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Adjustment of core petrophysical measurements to account for core quality issues: A case study from the New Jersey Shallow Shelf (IODP Expedition 313)

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During the offshore phase of the New Jersey Shallow Shelf Expedition (Integrated Ocean Drilling Program (IODP) Expedition 313), the physical properties of more than 1300m of borehole core were measured on a Multi-Sensor Core Logger (MSCL). Measurements of gamma density, P-wave velocity, electrical resistivity and magnetic susceptibility were conducted with the MSCL in whole-core setup with the measurement interval set at 1cm to ensure high resolution data.

On Mission Specific Platform expeditions, such as Expedition 313, petrophysical equipment is provided and managed by the European Petrophysics Consortium (EPC). EPC standard operating procedures are designed to ensure high quality data from the MSCL with regular calibration checks on all sensors, repeat measurements on selected cores and observations of core quality being made and recorded. In addition, certain erroneous data are removed from the final dataset, including data around the end caps (end effects), spikes (single point) in the magnetic susceptibility data, data where there are obvious cracks/voids in the core and data where there is evidence for the presence of metal in the liner (where a core catcher is trapped in the liner).

The quality of three of the four principal sensor measurements taken in whole-core MSCL setup rely on the assumption that the core liner is completely filled with core. However, on Expedition 313 it was relatively rare for liners to be entirely filled and sometimes the gap between the core and the liner was filled with drilling fluid. This introduces different issues in terms of data output for the various sensors, some of which will be addressed here.

The physical property measurements taken during Expedition 313 provide the background to many interpretations. For example, in places the gamma density has been used to aid recognition of potential seismic reflectors. As such, ensuring an accurate and calibrated dataset or knowing the potential errors introduced by poor core quality is important.

Here we propose corrections for some of the sensor measurements where the percentage of core liner fill has been noted as well as for the presence of drilling fluid in any gap between the core and the liner. These two factors are used to reprocess the raw/original data with the intention of improving the accuracy of the final dataset. Where possible, corrected and uncorrected datasets are compared with discrete core measurements taken during the onshore phase of Expedition 313.