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Time Lapse Seismic Inversion at the Oseberg Field

The Oseberg Field is a major oil and gas field located in the North Sea. The reservoir comprises sandstones from the Middle Jurassic Brent Group in three eastward-dipping, tilted fault-blocks. The production started late 1991 with a two front production drive system; gas injection in the initial gas cap, and water injection in the water leg.

As an IOR initiative in the decline phase of the production, a time-lapse seismic survey was acquired in 1999 to be compared with the base survey from 1992. This paper presents the results of a time-lapse elastic inversion. Currently, close to 85% of the initial oil reserves have been produced and time-lapse seismic is in the process of being used to plan infill wells.

It has also been shown previously (Rutledal et al.) that the full stack seismic data contains 4D responses consistent with the production effects. Similar indications were also seen on the far-offset stack data. In order to utilise the 4D data even more extensively, it was therefore decided to initiate an elastic inversion study based on the two seismic surveys, both for reservoir characterisation and for 4D purposes.

Results show that time lapse elastic inversion has a great potential in supporting the reservoir history matching process and detecting areas of undrained reserves. Future work will focus on more quantitative use of the inversion result and discrimination between saturation and pore pressure changes, by use of the rock physics model for Oseberg.