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# Release of soil-bound phosphorus in aquatic systems

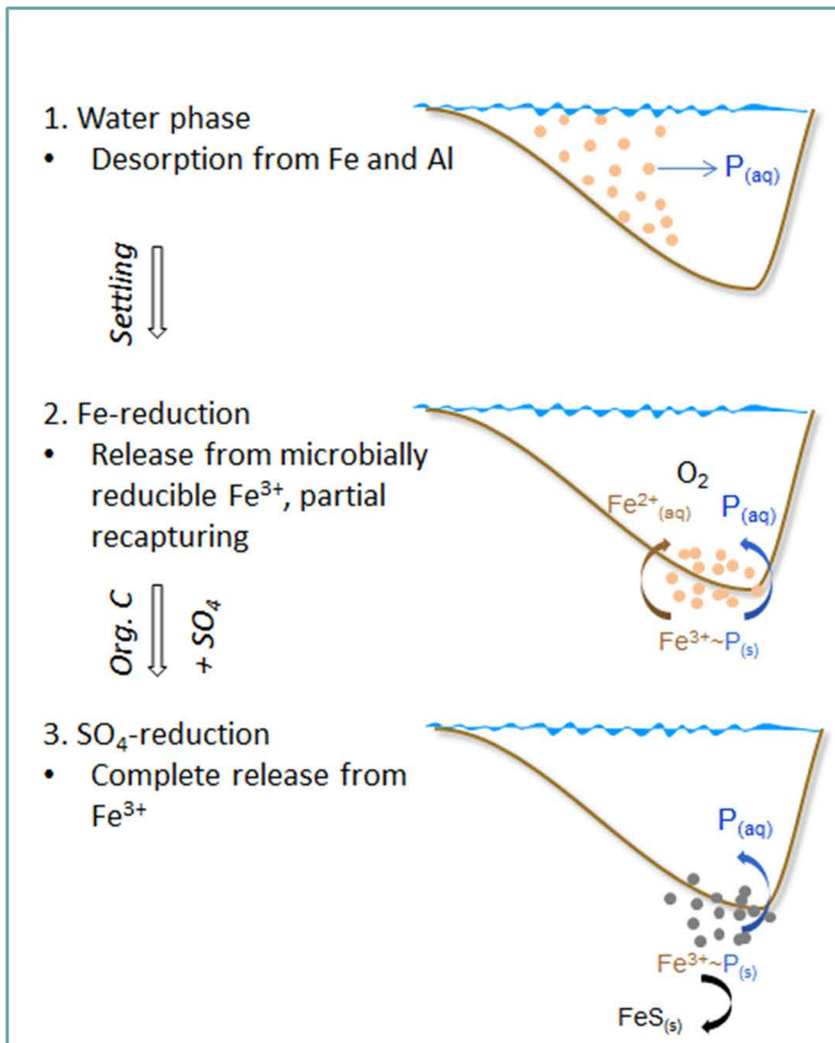


**Fig. 1.** Phosphorus is released by desorption in the water phase and as a consequence of microbial mineralisation processes in sediments.

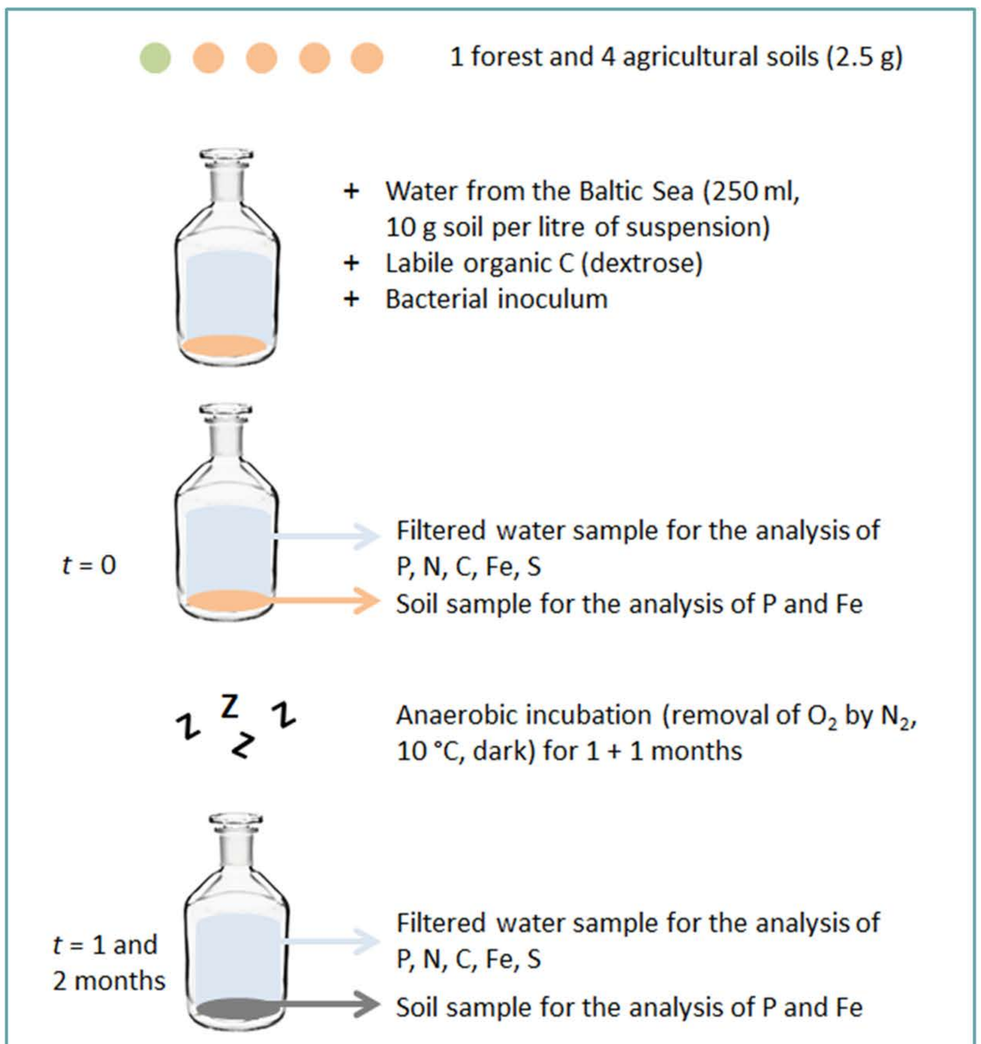


**Fig. 2.** Experimental setup of the anaerobic incubations.

We quantify the release of algal-available P from soils in anoxic conditions

This is important when assessing the efficiency of agricultural erosion control measures in mitigating eutrophication

Eutrophication?

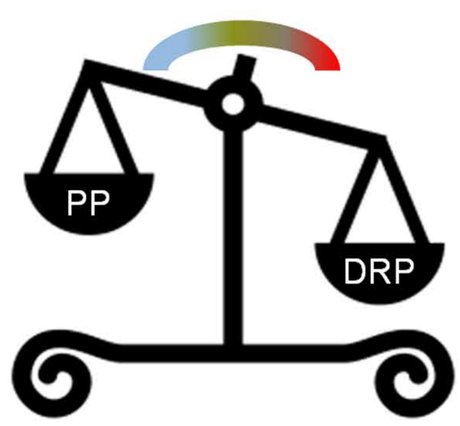


**Table. 1.** Characteristics of the soil samples. Textural class: clay.

| Sample | P | | Al | Fe | C |
|---|---|---|---|---|---|
| | Total | Water extraction (1:100) | Oxalate extraction | | |
| | mg/kg | | | | % |
| Forest | 1 200 | 2 | 3 200 | 18 100 | 3.5 |
| Field 1 | 1 300 | 18 | 2 600 | 15 100 | 3.0 |
| Field 2 | 1 700 | 52 | 2 700 | 12 200 | 3.7 |
| Field 3 | 1 200 | 8 | 3 500 | 10 000 | 6.8 |
| Field 4 | 1 100 | 14 | 2 700 | 9 200 | 3.6 |

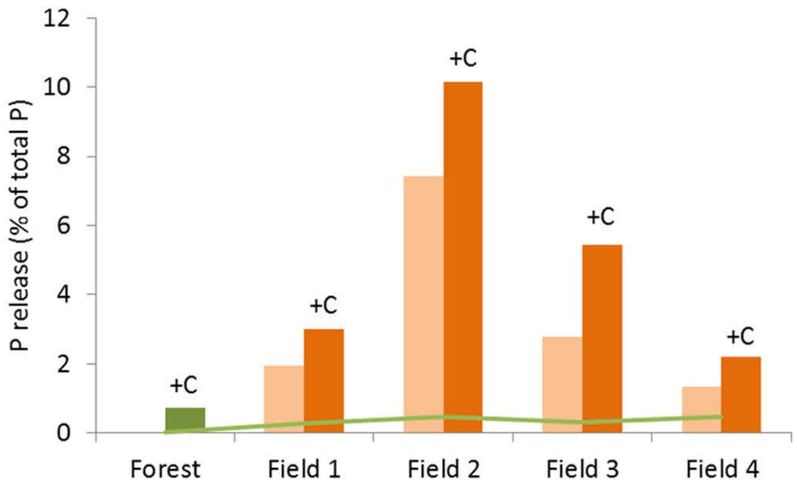


**Fig. 3.** Phosphorus release during the incubation. **Green line**: release during the one-day aerobic phase. **Columns**: release during the 2-month anaerobic incubation without (light brown) and with (dark brown) carbon addition.

## RESULTS

- Anaerobic mineralisation was seen in carbon (DOC, DIC), ammonium, and terminal electron acceptors ($Fe^{3+}$, $SO_4$) and their end products ($Fe^{2+}$, $H_2S$, FeS)
- Formation of iron sulfides was confirmed by X-ray absorption spectrometer
- Most of the mineralisation was coupled to sulfate reduction (**Fig. 4a**)
- Only little soil organic carbon was mineralised
- Small amount of soil-bound phosphorus was desorbed (**green line in Fig. 3**)
- Mineralisation was slow but greatly enhanced phosphorus release (**Fig. 3**)
- Phosphorus release varied among the soils (**Fig. 3**)
- Carbon appeared to enhance phosphorus release at soil-specific rates (**Fig. 4b**)

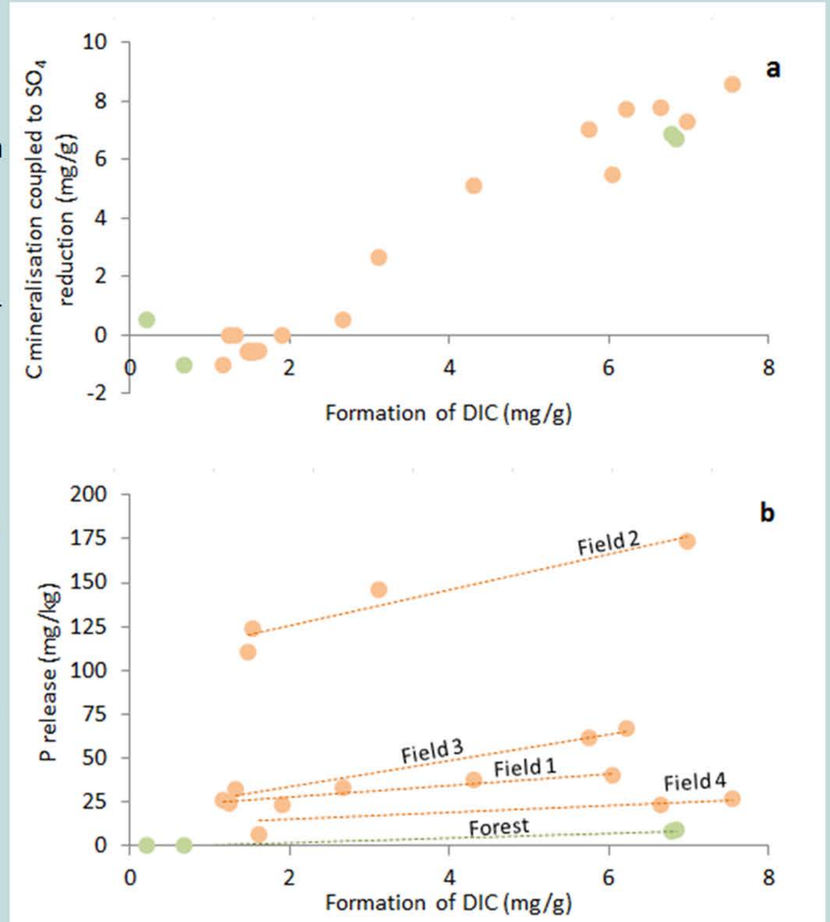


**Fig. 4. (a)** Mineralisation occurring through sulfate reduction and **(b)** release of phosphorus as a function of increase in dissolved inorganic carbon (DIC).

## CONCLUSIONS

- Release of soil-bound phosphorus depends on (1) soil itself, (2) organic carbon and (3) sulfate
- Soils are likely to release more phosphorus in eutrophic than oligotrophic marine bottom sediments

**Impact of erosion control as a eutrophication abatement measure depends on the characteristics of the soil and of the receiving water body**