

石垣島津波石のネールの理論を用いた年代推定とその正確性

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Determination age of Tsunami events using Neel's theory and its accuracy

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In Ishigaki Island, Japan, there are many huge boulders emplaced by historical Tsunami events. Originally, these boulders were hermaypic corals and attached to the reef edge. Then, corals were transported and emplaced by Tsunami events. Corals were dead and fossilized because deposited above the present sea level. Recent studies have conducted the radiocarbon dating method to estimate the Tsunami ages utilizing the cease from carbon cycle at the time of Tsunami event. The statistical approach of radiocarbon dating shows the presence of multiple Tsunami events during the last 3000 years. However, this method can only obtain the first emplacement from individual Tsunami boulders. So we used paleomagnetic approach to reveal multiple emplacements from individual Tsunami boulders. Corals at the reef edge have acquired a remanence during their growth parallel to the Earth's magnetic field. When corals are transported and emplaced on the reef flat or land as a boulder, the direction of Earth's magnetic field to the boulder is changed. Then, boulders would acquire the secondary magnetic component. This new magnetic vector component is called viscous remanent magnetization (VRM). VRM component is overprinted in each emplacement and transportation. Therefore, if we visualize the magnetic vector components, multiple emplacements are determined from individual boulders. To visualize the magnetic vector components, progressive thermal demagnetization (PTD) has been adapted. This demagnetization technique can separate the new to old components. Also we utilize the Neel's single domain theory to date the multiple emplacements. This theory shows the magnetization at low temperature over a long time demagnetized at high temperature in short time. Therefore, the inflection point of magnetic vector components and its unblocking temperature can reveal the Tsunami age. In our result, ages of some samples were almost consisted with the historical Tsunami ages by radiocarbon method but others were not. So it is possible that Neel's theory may not be adapted to some boulders. Thus, we had to confirm the accuracy of time and temperature relation using partial thermoremanent magnetization (PTRM). Neel's thermal activation theory of VRM and TRM leads to a relation of time and temperature (Pullaiah and Dunlop, 1975). If the time and temperature relation of PTRM in the laboratory are consisted with the relation of VRM in the geomagnetic field, the accuracy of Neel's theory is established. However, if it is not consisted, we should calibrate the gap of theoretical relation and measured. In this presentation, we report the laboratory experiments to confirm the accuracy of paleomagnetic dating.