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Flux of Al, DOC and inorganic nutrients in river-estuary-seawater system impacted by red soil in Gesashi mangroves: Does the elevated Al concentration a potential threat on marine organisms in the red soil distributed areas in Okinawa Island?

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**PE-4 Flux of Al, DOC and inorganic nutrients in river-estuary-seawater system impacted by red soil in Gesashi mangroves: Does the elevated Al concentration a potential threat on marine organisms in the red soil distributed areas in Okinawa Island?**

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A study was conducted to investigate the geochemical status of red soil impacted estuary at Gesashi mangroves stand in Okinawa Island. Water samples were collected from river and two streams (discharge to the estuary), in the estuary and in the sea at coastal area, once, at the end of each month from Jan. to Dec. 2005. The pH values of fresh water were mostly neutral to slightly alkaline range from 7.01 to 7.85 with averages of 7.2, 7.6 and 7.53 in river, in streams 1 and 2, respectively. In fresh water, the lowest value of Al concentration was  $0.034\text{mgL}^{-1}$  in stream 1 and the highest of  $0.250\text{mgL}^{-1}$  in stream 2 while the average values were 0.119, 0.105 and  $0.139\text{mgL}^{-1}$  in river, in streams 1 and 2, respectively. Dissolved Al showed increasing trend with salinity where the closest point to the river (E1) showed the lowest value of  $0.033\text{mgL}^{-1}$  while the seawater showed the highest Al value of  $0.594\text{mgL}^{-1}$ . The dissolved Al trend was opposite to both the acid extractable Al by 2%  $\text{HNO}_3$  in the non-filtered water samples and the amounts of Al in the sediments. This indicated that the solubility of Al was low in fresh waters due to adsorption on suspended particulate matter and/or on sediments, favored by ~neutral pH. Al increased with salinity and pH with significant correlations ( $P < 0.001$ ) suggesting that ion exchange and/or formation of  $\text{OH}^-$  complexes such as  $\text{Al}(\text{OH})_4^-$  were important Al controlling processes. The average silica concentrations in fresh water were 25.8, 43.4 and  $29.2\text{mgL}^{-1}$  for river, streams 1 and 2, respectively. Dissolved silica decreased with salinity showing the average value of  $14.9\text{mgL}^{-1}$  in E1 and the lowest value of  $0.145\text{mgL}^{-1}$  in seawater that could be largely attributed to the diatom utilization and dilution in marine environment. River water showed the higher DOC value of  $3.73\text{mgL}^{-1}$  while the averages were 1.95, 1.36 and  $1.97\text{mgL}^{-1}$  for river, streams 1 and 2, respectively. Generally DOC in estuary was relatively high in mangrove zone at a maximum of  $3.75\text{mgL}^{-1}$  suggesting autochthonous contribution and decreased with salinity showing the lowest value in seawater up to zero value in some cases, that could be due to microbial, photochemical degradation and dilution. The  $\text{NO}_3^-$  was dominant nitrogen compound with the highest value in river ranging from 4.83 to  $16.5\text{mgL}^{-1}$  suggesting importance of allochthonous sources and continuous decreased with salinity up to zero value in seawater for some cases largely due to biological assimilation. Phosphate was generally very low with the highest value of  $0.511\text{mgL}^{-1}$  in river and in many cases was not detected in the estuary and seawater, probably due to biological use. Proximity to the rivers, flow rate, temperature, rainfall, pH, biological use and seawater dilution largely affect the geochemical feature of water in the Gesashi mangrove estuary.

Average dissolved Al concentration in river and seawater are  $0.050\text{mgL}^{-1}$  and  $0.010\text{mgL}^{-1}$ , respectively, lower than observed average values of  $0.119\text{mgL}^{-1}$  in river and  $0.477\text{mgL}^{-1}$  in seawater at the Gesashi. Dissolved Al is a toxic to plants and aquatic organisms at the range of 1-3 ppm. Physical features such as sedimentation and turbidity accompany with red soil pollution certainly affect marine organisms such as reef building corals but how about chemical aspect of this observed elevated Al concentrations in seawater?