Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AHW026-15 Room:201A Time:May 27 18:00-18:15

100 years variation in nutrient discharge reconstructed, using the sediment profile of an artificial lake in west Japan

Guangzhe Jin[1*], Shin-ichi Onodera[1], Atsuko Amano[2], Yuta Shimizu[1], Takaharu Sato[1]

[1]Hiroshima University, [2]AIST

Coastal sediments are an important sink for terrestrial derived nutrients. Sediment cores extracted form these environments can provide vertical phosphorus distribution which correlate with historical patterns of phosphorus sedimentation. Coastal lake sediment therefore provides information on phosphorus which can be used to reconstruct the paleoecological and pollution history of the lakes and their catchment basins. And also some climatic changes could also reflect on its recorded.

One 124-cm long core sample was taken by piston core sampler in Kojima Lake during September 2009. Sediment total phosphorus (TP) and total inorganic phosphorus (TIP) were determined by Aspila method. Local precipitation data, population data and paddy field data were also considered in the research.

The reconstruction of phosphorus discharge for last 100 years was conducted. We use the ^{210}Pb activity and ^{137}Cs activity to determine the dating data of the core sample. Sediment TP in sediment showed a slightly decreasing trend with the depth and through obvious peak in the core suggests the eutrophication in Kojima Lake for last century and the peak of nutrient load in around 1970s. As In Sasagase Basin and Kurashiki Basin, there is significant amount of farmland and residences area. And the construction of dike enhances the Nutrient retention in lake sediment. So the impact of intensive human activity and diversity of heavy nutrient discharge form the Rivers leads to abrupt changes of phosphorus in sediment both in organic and inorganic forms. The high P content of sediments in the eutrophic Kojima Lake is hypothesized to result from high P content of sediment in the inflow.

In addition, sediment TP and TIP contents in sediment indicated yearly variation. Relationship between TP content and factors were determined through liner correlation ship analysis. The variations of TP content were not clearly affected by the annual precipitation(1900-2000),population change(1920-2000)and paddy field area change(1949-2006) whereas it was related to the annual number of the event with daily rainfall over 100mm. Intensive extreme precipitation events results most of the points which sediment TP content is over 1.000mg/g . In 1976, there was 3 times of over 100mm daily precipitation leads to a high TP content recorded in sediment core at 1.161mg/g. The 2 times big precipitation year in 2005 also leads to a high TP record (1.155mg/g).The two big precipitation in year 1971 and 1972 related to a TP content of 1.023mg/g . Same trend also show on sediment TIP result which consist of most part of sediment TP content. This may because of the regional high rainfall carries more nutrients of the two basins farmland into the lake and the storm may have a direct effect of erosion. And high rainfall also brought more suspending sediment property and storm water runoff. An increase in the number of torrential rainfall events are hypothesized to increased phosphorus transported to ocean.

The climate change by global warming may expected to appear in the alternation in rainfall patterns and an increase in the occurrence of extreme climate change events, which may lead to a change in the frequency and intensity of storms. This influence has already been confirmed in Japan from daily precipitation including typhoon .Accordingly; it would be further enhanced over Japan due to the increase in atmospheric moisture availability. If precipitation changes more intensive and more sever, it may lead to a result that high soil erosion and high phosphorus river discharge. The phosphorus resources in sediment may also increase due to increase of extreme precipitation event. It would be a potential release pool of phosphorus to the environment again because the most part of TP in sediment is consists of inorganic forms. Consequently, climate change may enhance phosphorus discharge to open-sea.

Keywords: sediment, phosphorus, precipitation, extreme rainfall event