In situ compaction measurements via radioactive markers in the Northern Adriatic basin: an analysis of data precision over 15 years of monitoring

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Abstract
Deep compaction of sediments caused by natural gas extraction has been monitored in the Northern Adriatic basin since 1994 using downhole radioactive markers, and both Schlumberger and Baker Atlas technologies for acquisition and processing. While laboratory techniques have been proposed to measure deep sediment compressibility (e.g. Hueckel et al., 2001), marker measurements are still the key approach to this end. Currently six wells are equipped with markers and data are acquired on a yearly basis on five wells. In this paper we analyse the accuracy of such data, starting from the raw count data. The analysis shows that accuracy of single peak determination depends on the signal/noise ratio, i.e. on the amplitude of the marker count peak with respect to the ambient background. This ratio in turn is an inverse function of marker bullet penetration into the well wall. We also analyse the propagation of this peak determination error into the data processing leading to the estimation of the marker interval length, and ultimately to estimates of compaction. The results show that while in some cases the nominal precision of 1 mm/10.5 m marker interval is achieved, for other wells the actual precision is substantially lower. These results shall be used to derive estimates of in situ compressibility having narrower confidence intervals.

Key words deep compaction; radioactive marker; gas extraction