掘削パラメータを用いた 南海トラフ付加体の強度推定
Strength profile of the Nankai accretionary prism evaluated from drilling parameters

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In-situ rock strength with depth under the ground/seafloor is a critical parameter for various studies in geology and seismology. The measurements on rock/core samples, however, hardly have been done with success due to lack of drilled cores and sufficient knowledge about the in situ conditions. We proposed a new indicator of the strength, equivalent strength (EST) developing previous mechanical parameter (Mechanical specific energy: Teal, 1964) from the oil industry, which is converted only from drilling performance parameters such as drillstring rotational torque, bit depth and drillstring rotational per minute. The data processing was applied to the data taken from International Ocean Discovery Program (IODP) expeditions in the Nankai Trough (sites C0002 and C0023). The depth profiles of the EST at Site C0002 are drawn from 0 to 3000 meter-below-seafloor (mbsf), across the forearc basin and the accretionary prism, and the values of the calculated EST are consistent with compressive strength measured on core samples under estimated in situ stress conditions in laboratory. The high (~20 MPa) EST in the forearc basin sediments corresponds to the high $CaCO_3$ content indicating the carbonate is cementing the shallow formation. The EST did not show a significant increase at the forearc basin–accretionary prism boundary, however clearly increased within the prism, ca. below 1500 mbsf. This result may indicate that even the shallow accretionary prism has been strengthened by horizontal compression derived from plate subduction. At the site C0023, where the toe of the accretionary prism area off Cape Muroto, the EST trend increases with depth and suddenly changes between 600–650 mbsf, 840–870 mbsf, and 1120 ~ mbsf, corresponding to tuff0rich zone, top of the subducting sediments and the basement igneous rocks, respectively. This EST trend shows good agreement with P-wave velocity curve measured on core samples. The EST decreases from ~20 MPa to 5 MPa below the frontal decollement with sharp negative peak. This low-EST zone probably indicate the existence of excess fluid pressure.

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