RELATIONSHIP BETWEEN PEAT MOISTURE AND PHYSICAL PROPERTIES IN DIFFERENTLY AFFECTED PEATLANDS

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Actuality and study aim

Peat moisture, water level and physical properties are closely related and affect each other. Physical properties of peat are dependent to a large degree on porosity and sphagnum pore-size distribution, as well as particle size and structure, resulting in porosity being controlled primarily by the degree of decomposition.

The study aims to elucidate the relationship between peat moisture and other physical properties using a multidisciplinary approach.
This includes the analysis of changes in moisture content and density in the peat section, taking into account the degree of decomposition and pore size determined using a scanning electron microscope Phenom ProX.

Sampling Sites: (1) Sēme Bog (2) Lielsala Peatland (3) Drabiņas Bog

1 Sēme Bog - N 57°20'69381", E 22°17'35940":

- located in Kursa Lowland, the northern part of Venta-Usma depression, north-western Latvia,
- raised bog which belongs to Stikli Mire complex,
- peat was sampled from two locations (a) in the natural bog (core Sēme1) and from influenced part of raised bog (core Sēme 2) located 1750 m eastern from the sampling site Sēme1.

2 Lielsala Peatland - N 57°20'67309", 22°19'12493":

- locates eastern from Sēme Bog and also belongs to the stikli Mire complex,
- sampling site Lielsala3 is located approximately 450 m from sampling site Sēme 2.

3 Drabiņas Bog - N 57°47'88352", E 23°31'32978":

- raised bog located in the north-western part of Tīreļi Plain, Middle Latvia Lowland.
- peat was sampled both from the natural part of the bog (core Drab4) and from the peat field (core Drab5) approximately 400 m west from core location Drab4.

Study methods

Field studies and sampling

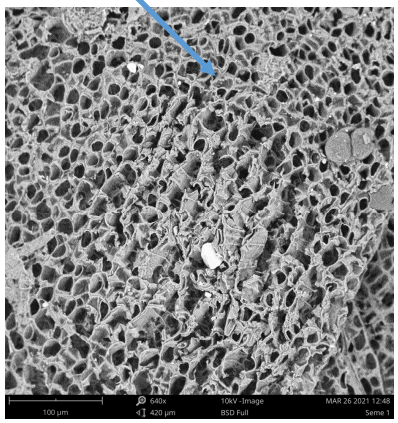
Study methods

Laboratory analyses

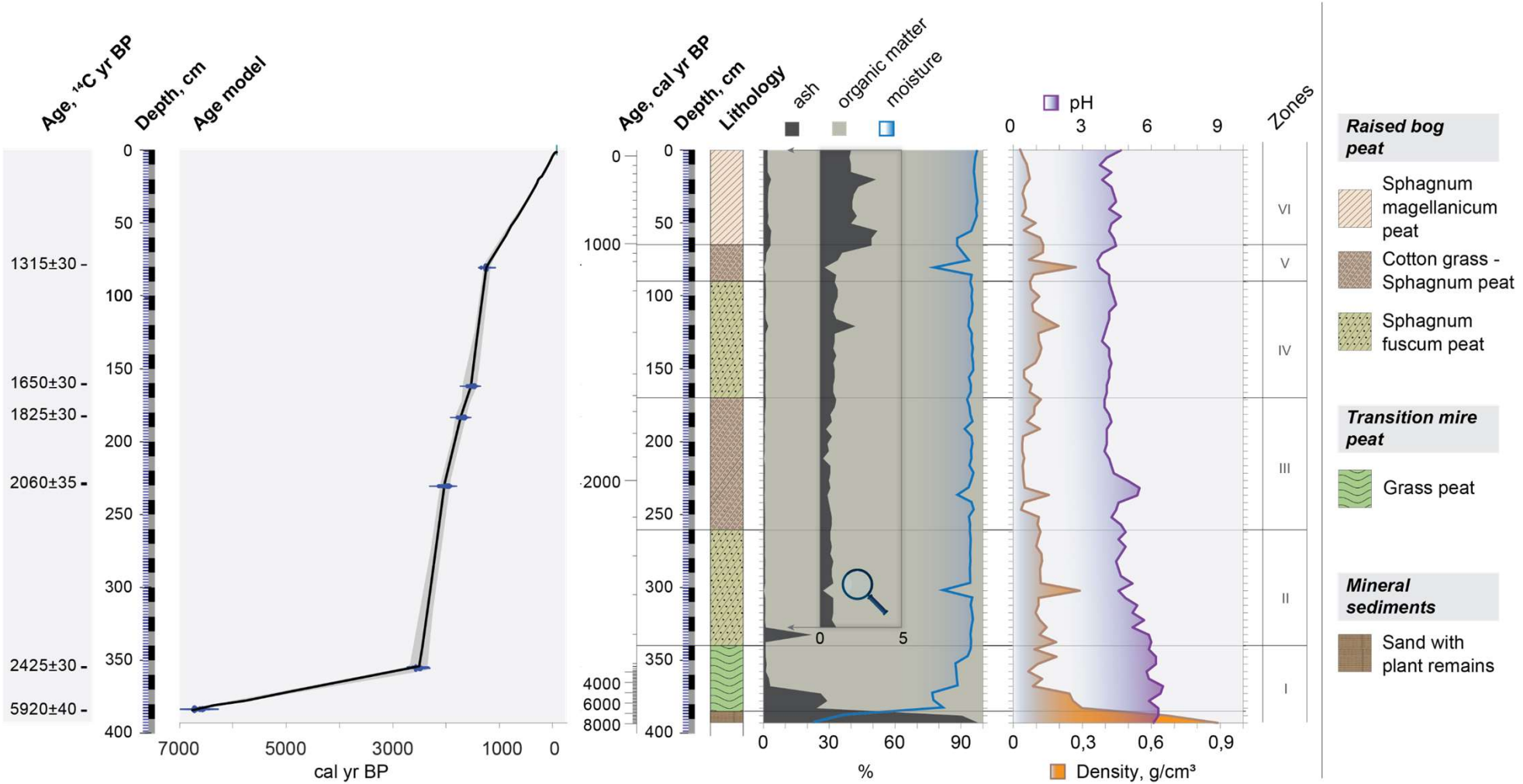
Loss-on-ignition (LOI) analysis
determination of moisture (%),
ash (%), pH, Bulk density,
Peat botanical composition and decomposition degree

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

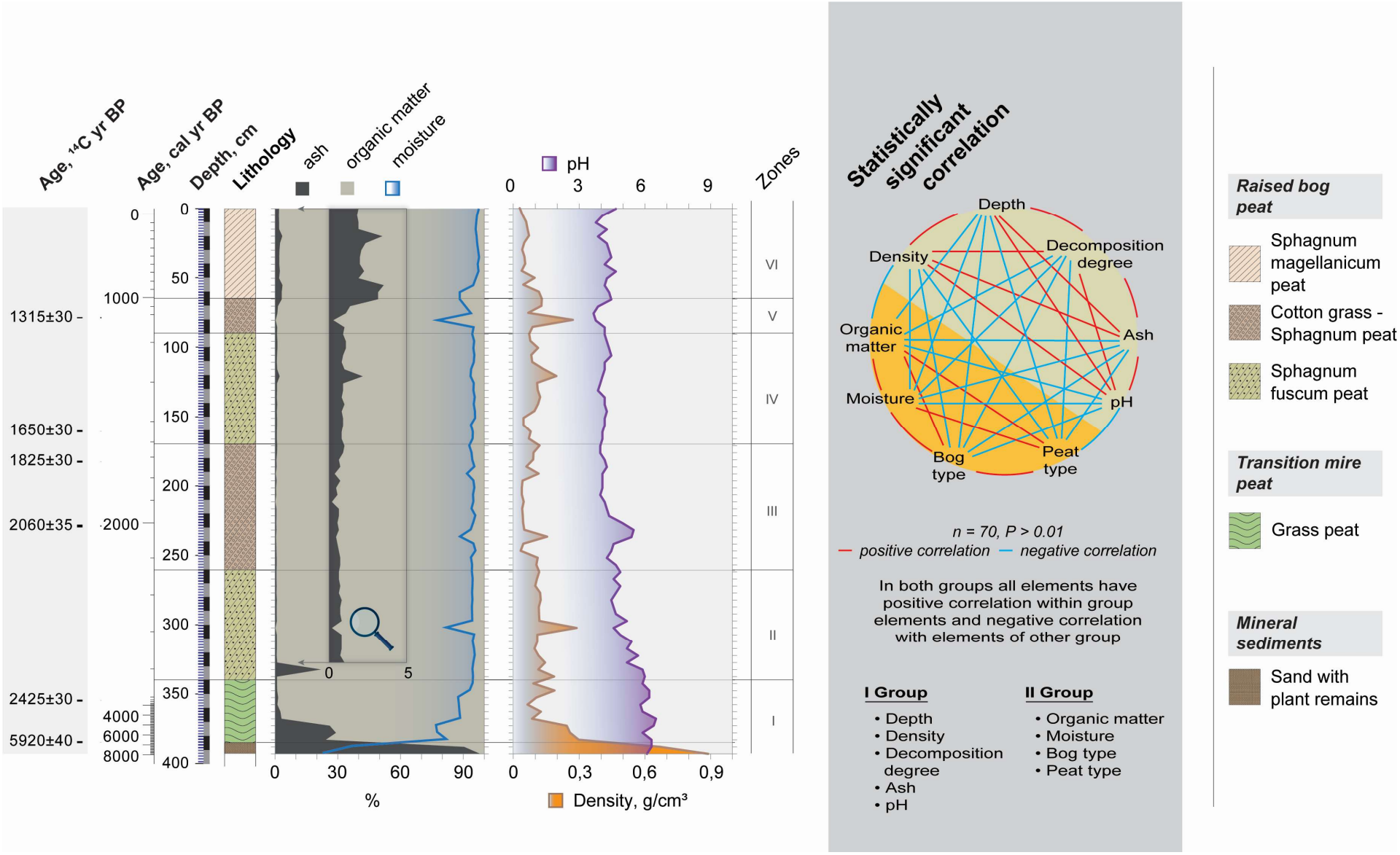
ATS Max 60 ÷ 210g 0,01%



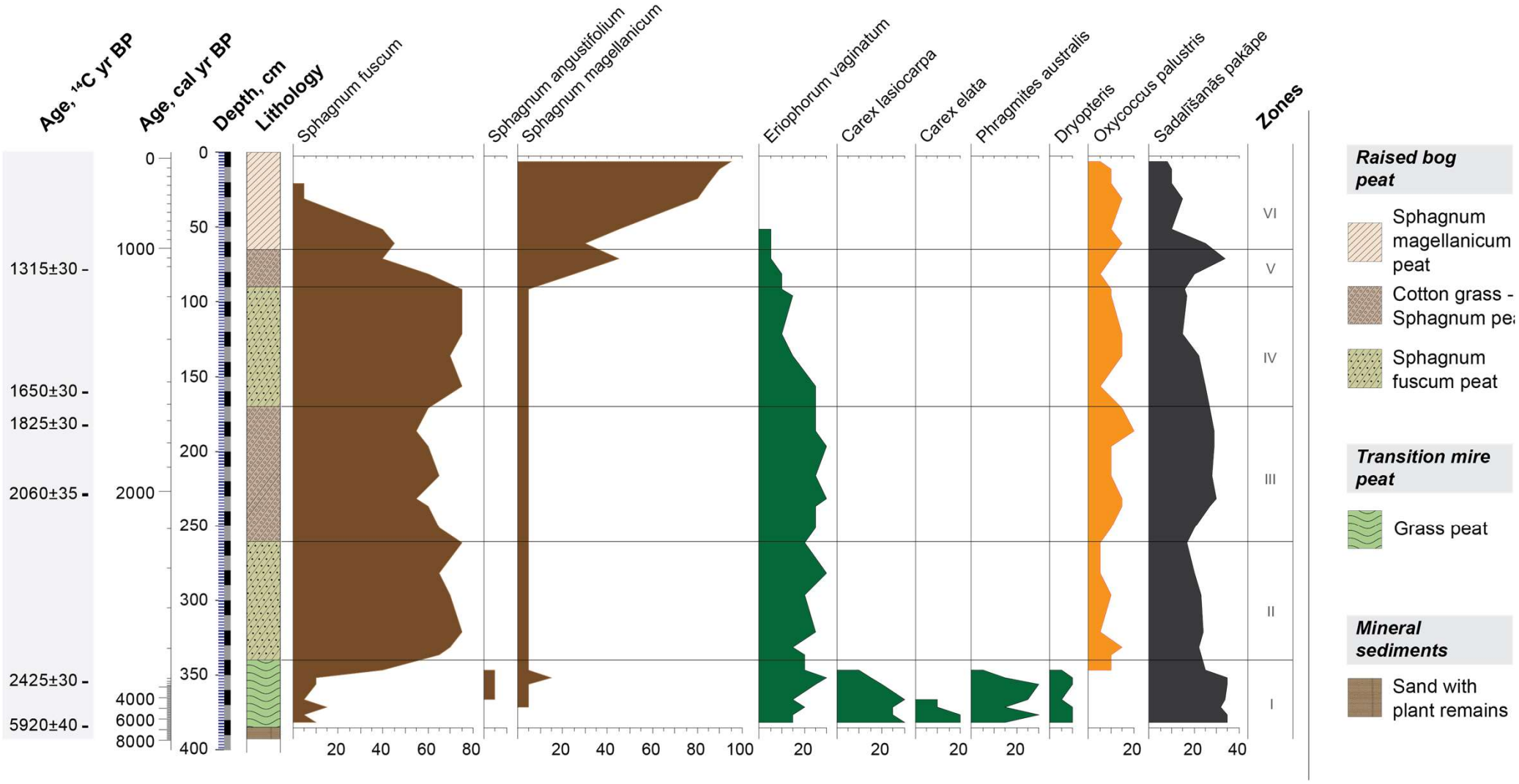
Results



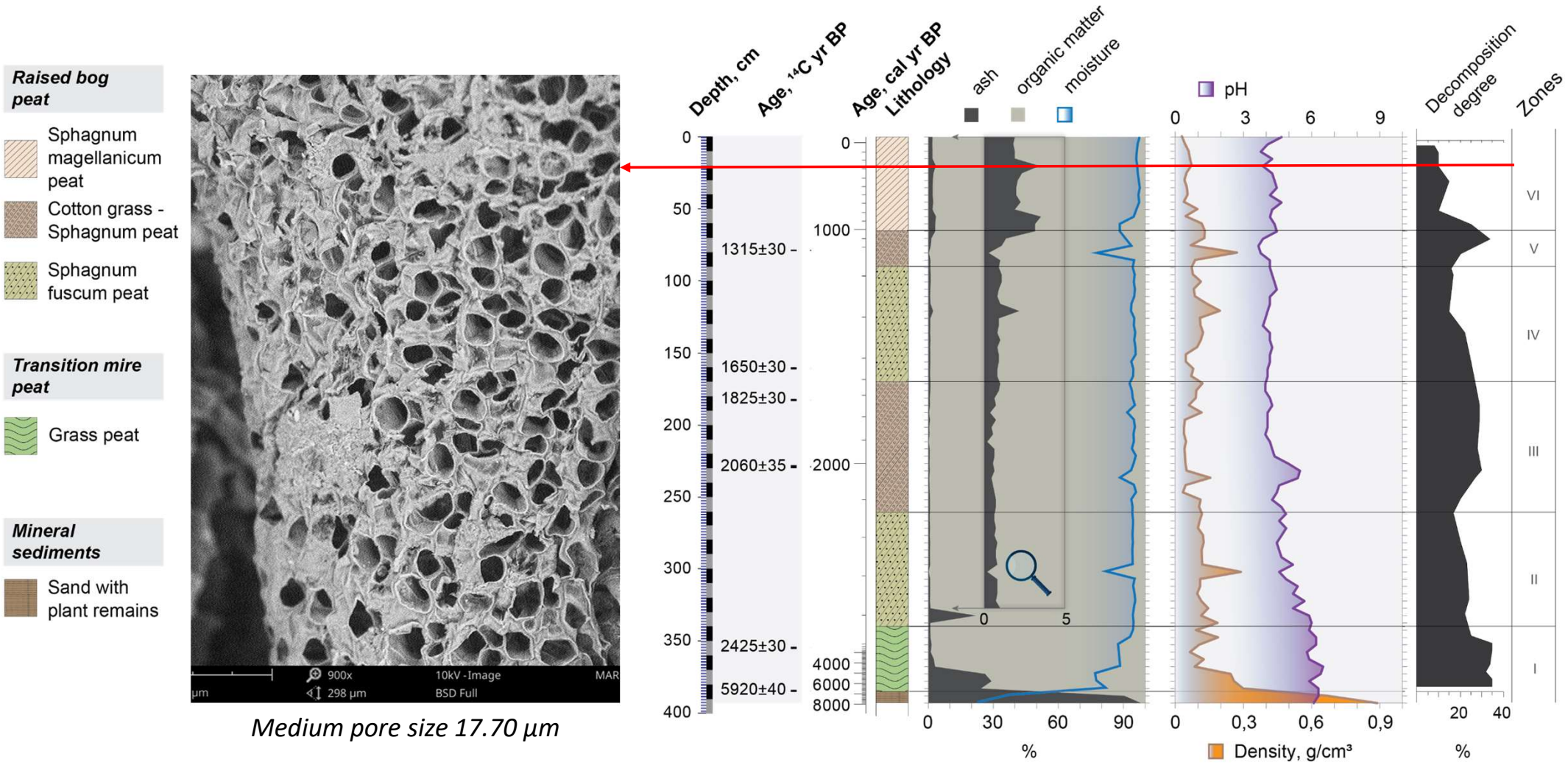
Age-depth model and changes in properties of peat section of Sēme1



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

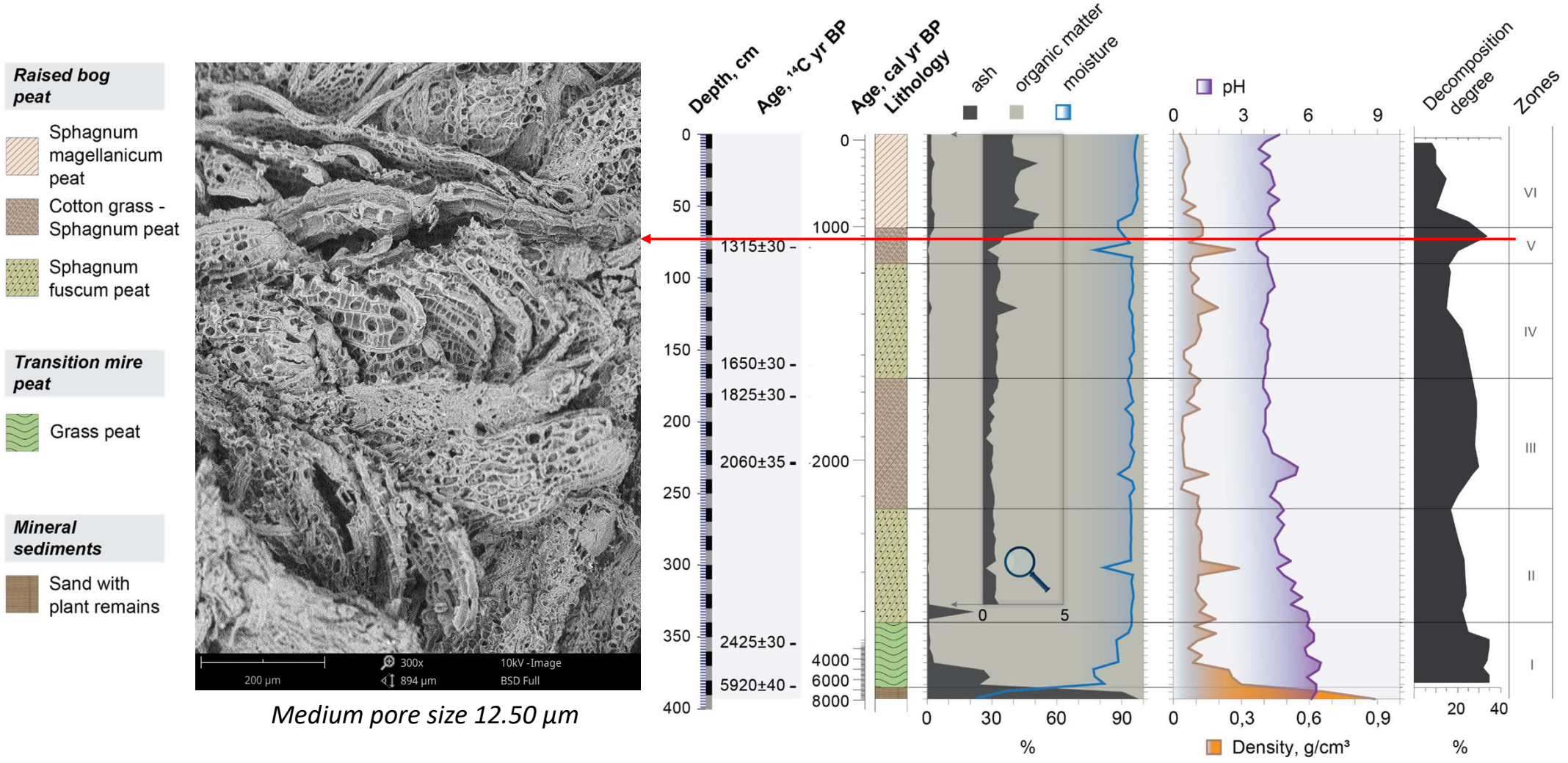


Peat botanical composition and decomposition degree (%) from core Sēme1



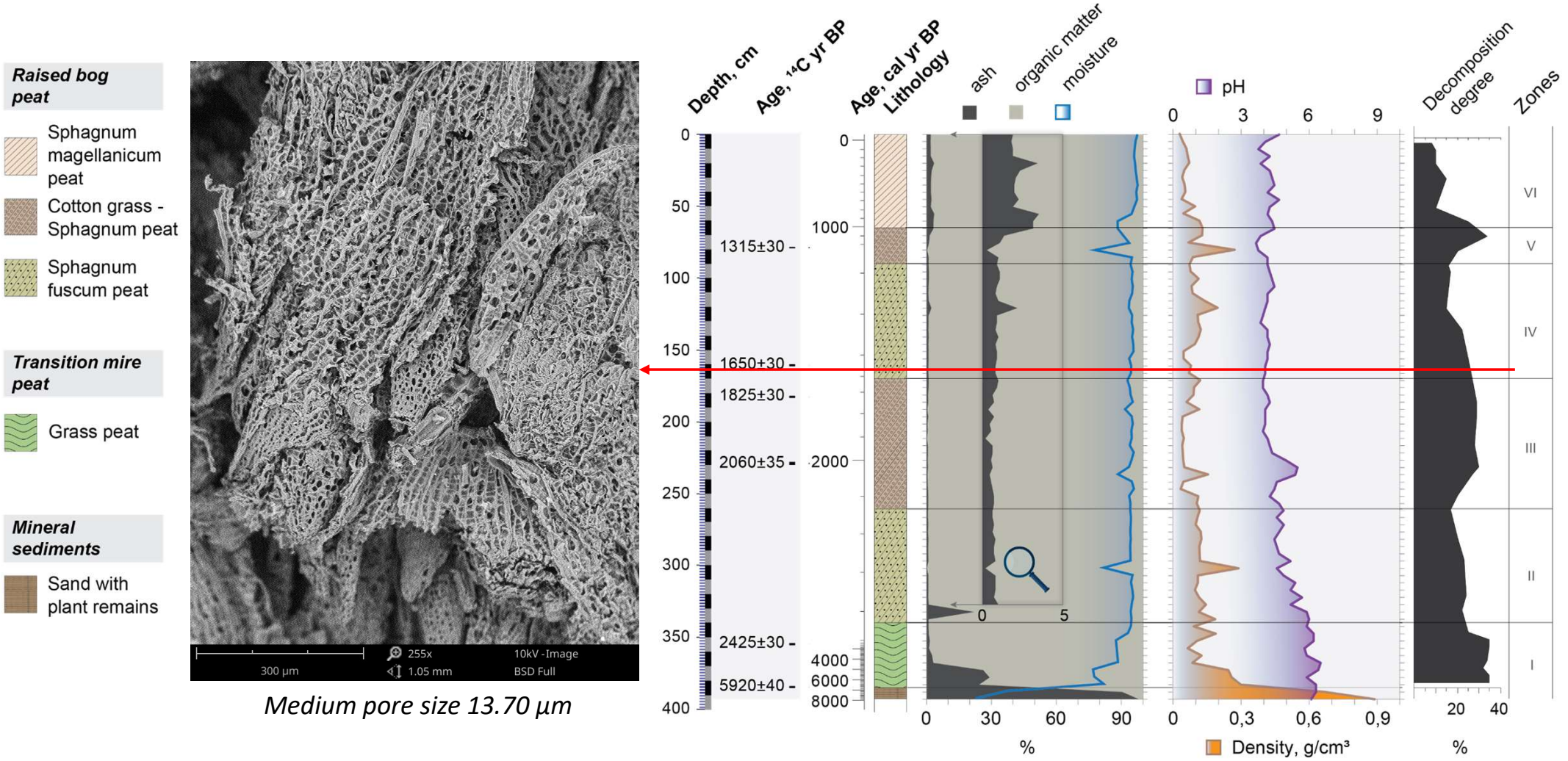
Medium pore size 17.70 µm

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



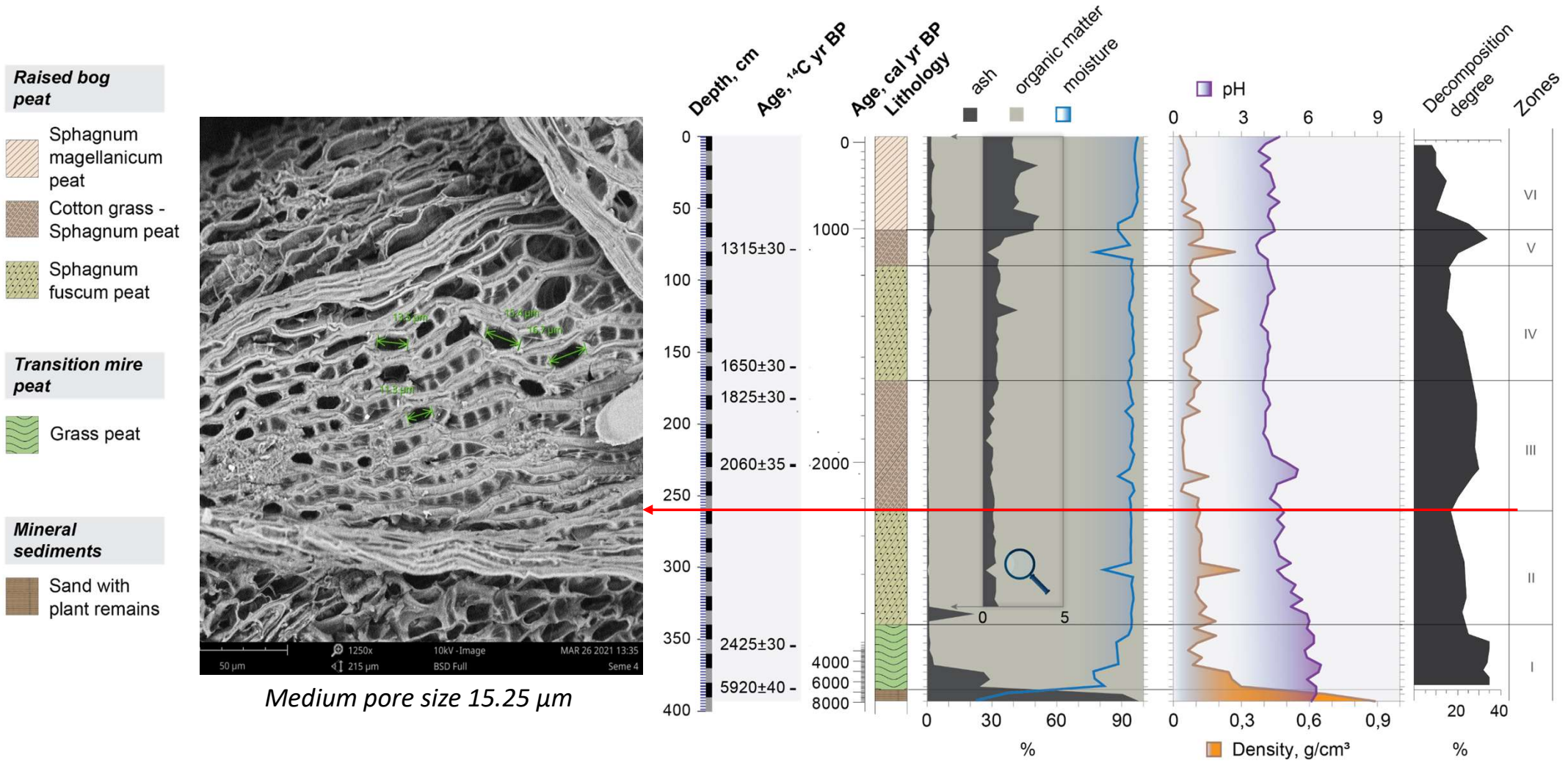
Medium pore size 12.50 µm

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



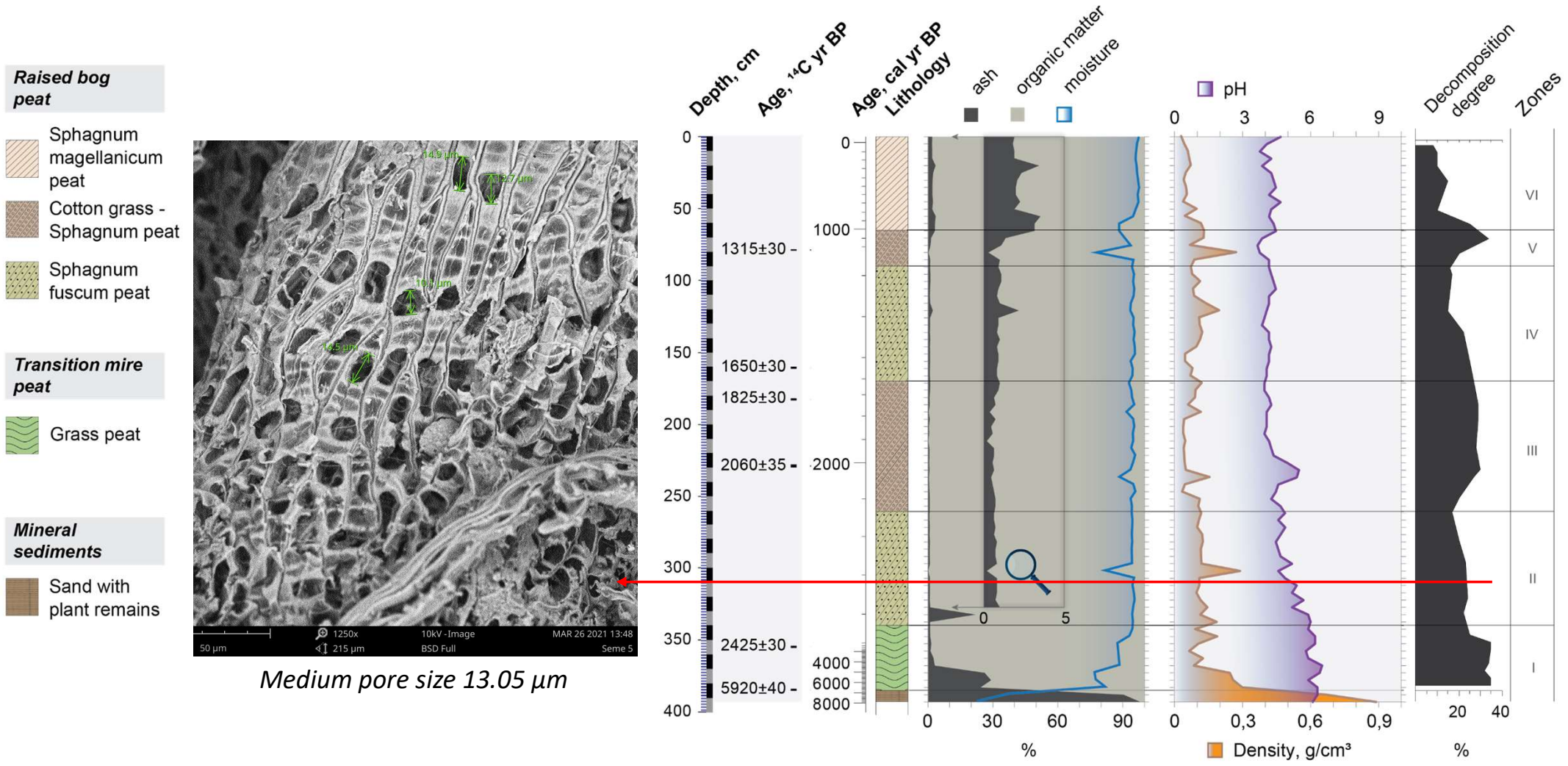
Medium pore size 13.70 µm

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



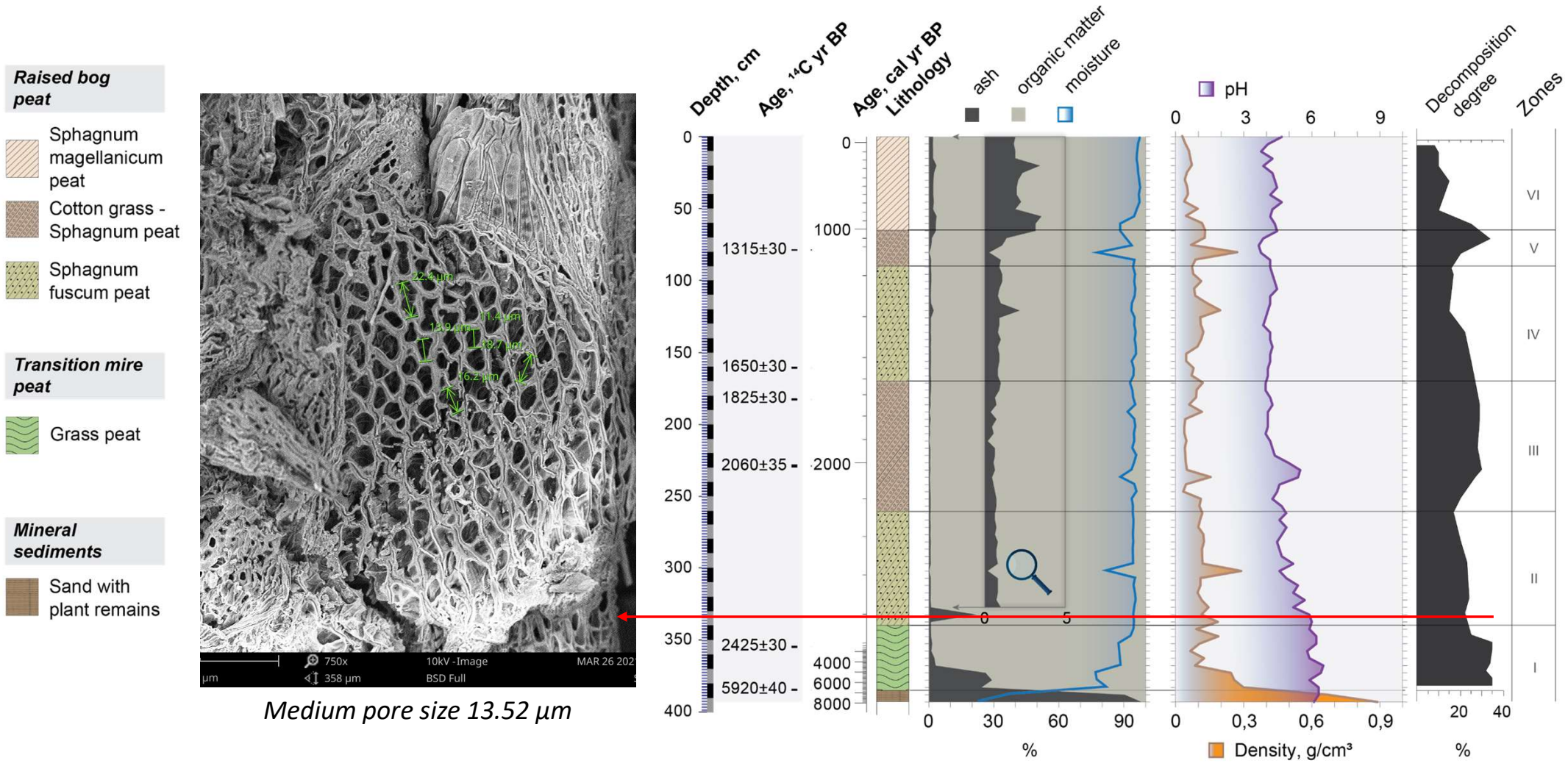
Medium pore size 15.25 µm

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



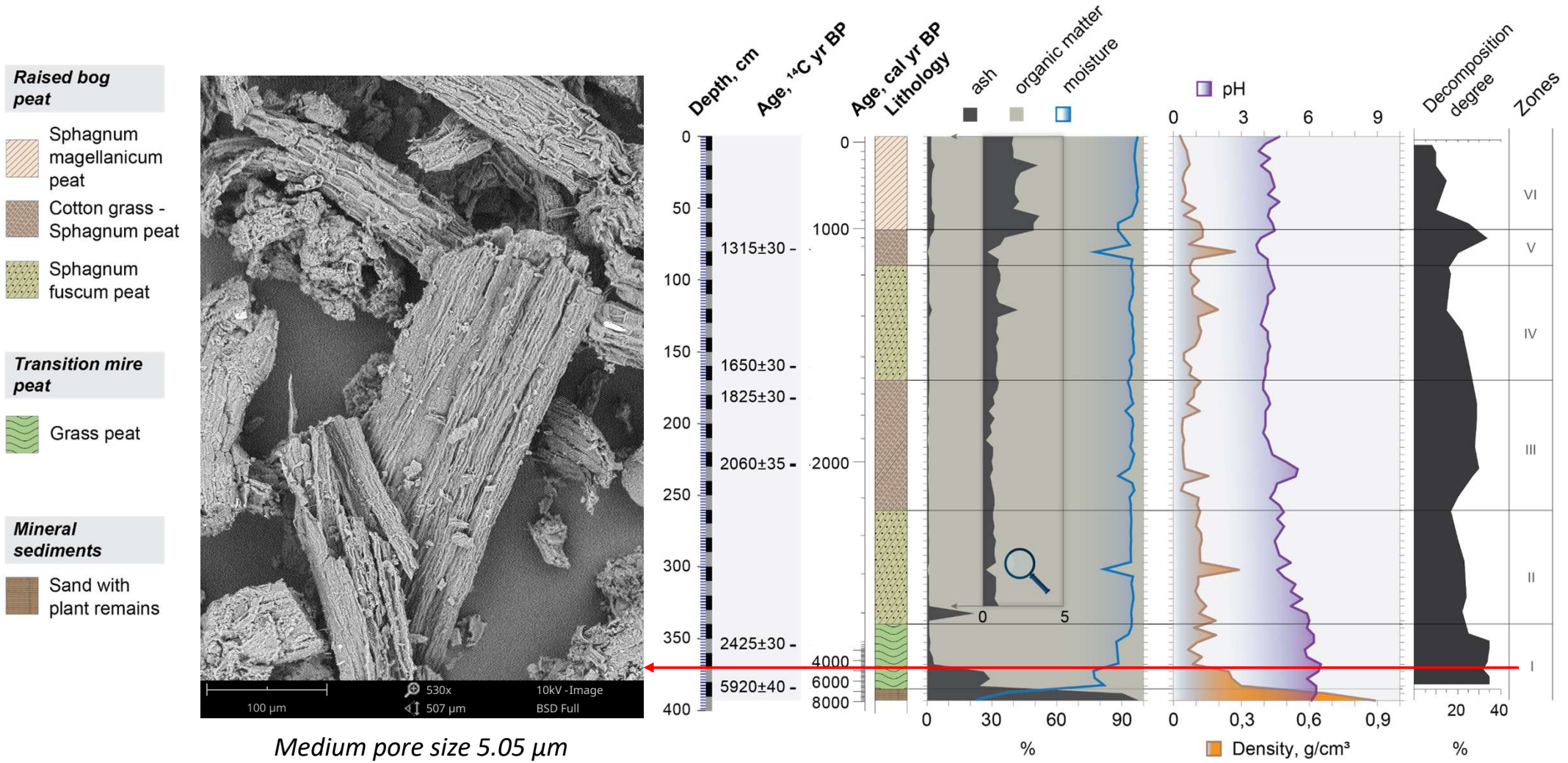
Medium pore size 13.05 µm

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



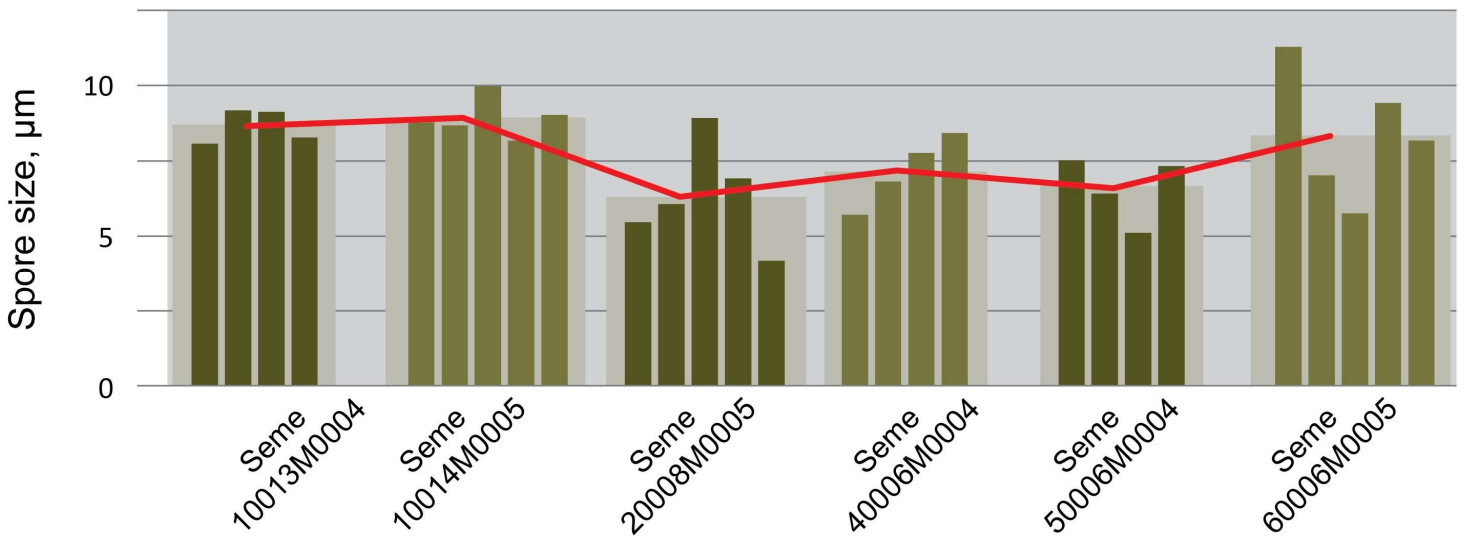
Medium pore size 13.52 µm

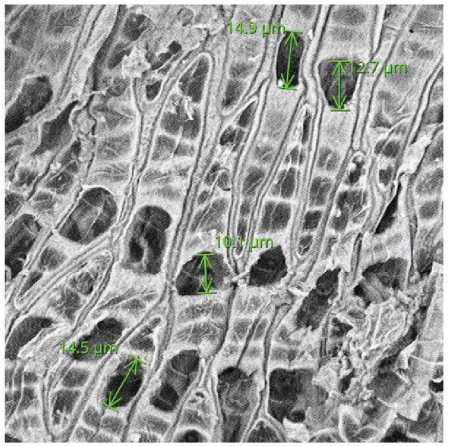
Comparison of the peat properties characteristics, the structure and Sphagnum moss pore size in the section of Sēme1 at a depth of 345 cm



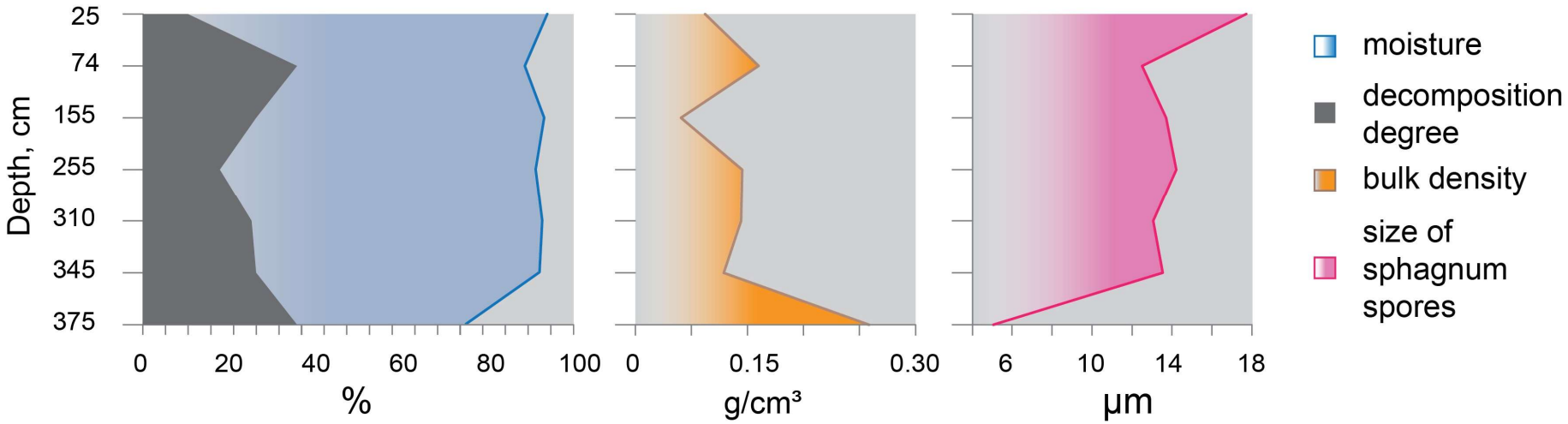
Medium pore size 5.05 µm

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

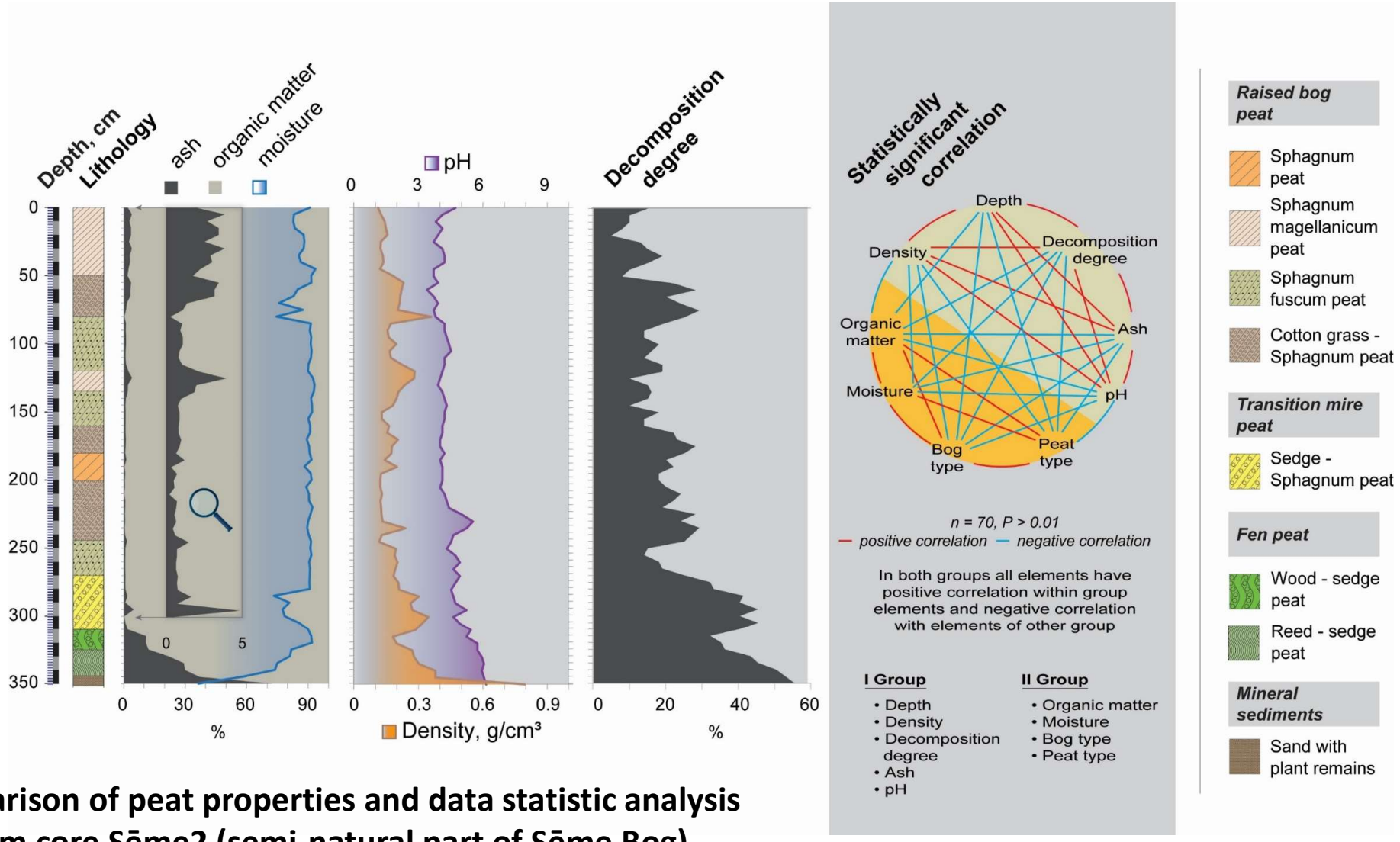




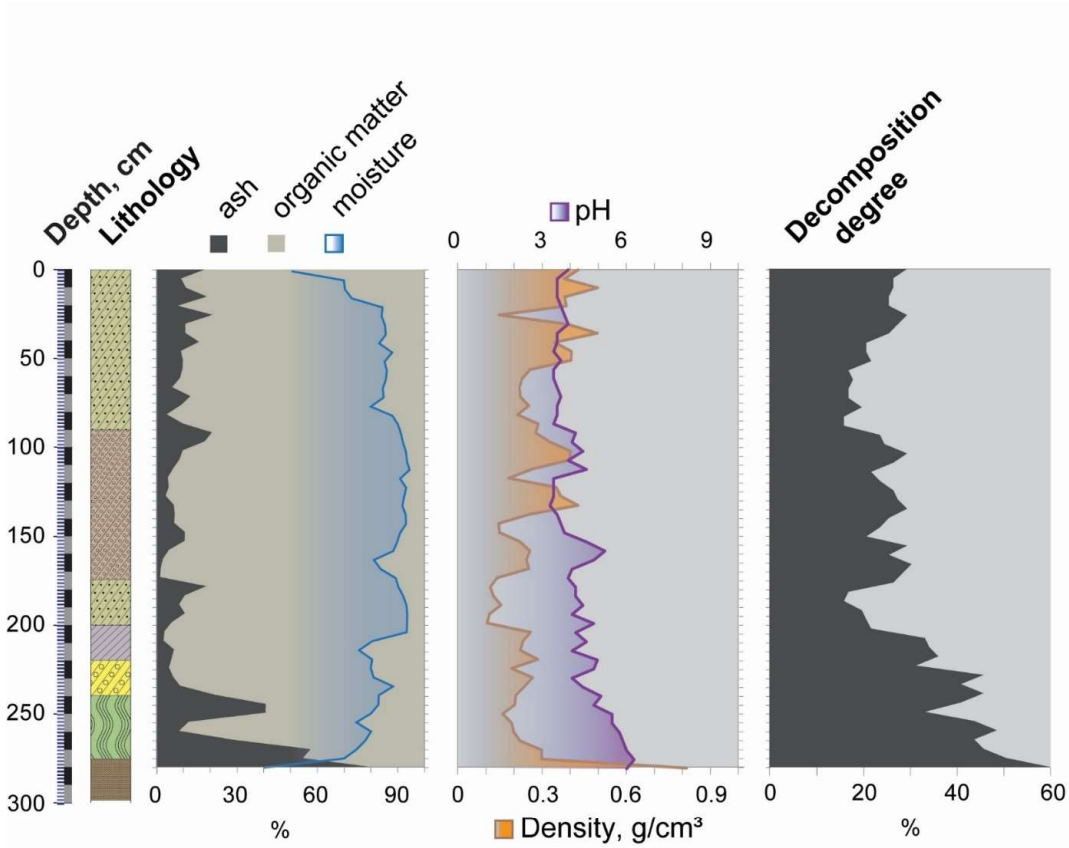
Medium pore size 13.05 µm

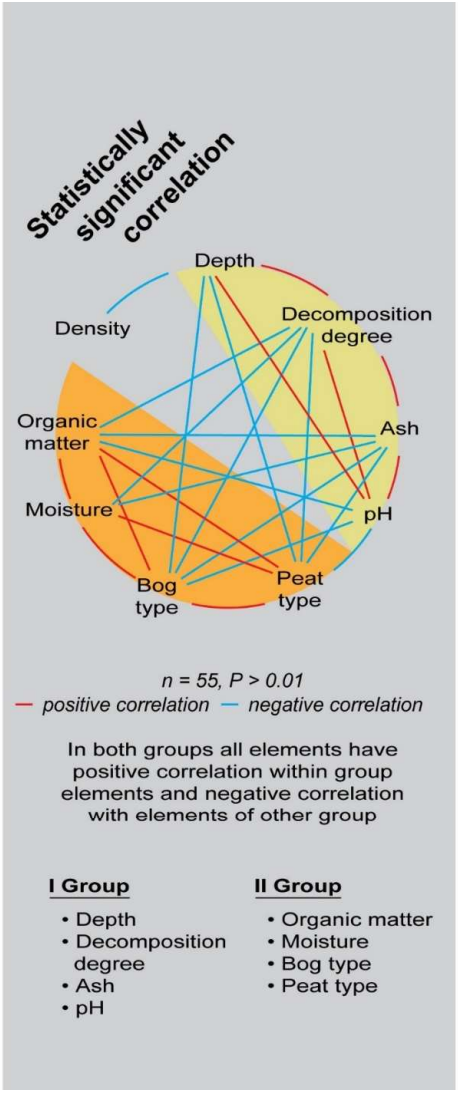


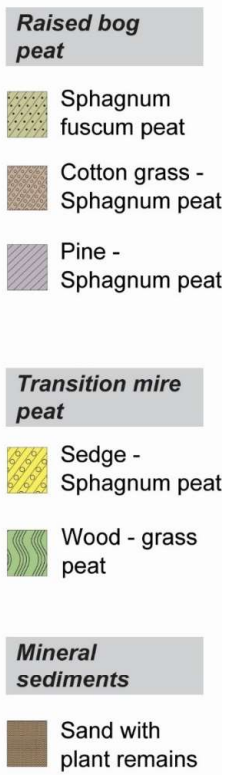
Relationship of sphagnum leaf pore size in studied samples from core Sēme1 with other peat properties



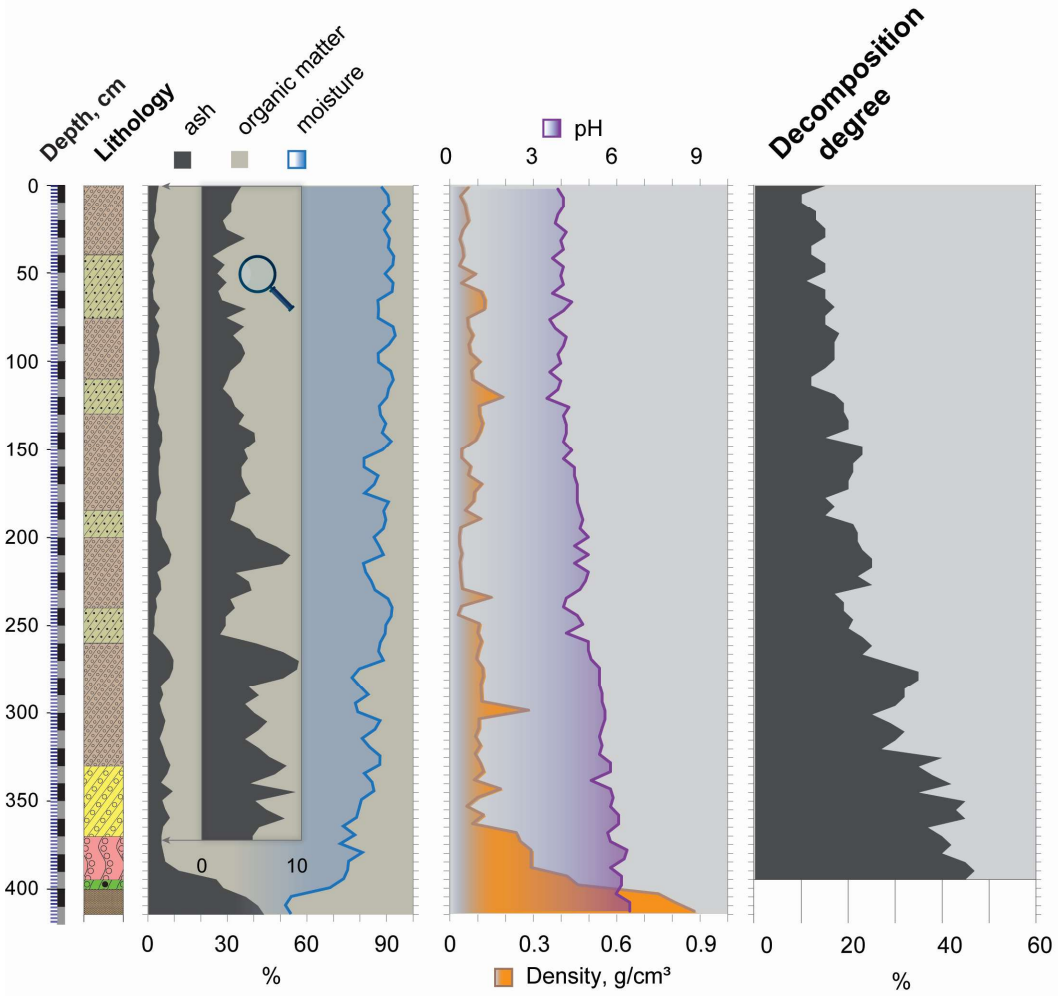
Comparison of peat properties and data statistic analysis from core Sēme2 (semi-natural part of Sēme Bog)

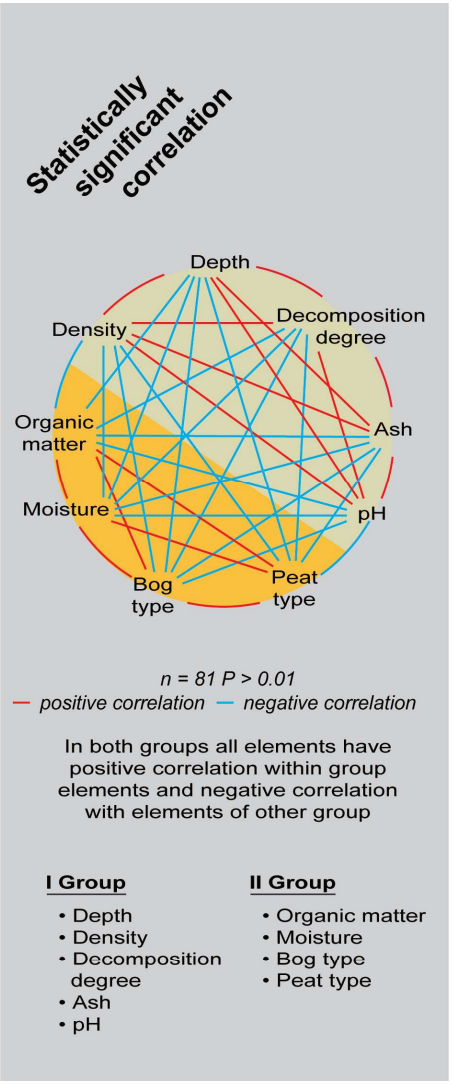


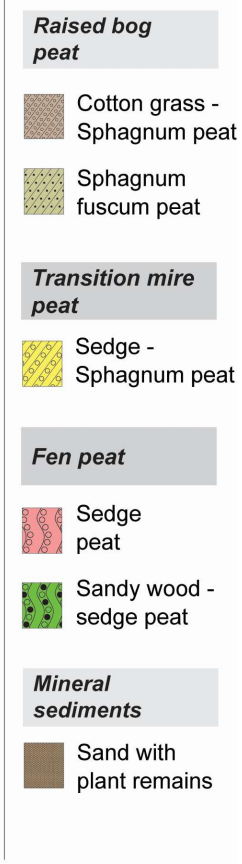




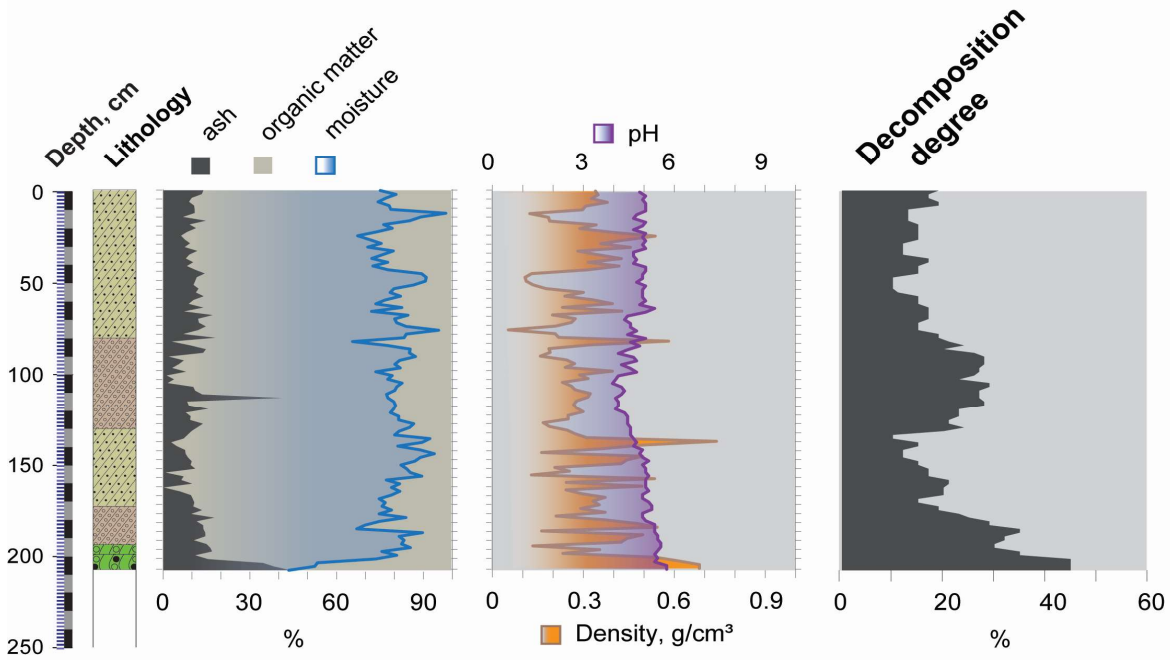
Comparison of peat properties and data statistic analysis from core Lielsala3 (peat extraction area of Lielsala Bog)



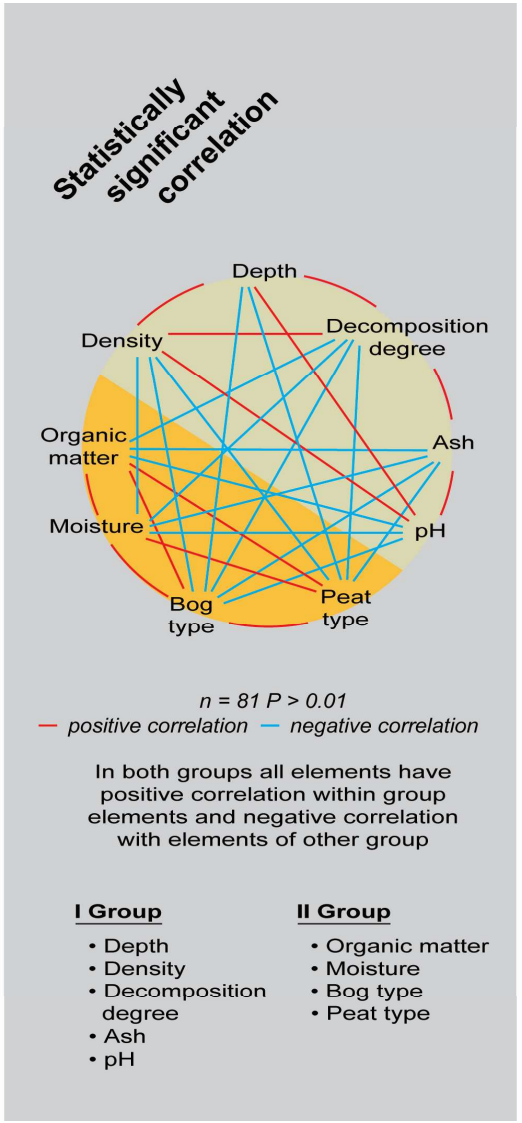


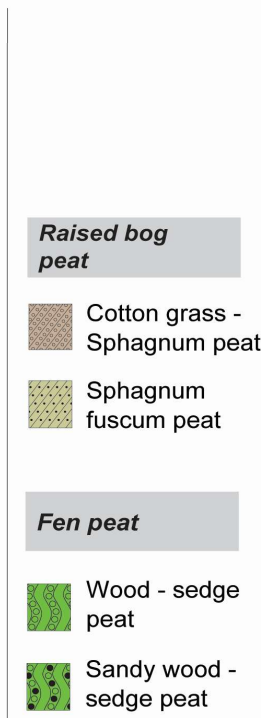


Comparison of peat properties and data statistic analysis from core Drab4 (natural part of Drabiņas Bog)



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





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 distribution 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 bog, which indicates the conditions of peat accumulation and climate change in a specific historical period.

- The moisture content of peat significantly depends on other peat properties, including sphagnum pore size, peat density and the degree of decomposition of the peat.

Conclusion (cont.)

- Additionally, 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.

- The properties of peat change more sharply and vary more significantly in peatlands affected by drainage in comparison to natural bogs.

- Sphagnum peat forms most of the 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.

Thank you for your attention!

Acknowledgements

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