# Relation between biostability and chemical properties of soil humic substances

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Humic substances are considered to be stable in soil against microbial degradation due to their complex polymer structure, their physical protection inside dense aggregates and their association with metal ions or clays. However, there are few experimental data concerning the chemical structural factors associated with the bio-degradability (namely biostability) of humic substances. In this study, we assessed the biostability of soil humic substances by regarding the resistance to fungal decolorization of humic substances as an indicator of the biostability.

Firstly, growth media containing the soil particle (buried Andosol or Cambisol) were inoculated with fungi (decolorizer), and changes in the absorbance at 600 nm of alkaline-soluble extracts (humic acids + fulvic acids) were determined. During 14 d of incubation, the absorbance of the extracts in the Cambisol decreased from 0.94 to 0.58, while that of the extracts in the buried Andosol maintained the value of 3.13. This suggests that the humic substances in the buried Andosol are more biostable than those in the Cambisol, under the soil particle form.

Secondly, fungal decolorization of the humic acids prepared from different soils (Andosols, buried Andosols and Cambisols) was monitored on a liquid growth medium containing one of the humic acids. After 14 d of incubation, the average of the decolorization percentages calculated by absorbance at 600 nm in the liquid solution were 20.0% in the Andosols, 9.6% in the buried Andosols and 35.9% in the Cambisols. These results suggest that Andosol humic acids, especially the buried series are more biostable than Cambisol humic acids. From the results of $^{13}C$ NMR analysis and others, the decolorization percentage showed highly negative correlations for the aromaticity and the absorbance coefficient at 600 nm. Therefore, humic acids with a higher aromaticity and a more dark-colored property showed a higher biostability, even under the free form.

Our results suggest that the chemical properties of humic substances are one of the principal factors responsible for their biostability. Results of fulvic acids will also be discussed.

# Tomographic imaging of subducted slabs and its implication for mantle down flow

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We review the seismic imaging of plate subduction, and discuss its implications for mantle down flow. The review results can be summarized as follows. 1)Subducted slabs generally extend further than the leading edge of the deep seismic zone. 2)This aseismic portion tends to flatten in the upper and lower mantle transition region (400-1000 km in depth), either above, across or below the 660-km discontinuity. 3)There is little indication for direct slab continuation down to the deep lower mantle far beyond the transition region. 4)The subducted slabs imaged in the deep lower mantle include those of the Farallon and Indian (Tethis) plates, which are separate entities from the presently active surface plates. The slab images summarized above indicate a stagnant nature of mantle down flow in the transition region and its possible role in plate tectonic history. Stagnant slabs accumulated in the past might have fallen unstably into the deep lower mantle all around the Circum Pacific to cause the Eocene plate reorganization including the breakup of the Farallon plate. We have resolved tomographically the remnants of the northern and southern Farallon plates and the presently subducting slab of the Cocos plate that meet each other under Central America. Recognizing that the slabs imaged in the transition region post-date the Eocene plate reorganization, slab subduction has a role of mass injection into the mantle transition region, which must induce a counter flow to carry transition region material upward. We report clear evidence of a hot anomaly (negative P-velocity anomaly with a depression of the 400-km discontinuity) on the oceanic side of the subducted slab that may be associated with this counter flow.