DOCTORAL CANDIDATE:	Alba Ordoñez Adellach
DEGREE:	Philosophiae Doctor
FACULTY:	Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Geosciences
AREA OF EXPERTISE:	Seismic imaging
SUPERVISORS:	Walter Söllner, Tilman Klüver and Leiv J. Gelius
DATE OF DISPUTATION:	27th of May 2016
DISSERTATION TITLE:	*Subsurface Imaging Using Multiples from Amplitude-Normalized Separated Wavefields: Application to Marine Towed-Streamer Data*

I avhandlingen blir multiple refleksjoner, som normalt sett betraktes som støy og derfor dempet i prosesseringen av de seismiske dataene, benyttet for avbildning av undergunnen. Basert på seismiske data innsamlet med multi-komponent lytte kabler, har verktøy for avbildning av både primære og multiple refleksjoner samtidig blitt utviklet. Denne nye metodikken har blitt anvendt på både syntetiske og reelle data med gode resultater.

POPULAR SCIENCE SUMMARY:

Imaging the subsurface is part of the process used in the interpretation of geological structures that may potentially contain natural resources, such as oil and gas. These subsurface images are mainly generated from seismic data acquired in marine environment. Imaging is traditionally applied on seismic data only composed of primary reflections, which are events reflected once in the subsurface and then returned to the acquisition level. Multiple reflections, which bounce at least twice in the subsurface, are commonly treated as noise and suppressed before imaging. However, multiple reflections have the capability of illuminating subsurface points that primaries cannot reach. Multiples also contain smaller reflection angles than primaries. These features can therefore be exploited to improve the image quality and the information content of the subsurface.

Based on seismic data acquired with multicomponent streamers comprising pressure and vertical velocity sensors, the PhD student Alba Ordoñez Adellach proposes a new tool for simultaneously imaging primary and multiple reflections. The main prerequisite for the approach is the ability to separate the pressure and vertical velocity recordings into their up- and downgoing components. The upgoing component of the pressure and the downgoing component of the vertical velocity, both of them composed of primary and multiple reflections, are combined to retrieve the reflection response of the subsurface. This is mathematically accomplished by solving an integral equation for every image point. The new imaging approach was successfully applied on several synthetic and field data examples.

This doctoral thesis was carried out at the Department of Geosciences, University of Oslo in collaboration with PGS Geophysical AS.