Feldspar pIRIR dating for defining depositional sequences in an uplifted coast since the Middle Pleistocene, eastern Japan

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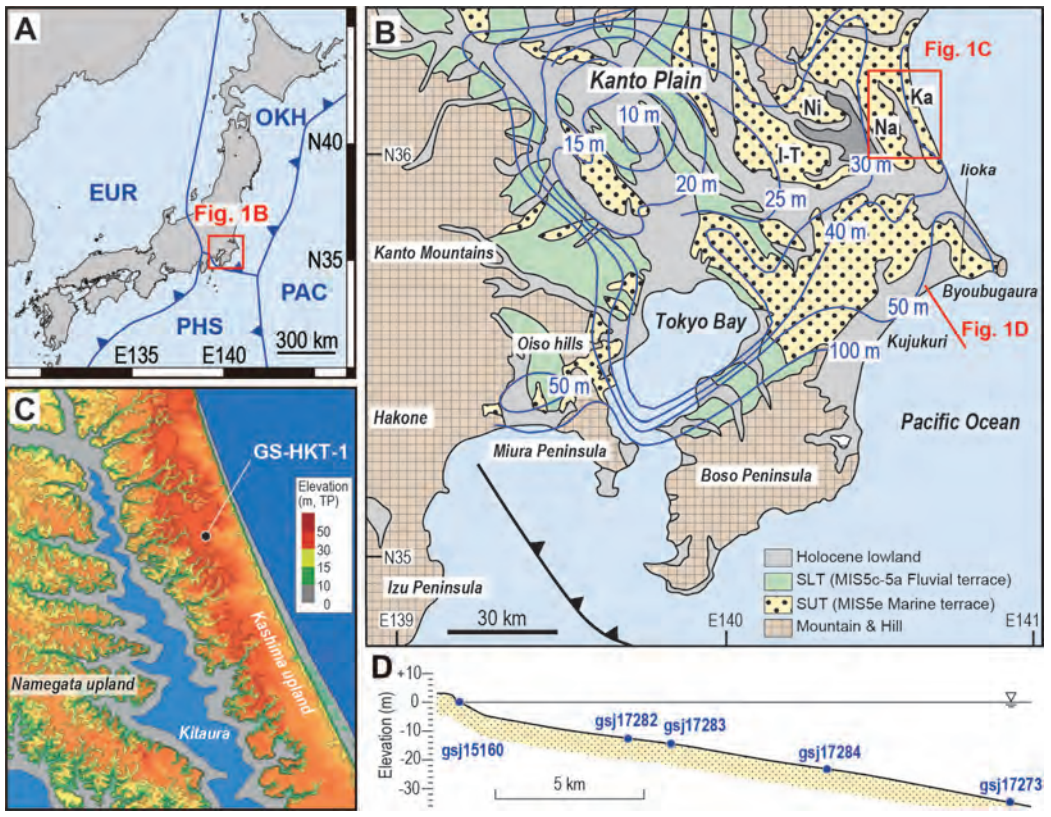
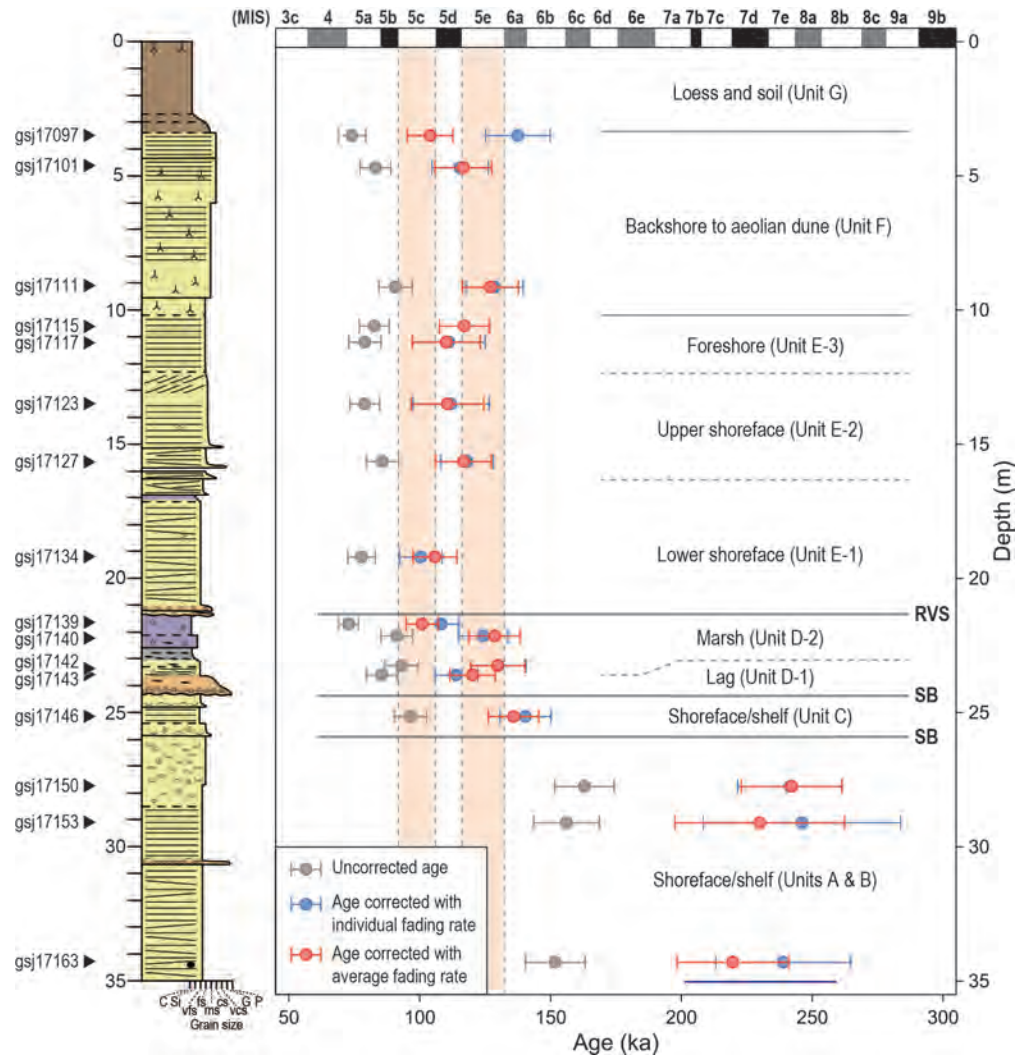
Background

Feldspar post-infrared infrared stimulated luminescence (pIRIR) dating is an advantageous trapped charge dating method of late Quaternary sedimentary records for its direct applicability to clastic sediments and wide time coverage. Its application to depositional sequences in various coastal settings potentially improve our understanding of long-term sea-level changes and regional tectonics that the sequences record. We present the application of post-infrared infrared stimulated luminescence (pIRIR) dating to a 35-m-long sediment core collected from the marine terrace in the Kanto plain, eastern Japan, and examine how effective its chronology is for identifying depositional sequences related to the relative sea-level fluctuations since the Middle Pleistocene.

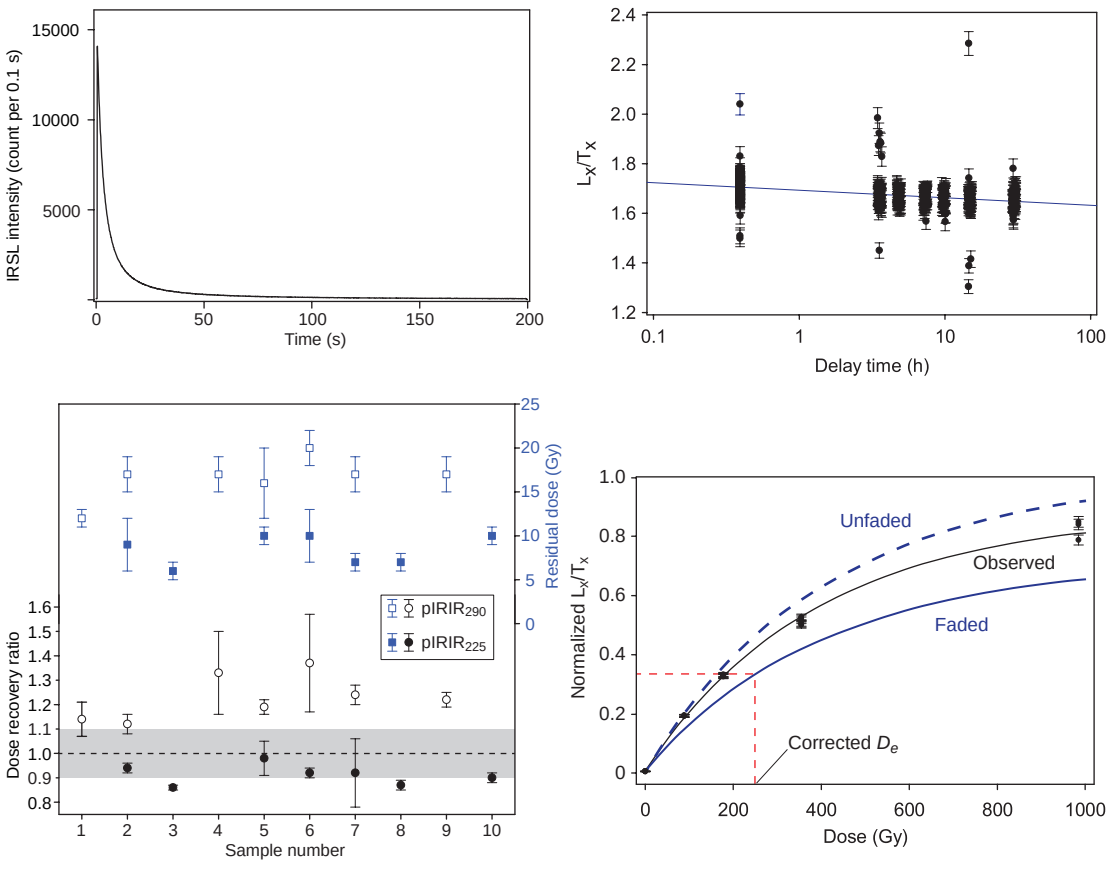


The Kanto coastal plain is situated near the triple junction of plate boundaries and extensive development of the Last Interglacial raised marine terrace in contrast to the longer-term subsidence trend. The sediment core was collected in the northeastern Kanto plain and shows a succession of seven facies units, A to G.

Stratigraphy & dating results



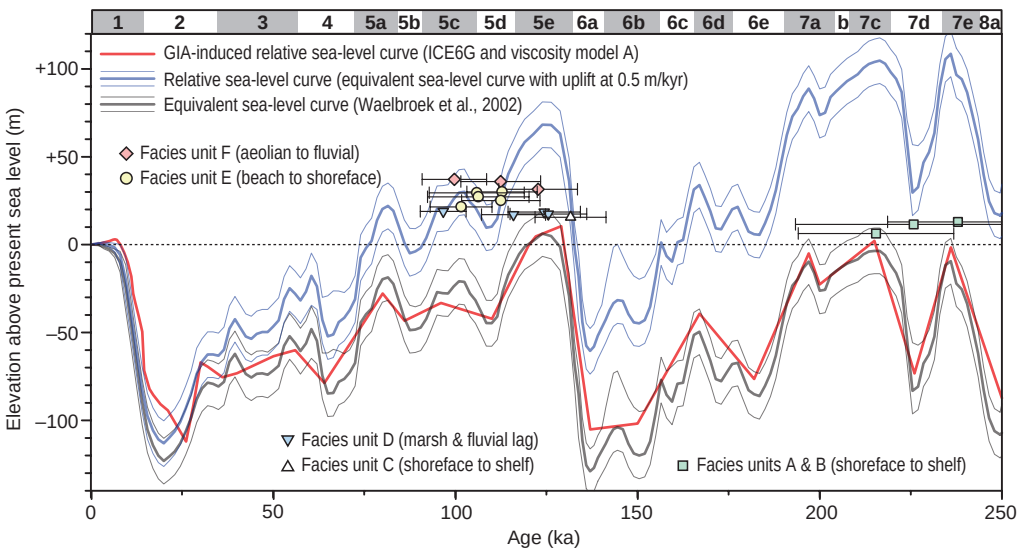
Luminescence measurements & pretests



Bright pIRIR signals were observed from all samples. According to pretests, pIRIR at 225 ºC after prior infrared stimulated luminescence at 50 ºC was chosen as an optimal signal for dating. The pIRIR is characterized by modest anomalous fading.

For details, read our recent paper:
Tamura et al. (2022) Frontiers in Earth Science 10, 967572.

Discussion – sea levels & tectonics



Fading-corrected pIRIR ages are consistent with the strati-graphy. Units A and B are dated as Marine Oxygen Isotope Stage (MIS) 7 and units C to F as MIS 5. However, uncertainties of individual age estimates do not allow further chrono-logical correlation. Instead, using sea-level changes inferred from characteristic facies tran-sitions as additional constraints, units C to F can be correlated to substages in MIS 5. Unit E represents coastal progradation during the MIS 5c sea-level highstand, which refines the date of the marine terrace around the core site as MIS 5c and revises up the rate of tectonic uplift accordingly. Our results exemplify a successful application of feldspar pIRIR dating for defining depositional sequences formed in relations to 100-kyr glacial cycles, in which with additional information of the sedimentary facies higher-frequency sequences may be defined.