Background & Objectives

- In Central Kalimantan, Indonesia, the artificial reclamation of the coastal area has led to the disappearance of the overlying peat and the bare mineral sediments. These have results in the environmental degradation of local activities due to the development of acid sulfate soil.
- Acid sulfate soils are formed in the coastal areas characterized by an excess of potentially acidic pyritic materials. When the soils are drained and aerated, pyrite (FeS₂) will be oxidized to sulfuric acid and the soils are acidified (pH < 3.0).
- However, since the peat soils become to be acidic naturally due to several factors, the sources of these proton are unintelligible. Thus, chemical interactions at the interface between peat and mineral sediments will give an insight the potential of pyritic acids on the geochemical environment.

The aim of this work is:

1. To quantify the vertical distribution of the potential acidity in peat sediments with reference to the interface from peat to mineral sediment
2. To delineate the effects of acidification of peat sediments on metal mobility

Materials & Methods

- Study area
- Soil sampling and chemical analysis

Results & Discussions

1. Vertical profiles of solubilized proton concentrations
   - Kalanpangan & Setia Alam Jaya
   - The peat sediments were dominated by humic substances with numerous identifiable roots and woody fragments in the whole sediments
   - The peat sediment deposited from the surface layer to 150 cm, and the underlying mineral layer was mainly clay at a depth below 160 cm (Organic Carbon < 10%)
   - KCl solution differed among the sites
   - At Paduran site, all of protons in the sediments were solubilized by water, and increased with increasing the depth

2. Vertical profiles of anion concentrations
   - Anion
     - Kalanpangan & Setia Alam Jaya
     - The change of anion concentrations were not clear
     - Paduran
     - Sulfate concentration was abundant near the mineral layer
     - Similar down-profile trend as H⁺
     - There are several possible explanations for SO₄²⁻ increase, including the inundation of seawater and the dissolution of pyritic sulfur

3. Vertical profiles of solubilized metal concentrations
   - Paduran
     - Al and Fe concentrations were significant increase with increasing the depth
     - At a deeper depth than 115 cm Al & Fe concentrations were over 600 mg/L
   - Kalanpangan & Setia Alam Jaya
     - Al concentration was higher than other metals, and increase with the depth
     - Dissolution of Al occurred within the organic-rich sediments

Conclusions

1. Difference in the potential acidity between organic-rich soil and mineral soil
   - Higher proton concentrations in the KCl solution than those in the water in the organic-rich soil, implying the release of exchangeable H⁺ on organic substances
   - At Paduran site, pyritic acids play a role in acidifying the sediments
2. Influence of the potential acidity on the metal mobility
   - Lower concentrations of metals at Kalanpangan site and Setia Alam Jaya site might be the result of affinity adsorption to organic matter (except for Al)
   - Sulfuric acid produced by pyrite oxidation make the heavy metals solubilize by water and increase of the downward mobility of them in the peat sediments
   - Heavy metals of underlying mineral layer may be possible to solubilize as a consequence of flooding after the exposure of the sediments brought by the removal of topsoil