Small-scale Spatial Variability of Hydro-physical Properties of Differently Degraded Peat

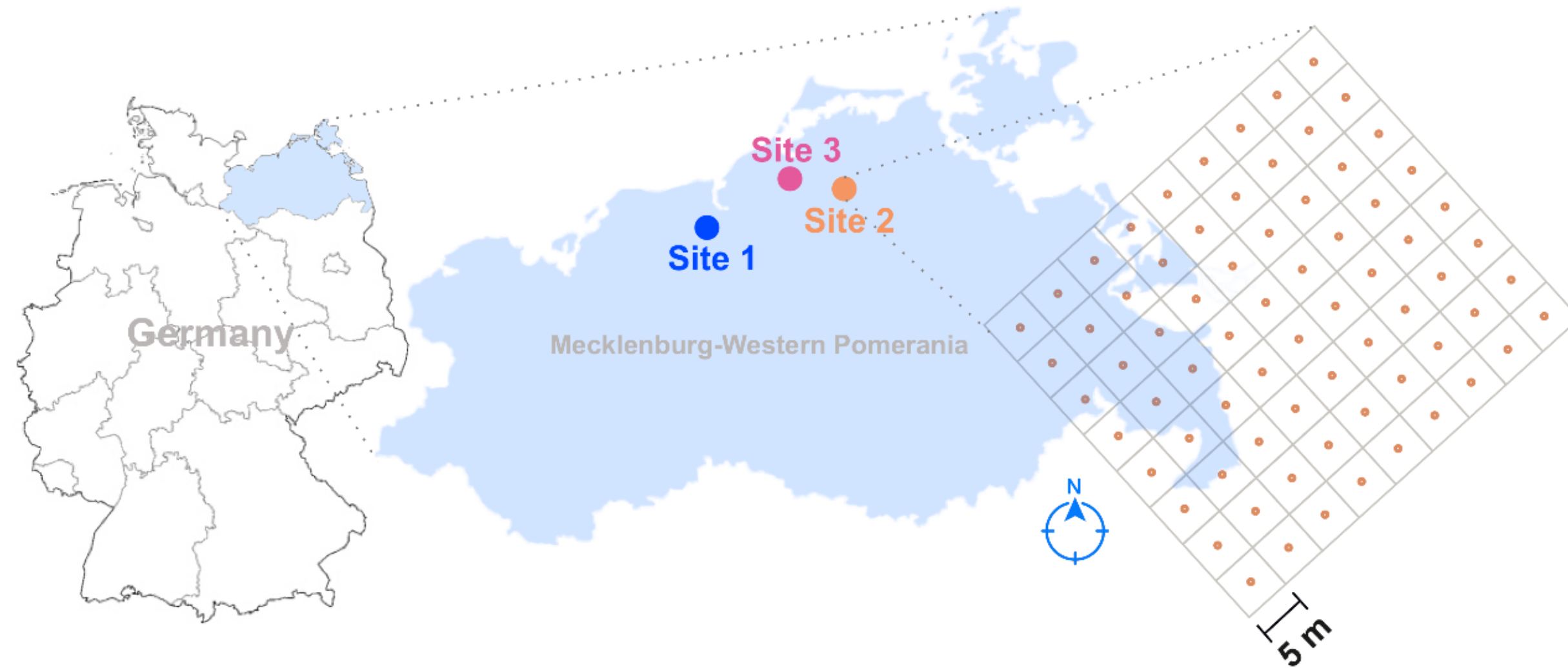Miaorun Wang[1], Haojie Liu[1], Bernd Lennartz[1]

Study Site

Figure 1 Three sampling sites in Mecklenburg-Western Pomerania, Germany. (Right plate 72 sampling points at each site within 35 m × 40 m plot)

Introduction

- Spatial variability of soil properties is important for hydrological studies. However, little information is available on the spatial variability of hydro-physical properties of peat soils.

- 216 undisturbed soil cores were collected from one extremely drained (site 1), one degraded (site 2) and one natural peatland (site 3). The saturated hydraulic conductivity (K_s), soil water retention curves, total porosity, macroporosity, bulk density, soil organic matter (OM) content and the van Genuchten model parameters (θ_s, α, n) were determined for all sampling locations.

- Hypothesis: Spatial correlation of hydro-physical properties of peat soils is related to soil degradation.

References

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- Shouse et al., (1995). Spatial variability of soil water retention functions in a silt loam soil. *Soil Science*, 159(1),1–12.
- Wang et al. (2014). Spatial Variability of Soil Parameters of the van Genuchten Model at a Regional Scale. *CLEAN - Soil, Air, Water*, 43(2), 271–278.

Concluding Remarks

- Macroporosity and LogK_s are positively correlated, however, the functions differ between natural peatlands and degraded peatlands.

- In general, the hydro-physical properties of peat soils are weakly or moderately auto-correlated.

- The hydro-physical parameters logK_s, logα, n are spatially cross-correlated with macroporosity indicating that the soil structure is important for spatial variance of hydro-physical properties of peat.

- Degradation stage plays an important role and should be considered more often in spatial analysis.

Semivariogram for hydro-physical properties along transect

Figure 3 Semivariograms of different hydro-physical properties (macroporosity, LogK_s, Logα, n) of three study sites. (blue: site1; orange: site 2; pink: site 3)

First Results

Relationship between hydro-physical properties of differently degraded peat

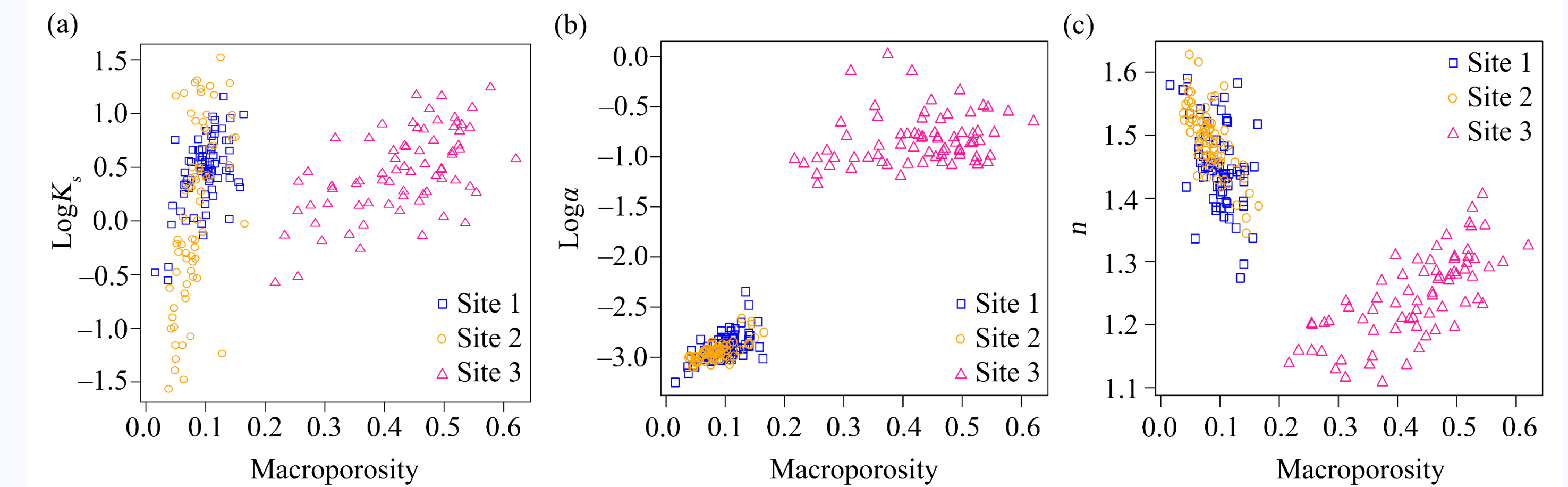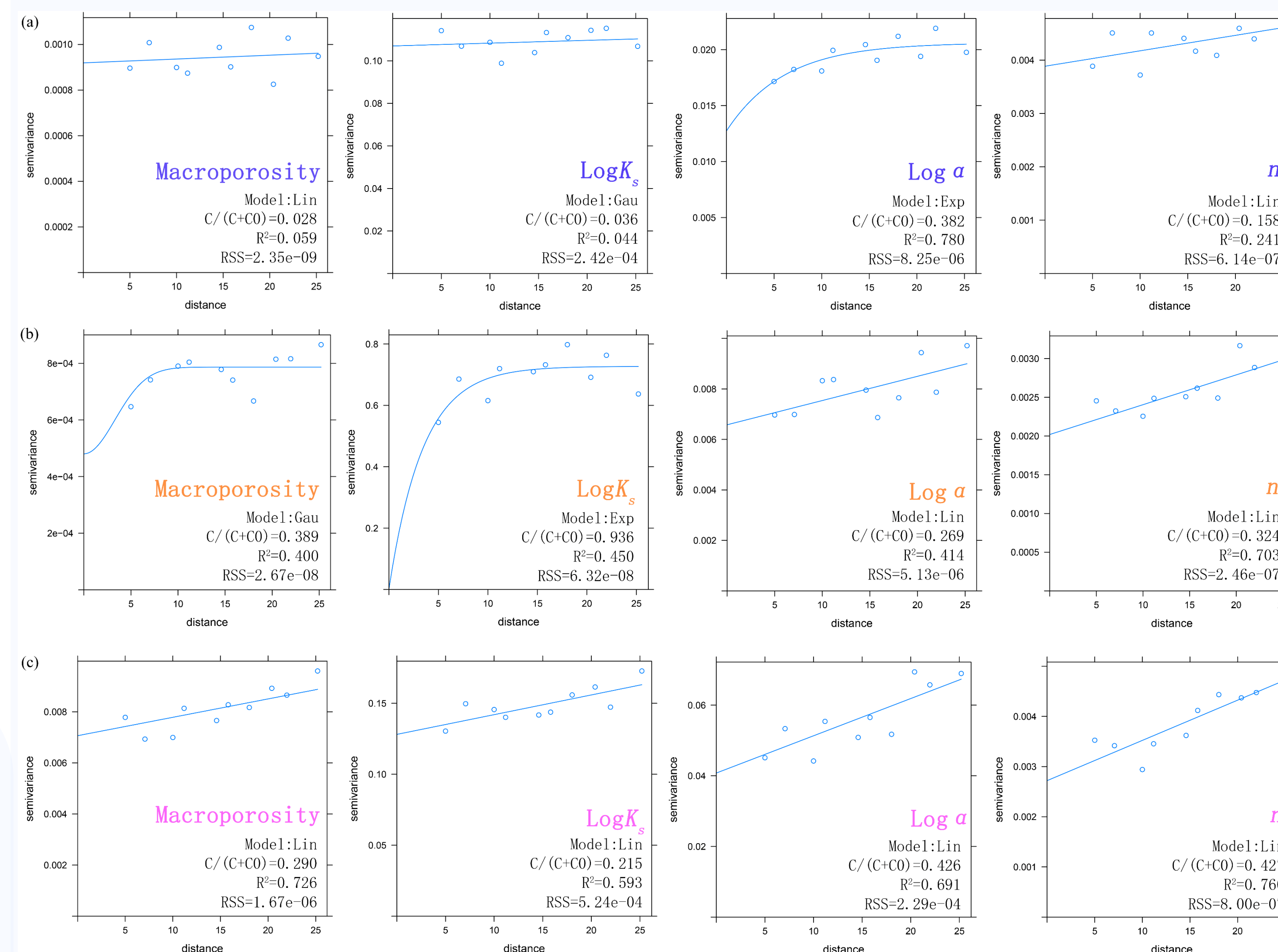**Figure 2** The relationship between (a) saturated hydraulic conductivity K_s (LogK_s) and macroporosity; (b) macroporosity and van Genuchten parameter α (Logα); (c) macroporosity and van Genuchten parameter n in differently degraded peat. (blue: site 1; orange: site 2; pink: site 3)
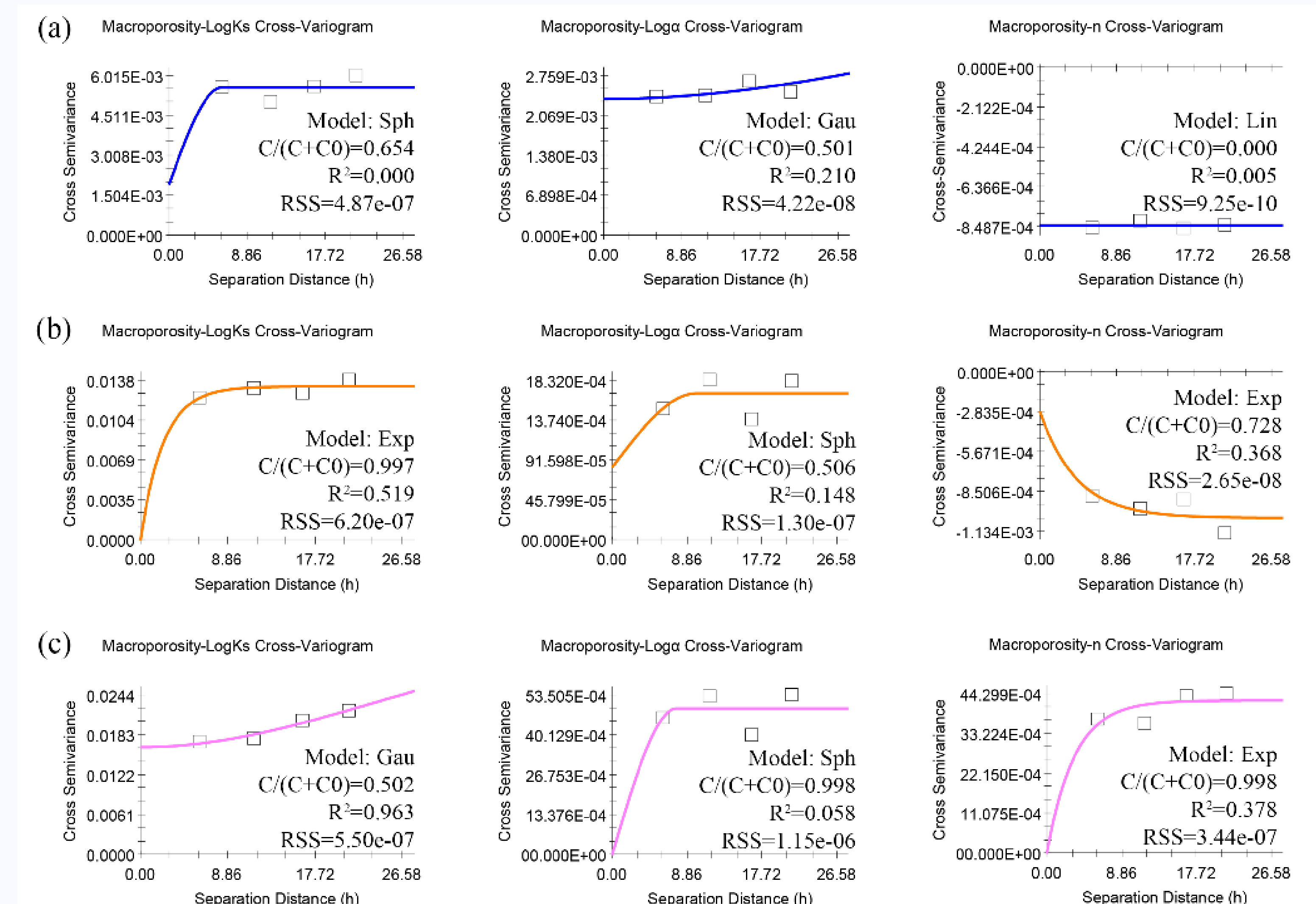
Cross Semivariogram for hydro-physical properties

Figure 4 Cross semivariograms of different hydro-physical properties (macroporosity and LogK_s, macroposorosity and Logα, macroporosity and n) of three study sites. (blue: site1; orange: site 2; pink: site 3)