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# Vulnerability of mineral-organic associations in the rhizosphere



For discussion, look for this face

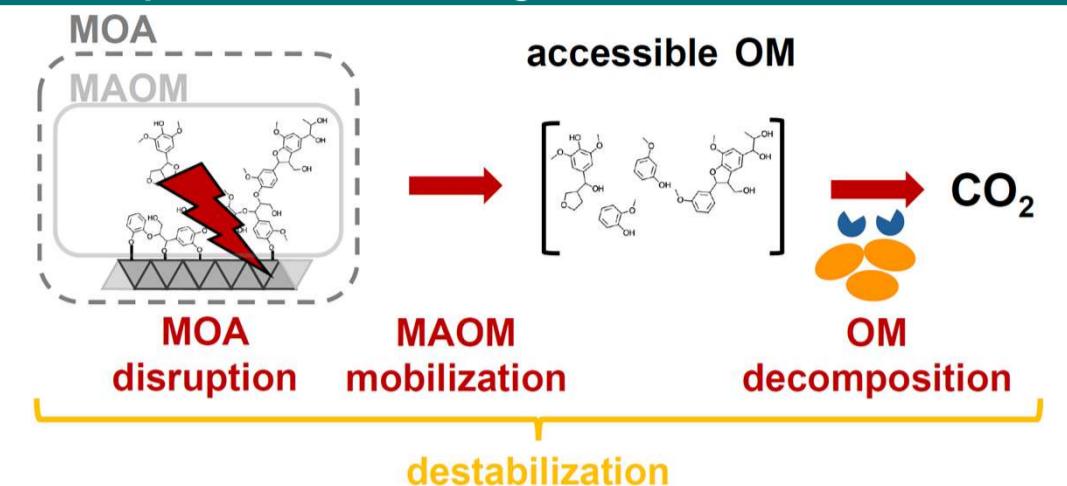
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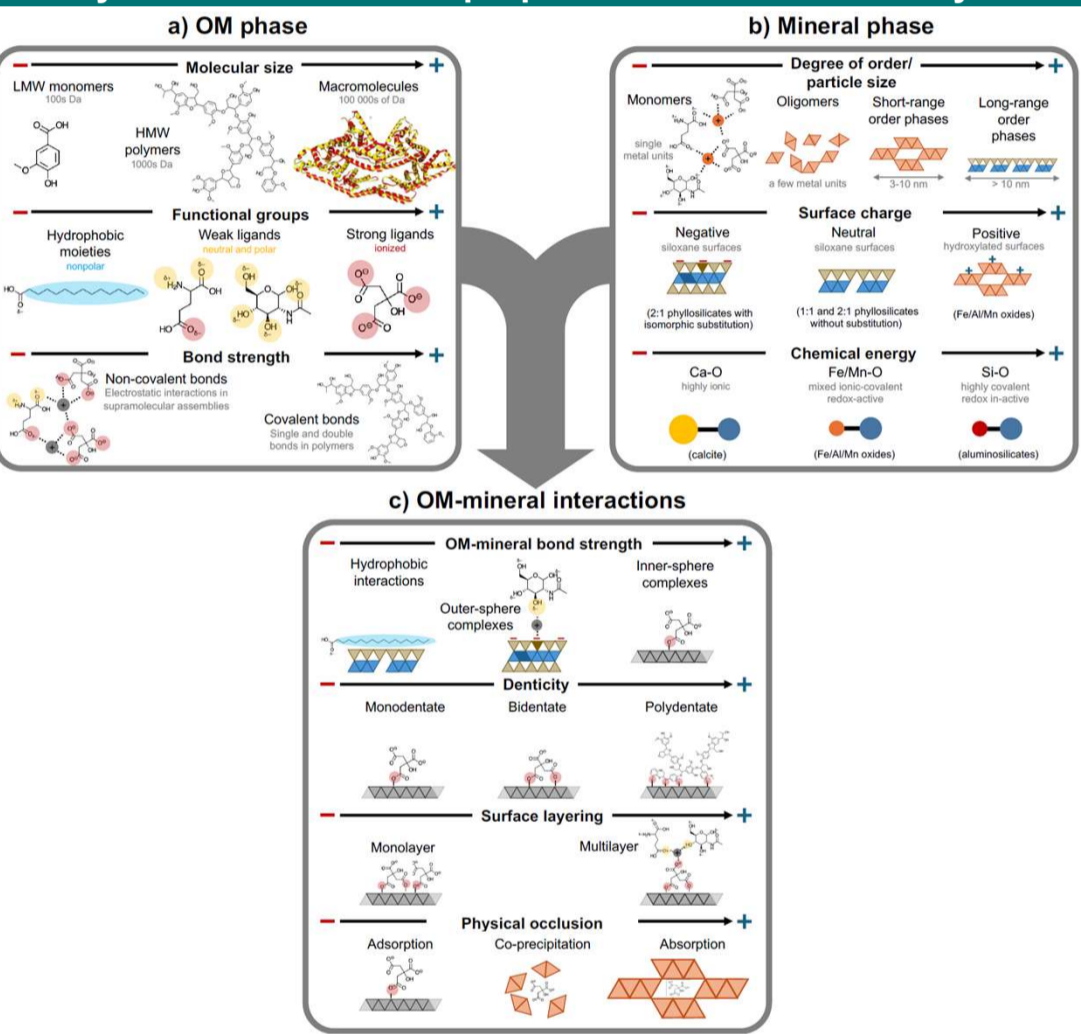
## 1. Background

- Organic matter (OM) within mineral-organic associations (MOAs) is considered relatively inert to environmental disturbance.
- Yet, plant roots and associated microbes in the rhizosphere have a well-known ability to transform minerals through dissolution and exchange reactions.
- The impact of such root- and microbially-mediated reactions on MOAs and mineral-associated OM (MAOM) protected therein remains elusive.
- We reviewed and summarized
  - Properties of MOAs that govern their inherent vulnerability to disruption
  - Biogeochemical mechanisms by which roots can disrupt MOAs
  - Rhizosphere processes that trigger these disruption mechanisms.
- We introduce a vulnerability spectrum that highlights how MOA characteristics in certain ecosystems are particularly susceptible to specific root-driven disruption mechanisms.
- This vulnerability spectrum provides a framework for critically assessing the importance of MOA disruption mechanisms at the ecosystem scale.

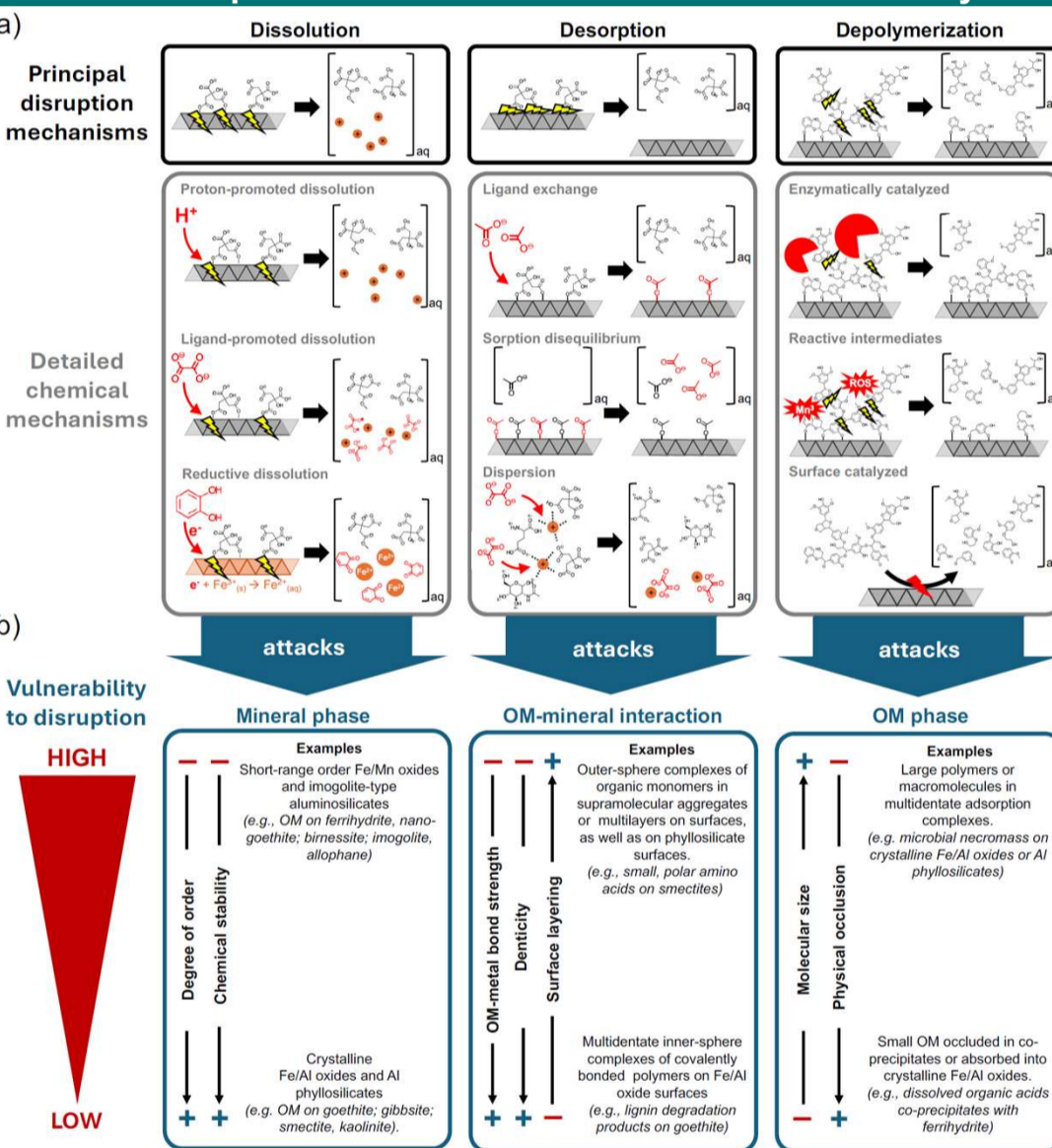
## 2. Disruption of MOAs causing destabilization of MAOM



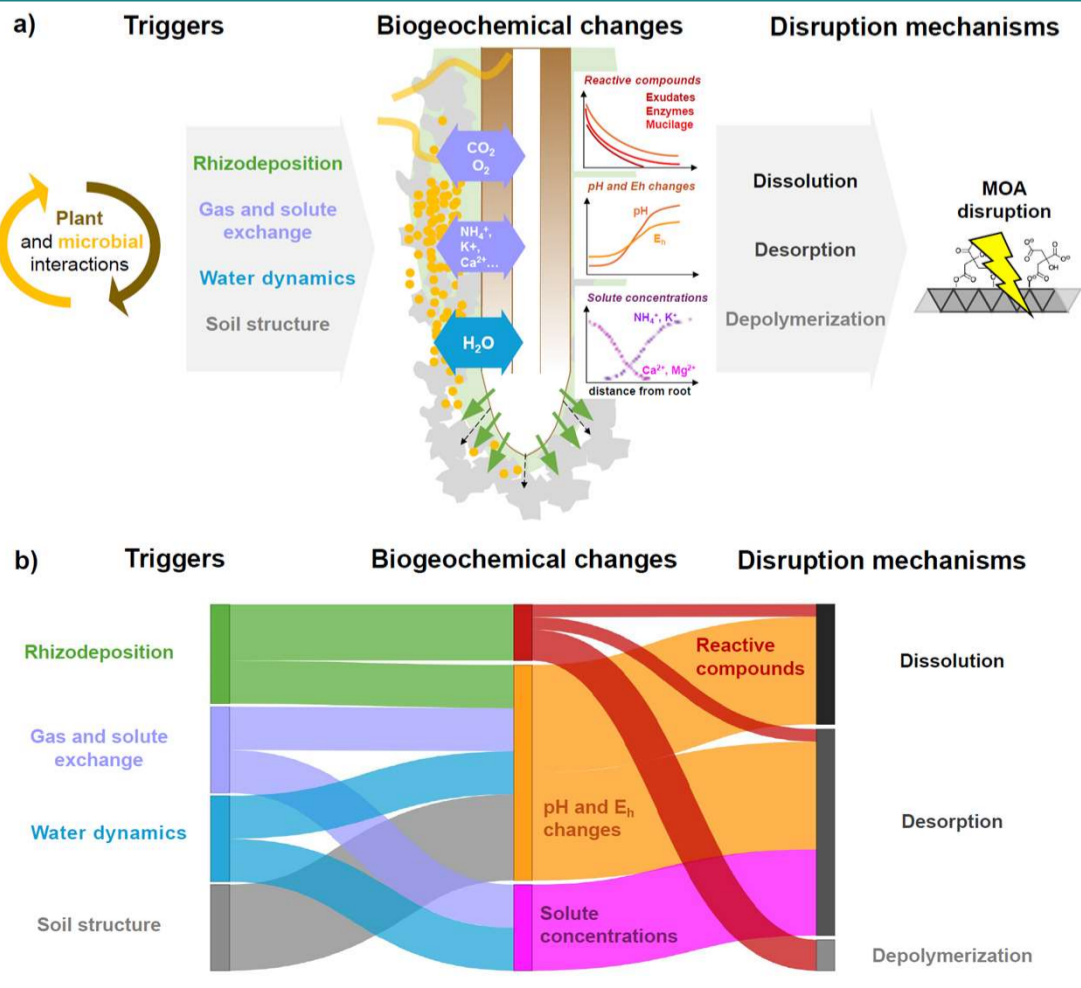
## 3. Physical-chemical MOA properties define vulnerability



## 4. MOA Disruption mechanisms and inherent vulnerability



## 5. Rhizosphere processes triggering MOA disruption



## 6. Challenges and research gaps

- Can we systematically link MOA characteristics to potential vulnerability?
- Beyond rhizodeposition: what mechanisms disrupt MOAs in the rhizosphere?
- Where and when does MOA disruption occur in the rhizosphere?
- Which MOA disruption mechanisms dominate across different soil ecosystems?
- To what extent is MOA disruption in the rhizosphere tied to ecosystem nutrient cycling?
- What factors govern the balance between MOA formation and disruption?
- How does the balance between MOA formation and disruption respond to global change?

### Link to the article

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