

TATSCAN-S1, non-destructive diffuse spectroscopic 2-D imaging scanner of sediment/rock cores

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The recent global warming enigma requires earth scientists to predict future environmental condition of the warm earth and to evaluate effect of the climatic change. Toward the problem, empirical study such as paleoceanography or paleoclimatology becomes much more important to understand the warm earth according to reconstruct the past environment when the earth became warmer than today. The recent study in such time scale requires intensive high-resolution measurement for the sediment core from the ocean or the lake. In order to achieve the task, non-destructive measurement in millimeter and/or micrometer scale is often necessary for detection climatic and oceanic changes in decimal and centennial time scale. Sediment color variation will be not only a good stratigraphic index but also sedimentary significance of sea-ice variation and related sedimentary rhythms and glacial/interglacial sedimentation.

The TATSCAN is a code name of developing original instruments for non-destructive sediment scanning and imaging in range of millimeter and micrometer scale. In the recent, we have newly developed non-destructive diffuse spectroscopic (UV, Visible, and Near infra-red domains) 2-D imaging color scanner of sediment/rock cores called as TATSCAN-S1. It originally measures spectroscopic spectrum on the sediment surface in a function of wavelength ranging from ultra-violet domain to near infrared domain (270 - 1250 nm) by using imaging spectroscopy. We can get not only visual image of core but also any spectroscopic image in specific wavelength, in some range of wavelength, and in differentiated wavelength. It is possible for spectroscopic analyses because resolution of a measurement is ~1 nm in wavelength, although conventional color measurement using Minolta spectrophotometer has been 10nm in wavelength. Measurement diameter of TATSCAN-S1 designed about 10 micrometer for one measurement, although conventional color measurement using Minolta spectrophotometer has been about 1cm in spatial resolution. The device can perform map- and line- scanning on sediment surface of 150 mm wide and 1500 mm long in micrometer in a special resolution of about 10nm. Conventional L*a*b*, XYZ, RGB data can be calculated from original spectroscopic image data. Analytical time by TATSCAN-S1 is estimated ~10 minutes for 1500 mm-long section, resulting in ~1 hours for a 9.5 m-long core.

In this presentation, we present some examples of measurements of recovers cores from the ocean, lake, and land.