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DEGREE:	Philosophiae Doctor
FACULTY:	Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Geoscience
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DISSERTATION TITLE:	*Sea Surface Wave Height Estimation from Dual-Sensor Towed Streamer*

POPULAR SCIENTIFIC SUMMARY:

Marine seismic data acquisition technologies are advancing rapidly and there is need for high-fidelity processing techniques that are capable of taking advantage of these developments. Time varying rough sea surface and varying streamer depth introduces distortions in the processed seismic data. This is because sea surface information is not available thus; existing data processing techniques assume it to be flat and stationary. In this doctoral thesis the feasibility of imaging time-varying rough sea surface topography using collocated dual-sensor towed streamer data has been demonstrated. Literally, the traditional subsurface imaging problem is turned upside down because the sea surface to be imaged is above the streamers.

The recorded marine seismic data are separated into the component up- and down-going wave fields under the assumption that these wave fields are related to each other given the sea surface. The complication is that the sea surface is time-varying and is actually not given. Therefore, the separated wave fields are moved backwards to the sea surface where they coincide in space and time and the sea surface topography extracted. Progressively complex synthetic cases have been used to validate the sea surface imaging technology: from frozen 1D rough sea, to time varying sea, to moving receivers, to varying receiver depths, and finally to 2D time varying sea conditions obtained from different wind speeds and directions. Moreover, the technique was applied to 2D and 3D field data from North Sea and offshore Brazil with good results. This doctoral thesis is carried out at the Department of Geosciences, University of Oslo in collaboration with Petroleum Geo-Services ASA (PGS).