Relationship between the length of drilled core and the depth of drilled hole -Examples from IODP Exp. 346 U1425 and U1427

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Core-log-seismic integration is an ultimate goal of all the efforts to understand and predict the physical properties and composition of geological formations at various scales (mm-km). Downhole logs are continuous with depth, and measure formation properties on a scale that is intermediate between those obtained from laboratory measurements on core samples and geophysical surveys. Where core recovery is good, log and core data complement one another and may be interpreted together. Where core recovery is poor, downhole logs provide continuous stratigraphic data to fill gaps in core recovery. Establishing accurate correlation between sediment cores and logging data is thus a crucial step to reposition cores in correct depth and check that no major gaps are present in the spliced core data.

For this purpose, physical property data acquired from both core and logs are compared both in terms of value and data pattern, and natural gamma-ray radiation (NGR), density, and resistivity are commonly used. Generally speaking, higher the vertical resolution of data acquisition is, more precise the quality of correlation is. In the case of IODP Exp. 346, resolutions of shipboard data collection from cores were 0.5 cm for RGB of digital image, 1-5 cm for reflectance spectrum, 2.5-5 cm for gamma-ray attenuation (GRA) density, and 20 cm for NGR, while data acquisition intervals for logging were 0.25 cm for formation micro-scanner (FMS) and 4-15 cm for NGR and density.

Popular correlation method using NGR could enable us the meter-scale pattern matching between the profiles obtained from core onboard and from borehole by logging. Therefore, once we aim to realize higher resolution correlation and integration of core and logging data, we need to utilize FMS data, which vertical resolution is about 5 mm in soft sediments. Because FMS gives a high-resolution relative resistivity profile of the formation, these data should be ideally compared to resistivity measured on whole-round cores at cm-scale interval. However, such data have not been acquired during IODP Exp. 346. In this particular presentation, we will seek for another possibility to implement centimeter-scale correlation between core and logging data.

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