

Changing process from freshwater lake into marine environment in the Aira caldera, Kagoshima Prefecture, SW Japan.

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Kagoshima bay is a very peculiar bay as several lined deep-water calderas in all over the world. Aira Caldera is appeared with the large eruption about 25,000yr BP. At the present time, this caldera locates at the innermost part of Kagoshima bay and connectes to Pacific Ocean by two narrow constrictions.

Aira caldera started as a caldera lake (freshwater) after the eruption, because the sea level was about 120m below the present sea level and the caldera was isolated far from the coast at that time. Then sea-level rising caused inflow of seawater into the caldera and changed the water condition.

However the detail was unclear how to change from freshwater into seawater environment in the concrete. So purpose of this study is making to clarify the detail of changing process by new methods from fresh water into marine environment in Aira caldera. Moeshima Island as the study place locates about 1.4 km northeast from Sakurajima and is in the center of Aira caldera. According to historical records, Moeshima island uplifted from the caldera bottom with Annei volcanic eruption of Sakurajima during 1779 to 1780.

The 59 samples were obtained perpendicularly from the Moeshima silt bed A and B on the outcrop at the south coast of Moeshima Island with 25 cm intervals for analyses. Radio carbon dating (^{14}C ages), total sulfur (TS), total organic carbon (TOC), stable isotope composition of sulfur and organic carbon(Dlt^{34}S , Dlt^{13}C) and diatom fossils of these samples were carried out.

Consequently, the three ^{14}C ages indicated that the Moeshima silt bed is formed during from 15000 to 7500 yr BP and the boundary between the Moeshima silt bed A and B is about 11000yr BP.

Different two groups of Dlt^{13}C values are recognized between below and above the boundary, and suggested that the organic matter is origin of land plants at period before 11000yr BP, and is origin of almost marine plankton at period after 11000yr BP. This result suggests strongly that Aira caldera was freshwater environment at period before 11000yr BP and changed to marine environment at period after 1000yr BP.

Consideration with stable isotope and TOC suggests that marine plankton mainly proved this organic carbon into the sediments.

TS value indicates marine environment at period after 11000 yr BP and TS values at period before 11000yr BP is also high level. Therefore TS suggests influence of seawater. Dlt^{34}S values are separated clearly into 2 groups. Compare with the present values (about -30 permil) indicates a closed system in sulfur cycle to the seawater at period before 11000yr BP and open condition to seawater at period after 11000yr BP.

At period after 11000yr BP, marine diatoms were abundant. They indicate marine environment. In contrast, a period before 11000yr BP, freshwater diatoms are abundant. However, brackish diatoms and marine diatoms were also contained about 10% respectively. Therefore Aira caldera is freshwater environment, but with small influence of seawater at period before 11000yr BP.

These results conclud the following environmental changes.

1) Aira caldera changed daramatically from freshwater lake with inflow of seawater (closed system to seawate) into marine environment (open system to seawater).

2) The start age of marine water condition in the caldera is about 11000yr BP.

3) The deepest point at the southern caldera wall of Aira caldera was keeping about sea level during from 15000 to 11000yr BP. It was about -50m at 11000yr BP below the present.

4) After 11000yr BP, rapidly rising of sea level caused inflow of a large quantity of sea water into the Aira caldera over the southern caldera wall, and formed marine environment up to the present marine condition at the innermost part of Kagoshima bay.