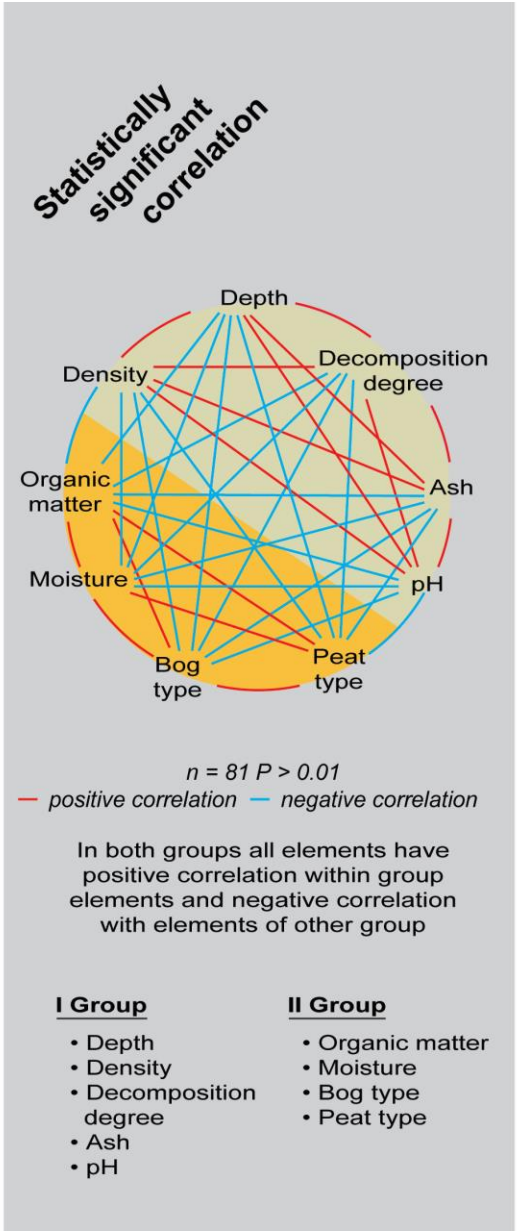
Sand with plant remains

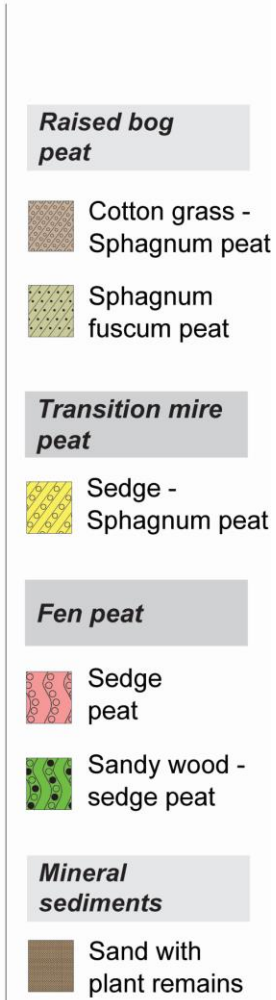
Comparison of peat properties and data statistic analysis from core Lielsala3 (peat extraction area of Lielsala Peatland

Drabiņas Peatland

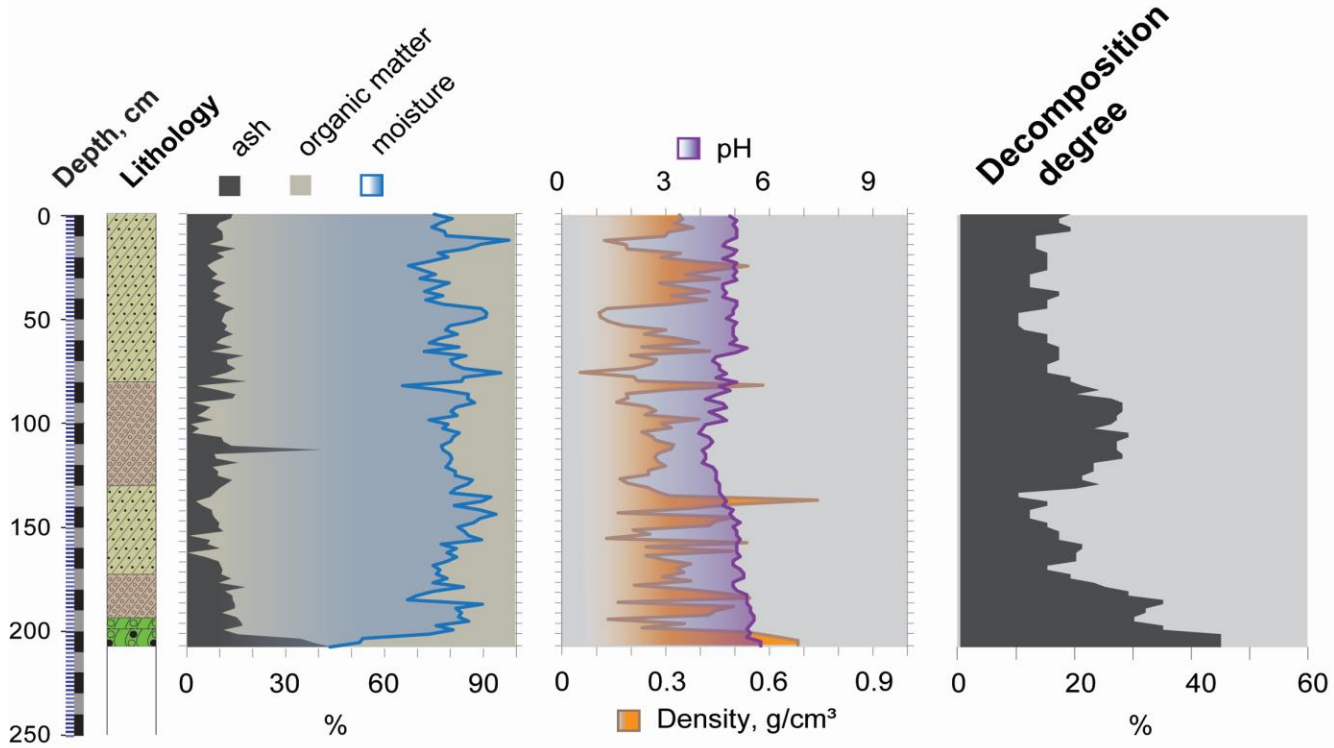


Comparison of peat properties and data statistic analysis from core Drab4 (natural part of Drabiņas Bog)

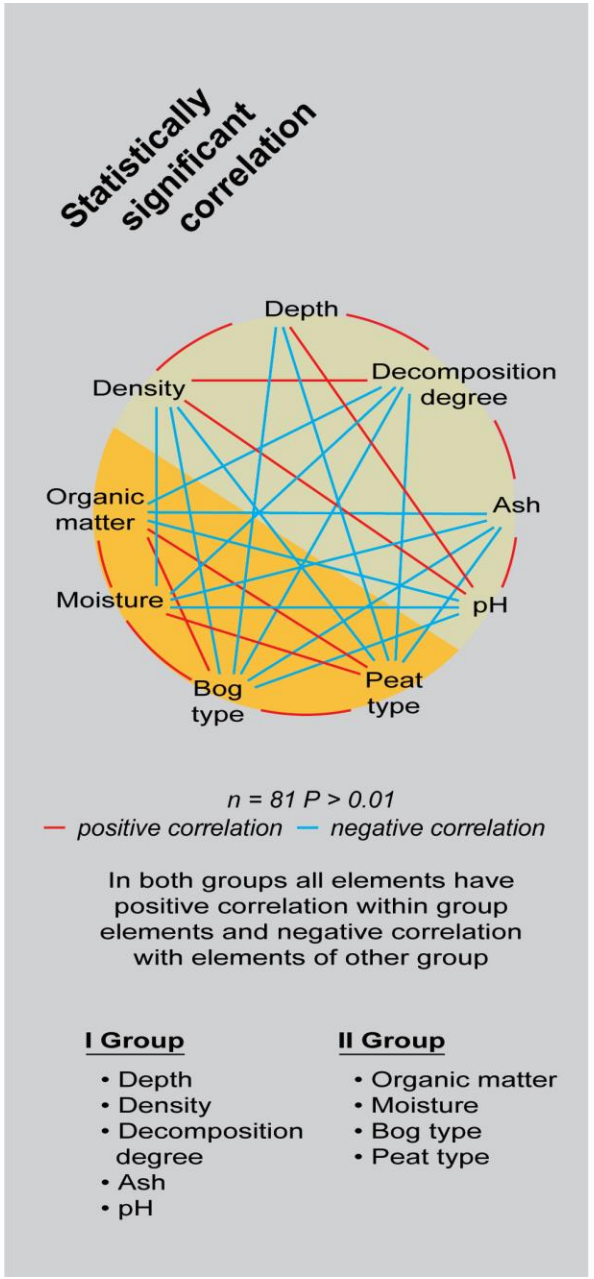


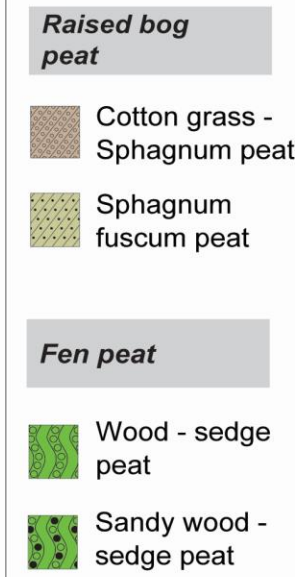


Drabiņas Peatland



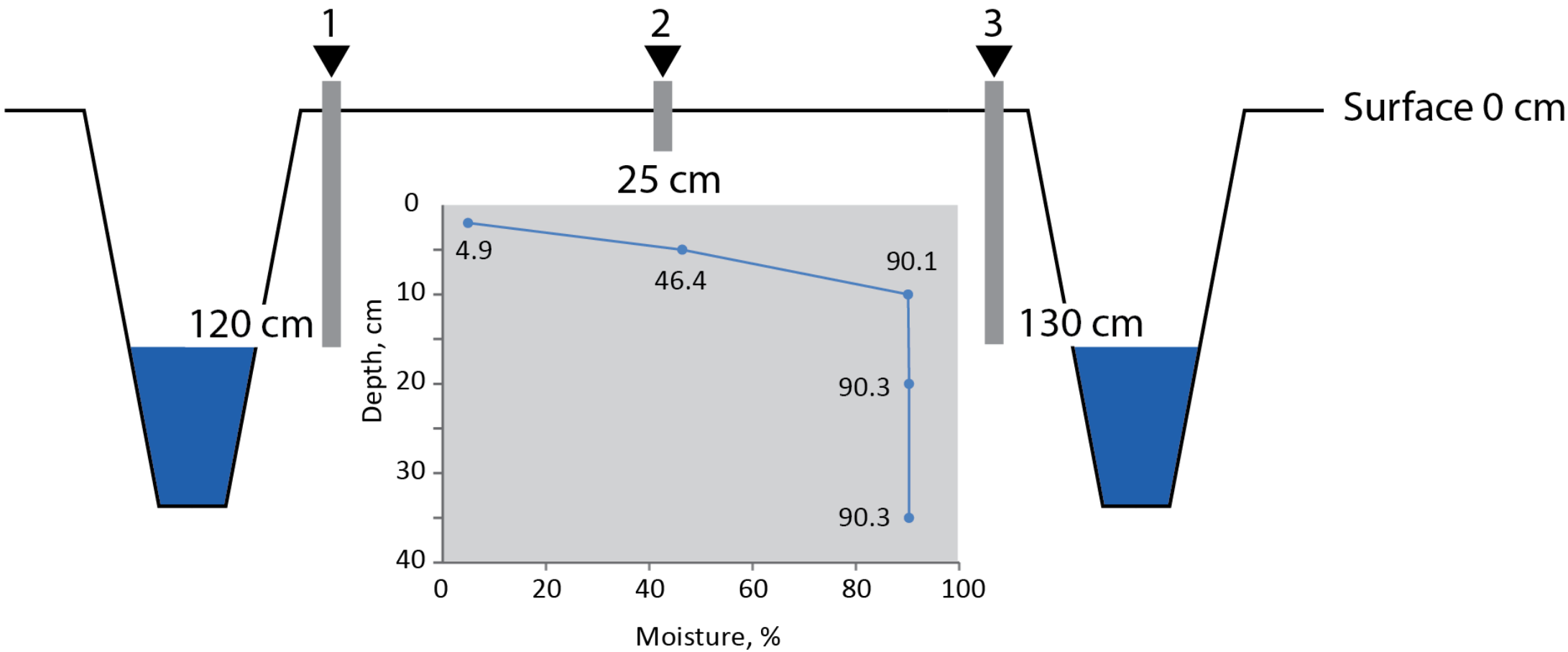
Comparison of peat properties and data statistic analysis from core Drab5 (peat extraction area of Drabiņas Peatland)





Kaigu Peatland:

measurements of peat moisture and water depth in the production field



Conclusion

- The results of the study confirm that the physical properties of peat are dependent to a large degree on peat decomposition degree and pore-size changes in the section. With increasing peat decomposition, the size of organic particles, as well as the size of pores decreases and increase the density of peat, which also causes a decrease in peat moisture.

- Detailed multidisciplinary research reveals relatively short-term changes in the course of the development of the raised bog, which indicates the conditions of peat accumulation and climate change in a specific historical period.

- However, in general, these short-term changes in peat properties during the formation of the high bog do not significantly affect the quality of production from the particular peat deposit.

Conclusion (cont.)

- Peat retains its properties in sections from peat extraction fields and they change significantly only in the upper 50 cm, where the moisture decreases, but the density and ash content increase. Also, the characteristics of the peat change and can affect the quality of the production in the lower layers of the sections, but this is largely related to the fact that they are represented by a different type of peat. In addition, these lower layers of peat usually have another distinct use.

- Sphagnum peat forms most of the upper raised bog peat layers in the studied sites and due to their unique structure, decomposition degree and density are closely related to the size of sphagnum pores, studies of which reveal important information on processes in nature.

- Measurements in the middle of the extraction fields and near their ditches prove that water flows in sphagnum peat are mostly vertical and that ditches therefore have less influence on moisture conditions in drained areas than is believed.

Thank you for your attention!

Acknowledgements

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