

Pseudoacid sulfate soil materials



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Background

Acid sulfate (AS) soils are in Finland and Sweden defined as soils, sediments (incl. glacial till) and organic materials (e.g. peat) containing hypersulfidic materials which upon oxidation in the field or during incubation in the laboratory form sulfuric acid that lowers soil-pH to <4.0 and <3.0 for mineral and organic soil materials, respectively.

In the Finnish-Swedish AS soil classification (Boman et al., in preparation), the term pseudoacid sulfate (PAS) soil, first described by Pons (1965), has been re-introduced to describe a soil not fulfilling the AS soil diagnostic criteria (not containing sulfuric and/or hypersulfidic materials). It is indicated that PAS soil materials (e.g. fine-grained) may contain higher acidities and S-concentrations than some types of AS soil materials (e.g. coarse-grained) (cf. Visuri et al., 2021; Mattbäck et al., 2017; 2022). PAS soils (Fig. 1) consists of **pseudosulfuric material**, which is characterized by a pH of 4.0–4.5 and 3.0–3.5 in the oxidised horizon for mineral soil materials and organic soil materials, respectively and/or **pseudohypersulfidic material**, which during incubation display a pH-drop of ≥ 0.5 units to values between 4.0–4.5 and 3.0–3.5. Mapping of AS soils in Finland and Sweden have shown that areas with PAS soil materials can be substantial.

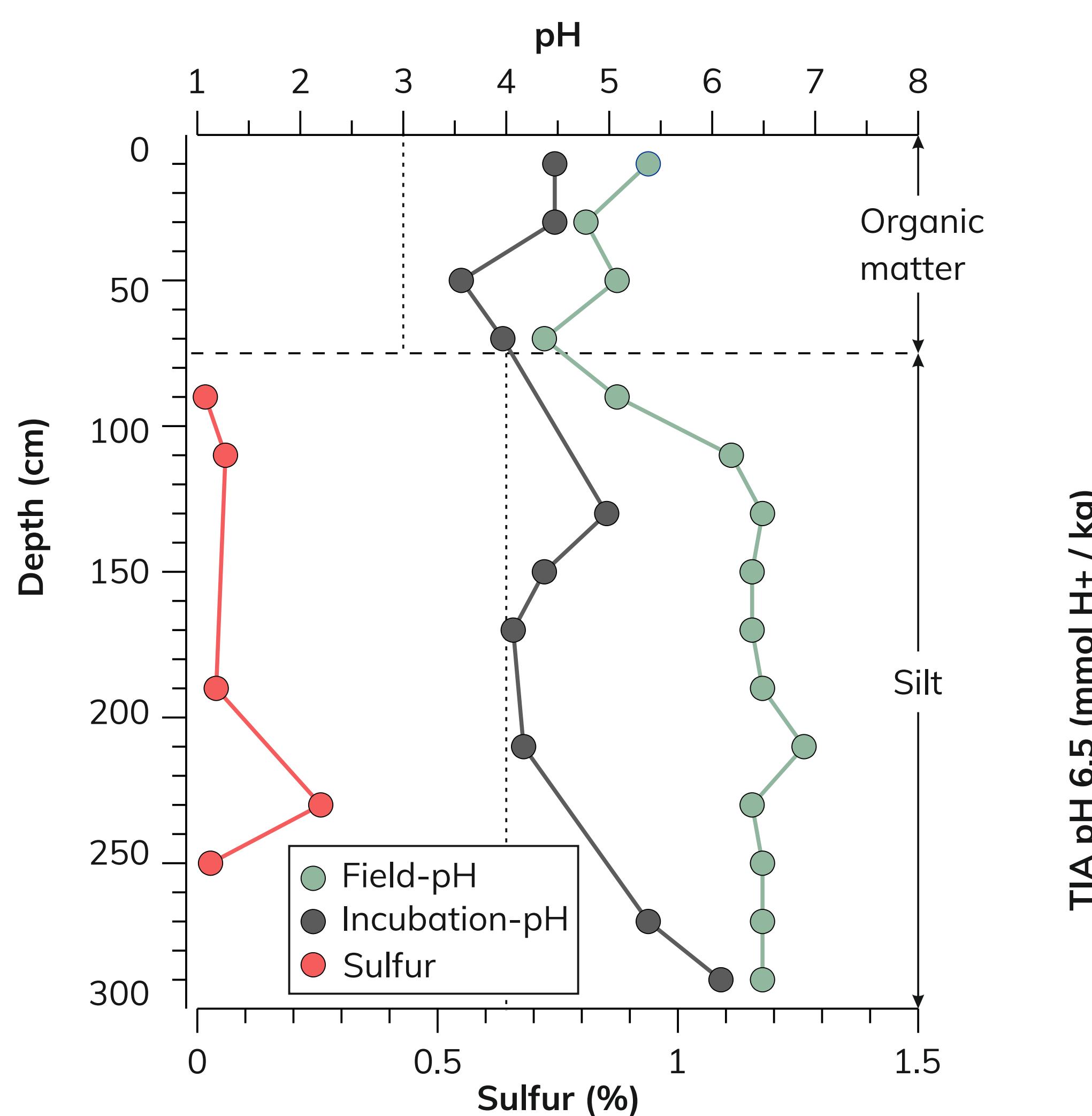


Fig. 1. Example of a pseudoacid sulfate soil. Note the drop in pH for silt during incubation, indicating sulfide oxidation.

Conclusions

- PAS soil materials (e.g. fine-grained) may contain higher acidities and sulfur concentrations than some types of AS soil materials (e.g. coarse-grained; Figs. 2 and 3).
- PAS soil materials need to be taken into account in evaluation of environmental impact.
- It is suggested that the criteria for PAS soil materials should be added to relevant soil classification systems.

Sulfur in various soil materials

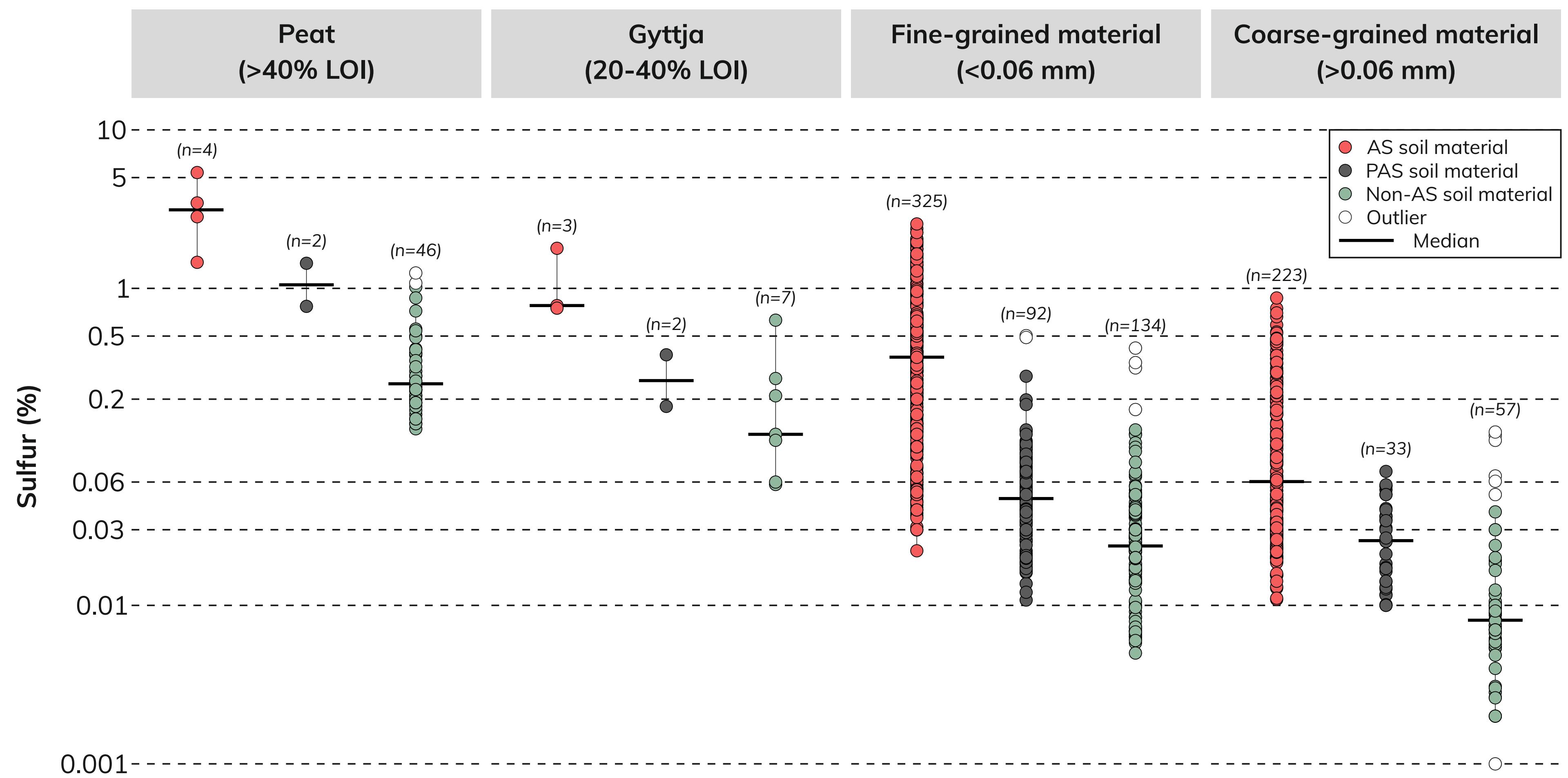


Fig. 2. Distribution of total sulfur in acid sulfate (AS) soil materials, pseudoacid sulfate (PAS) soil materials, and non-AS soil materials based on grain size and organic matter content (LOI). Included in the fine- and coarse-grained materials are also gyttja-containing materials (2-6% LOI). Slightly modified after Visuri et al. (2021).

Titratable incubation acidity (TIA) in various soil materials

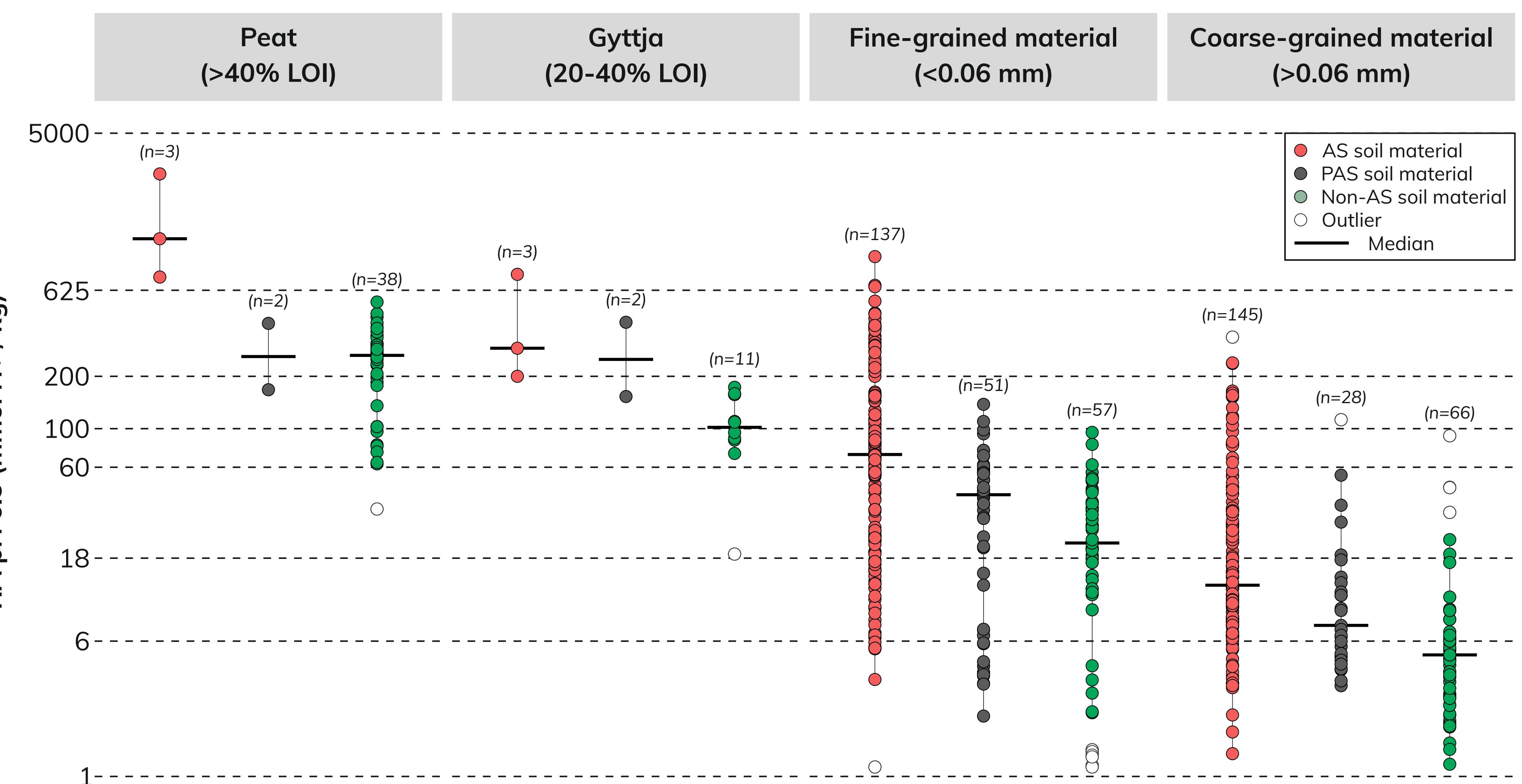


Fig. 3. Distribution of titratable incubation acidity (TIA) in acid sulfate (AS) soil materials, pseudoacid sulfate (PAS) soil materials, and non-AS soil materials based on grain size and organic matter content (LOI). Included in the fine- and coarse-grained materials are also gyttja-containing materials (2-6% LOI). Slightly modified after Visuri et al. (2021).

References

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