

Consideration of sea level rise effect on sediment transport process in mangrove forest

*Keita Furukawa¹, Kiyoshi Fujimoto², ONO Kenji³, Shin Watanabe⁴, Shingo Taniguchi⁴, Yasumasa Hirata³, Kodai Hasada⁵, Renpei Suwa⁷, Saimon Lihpai⁶

1. Association for Shore Environment Creation, 2. Nanzan University, 3. Forestry and Forest Products Research Institute, 4. University of the Ryukyus, 5. Hosei University, 6. Pohnpei State Government, 7. Japan International Research Center for Agricultural Sciences

Preliminary measurement for detecting sea level rise (SLR) effects on mangrove forests has been observed at Iriomote Island, Japan and Ponpei Island, Federal States of Micronesia since 2018. The short term SLR effects were measured by surface erosion and sedimentation. If sedimentation rate on a mangrove forest floor is faster enough to catch up with SLR, the forest will adapt on the change (Fujimoto et.al. 1989). Nevertheless, if it is slower than SLR, or erosion rate becomes greater than sedimentation rate, the forest will NOT adapt on the change (Furukawa et.al. 2002).

According to the observations, existence of following sediment transport mechanisms was suggested i.e. the existence of a sheet-flow transport mechanism in a short period of time when seawater is flooded and drained, the occurrence of steady erosion due to tidal transports, and the temporally and spatially uneven transport mechanism (Furukawa et al. 2019). In particular, it is necessary to clarify the effects of sediment supply from the upstream and micro-topography (creeks) existing on the forest floor.

Therefore, we attempted to measure two-dimensional sedimentation rate and sediment transport in the plot with complex topography conditions in 2019 (Pompeii PK plot: Fujimoto et al. 2019). In order to study the effects of tides and rainfall, observations were made during the spring tide (clear weather) and the ebb tide (rainfall).

The observation results were categorized, and the data obtained in the PK plot suggests a net sediment export from the forest to the sea. In particular following three points were noted, 1) sediment transport was remarkably different between the creek area and the flat forest floor area, 2) during the spring tide, sediment is supplied from both upstream and downstream in the creek, and the sediment tends to be slightly deposited, and 3) during the neap tide and rainfall, it was observed that the supply from the upstream side was dominant in the creek and the sedimentation in the forest increased, furthermore net sediment runoff occurred.

This research has been done as a part of “Mangrove forests community situation understanding against SLR.”

Keywords: mangrove forests, sediment transport, sea level rise, micro topography