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# Uranium-Series Age of the Highest Marine Terrace of the Upper Pleistocene on Kikai Island, Central Ryukyus, Japan

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Pleistocene marine terraces developed in Kikai Island which is located Central Ryukyus generally have three steps. They consist of mainly thick Middle Pleistocene and thin Upper Pleistocene sediments. The Hyakunodai Formation composed of coral limestone is distributed on the higher two steps called the Hyakunodai Terrace. This terrace has been investigated using radiometric dating since the 1960s. The Hyakunodai Terrace, which is divided into three blocks by faults, assigned in this study as Block C, Block B and Block A in ascending order of height. Previous studies indicate that Block A was formed during Marine Isotope Stage (MIS) 5e and that MIS 5c corals were distributed on the cliff between Blocks A and B based on uranium-series dating. We carried out careful fieldwork and report more precise  $\alpha$ -spectrometric uranium-series ages of Blocks A and B. Fossil corals showed eight Mid- to Late Pleistocene dates ranging from  $154.8 \pm 6.4$  to  $97.7 \pm 3.0$  ky ( $2\sigma$ ) and three Middle Pleistocene age ( $> 450$  ky). Mid- to Late Pleistocene dates are divided into three age groups,  $154.8 \pm 6.4 - 142.7 \pm 5.8$  ky,  $122.1 \pm 3.8$  ky and  $108.2 \pm 3.2 - 97.7 \pm 3.0$  ky, corresponding to MIS 6, 5e and 5c, respectively. While all age groups were obtained from Block A, Block B only contains MIS 5c and Middle Pleistocene corals. Coral assemblage dated as MIS 5c at the outcrop *ca.* 195 m above present sea level indicate depositional depth ranging from 5 to 15 m. The elevation of the samples and the depth range of the corals put the relative sea level position during MIS 5c between 200 – 210 m, higher than the position of the Hyakunodai Terrace. These facts reveal that the highest terrace was formed during MIS 5c. The appearance of MIS 6 sediments implies that sea level fluctuation occurred before MIS 5. Exposure of MIS 5e or 6 corals is possibly due to erosional effect during MIS 5c transgression.

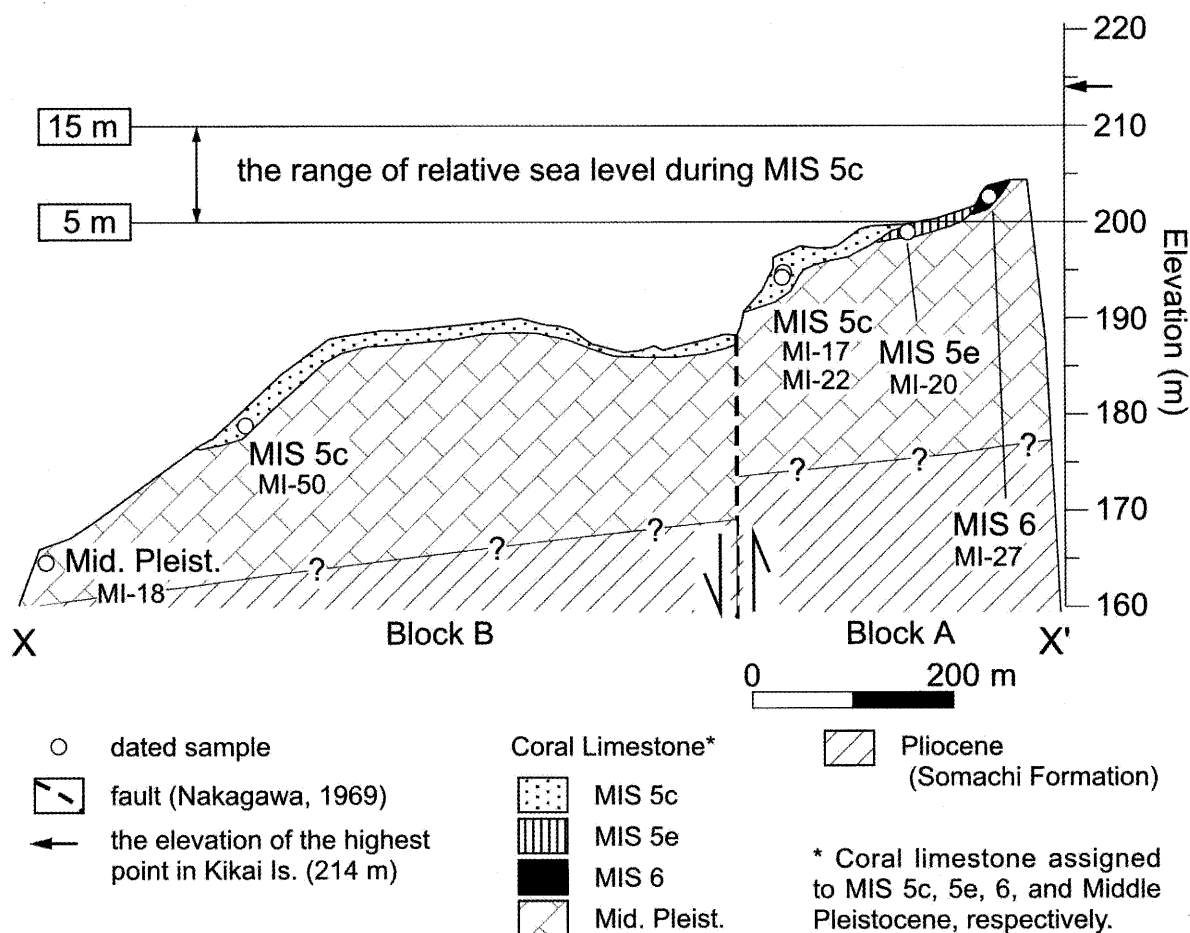
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**Table. Uranium and thorium isotopic compositions and  $^{230}\text{Th}/^{234}\text{U}$  dates of fossil corals collected from the Hyakunodai Terrace.**

Sample No.	Species	Height (m)	$^{238}\text{U}$ (ppm)	$^{234}\text{U}/^{238}\text{U}$ (activity ratio)	$^{230}\text{Th}/^{234}\text{U}$ (activity ratio)	$[\text{}^{234}\text{U}/^{238}\text{U}]_0$ (activity ratio)	Date (ky)
MI-17	<i>Acropora palifera</i>	195	$4.208 \pm 0.032$	$1.106 \pm 0.007$	$0.6011 \pm 0.0058$	$1.140 \pm 0.009$	$97.7 \pm 3.0$
MI-50*	<i>Plesiastrea versipora</i>	180	$3.038 \pm 0.019$	$1.113 \pm 0.007$	$0.6215 \pm 0.0054$	$1.152 \pm 0.009$	$103.0 \pm 3.0$
MI-22	<i>Porites</i> sp.	195	$2.900 \pm 0.020$	$1.107 \pm 0.007$	$0.6266 \pm 0.0055$	$1.144 \pm 0.009$	$104.5 \pm 3.0$
MI-46	not identified	203	$3.000 \pm 0.018$	$1.108 \pm 0.006$	$0.6397 \pm 0.0057$	$1.147 \pm 0.008$	<u><math>108.2 \pm 3.2</math></u>
MI-20*	<i>Porites</i> sp.	205	$2.769 \pm 0.018$	$1.111 \pm 0.006$	$0.6859 \pm 0.0061$	$1.157 \pm 0.009$	$122.1 \pm 3.8$
MI-44	<i>Goniopora</i> sp.	200	$2.968 \pm 0.019$	$1.099 \pm 0.007$	$0.7076 \pm 0.0062$	$1.143 \pm 0.010$	<u><math>129.7 \pm 4.4</math></u>
MI-26	<i>Plesiastrea versipora</i>	200	$2.415 \pm 0.179$	$1.092 \pm 0.019$	$0.7427 \pm 0.0074$	$1.138 \pm 0.011$	$142.7 \pm 5.8$
MI-27	<i>Acanthastrea</i> sp.	203	$2.838 \pm 0.021$	$1.099 \pm 0.008$	$0.7729 \pm 0.0073$	$1.155 \pm 0.012$	$154.8 \pm 6.4$
MI-15	<i>Goniastrea</i> sp.	203	$2.276 \pm 0.023$	$1.017 \pm 0.010$	$1.0266 \pm 0.0137$	-	>450
MI-18	<i>Porites</i> sp.	170	$2.622 \pm 0.017$	$1.042 \pm 0.006$	$1.040 \pm 0.009$	-	>450
MI-23	<i>Pavona</i> sp.	203	$2.942 \pm 0.021$	$1.020 \pm 0.006$	$1.048 \pm 0.011$	-	>450

\* Re-dated samples. Errors for  $^{230}\text{Th}/^{234}\text{U}$  dates are statistical errors ( $2\sigma$ ). Two underlined dates are evaluated to be less reliable.



**Figure. Topographic profile of the Hyakunodai Terrace based on the EDM measurements. Numbers inside squares mean the depositional depth estimated from coral assemblage during MIS 5c or relative sea level position.**