Imaging the North Atlantic: deployment of the ocean-bottom seismometers of the SEA-SEIS project and quality control of global and regional network data

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The North Atlantic Ocean and its margins present important, unanswered geodynamics questions, both in the continental and oceanic domains. To better understand the structure and evolution of this area, a set of 18 state-of-the-art ocean-bottom seismometers (OBSs) have been deployed in the North Atlantic Ocean in September 2018 as part of the project SEA-SEIS (Structure, Evolution And Seismicity of the Irish offshore). The network covers the entire Irish offshore and parts of the UK and Iceland waters. Over a period of 15 months, they will record seismic data at 1-4 km depths on the ocean bottom, with the retrieval planned for April, 2020. With this new broadband data, together with all other globally available broadband data, we will improve the tomographic resolution of the North Atlantic region, including the Iceland hotspot. To image the lithosphere and mantle, structural information will be extracted from the large amount of vertical- and transverse-component waveform fits, including the unique new OBS data, using the Automated Multimode Inversion (AMI) of surface, S- and multiple S-waves. Realistic body-wave sensitivity kernels will be developed and integrated into the inversion. The improved tomographic models of the North Atlantic region should yield new insights into the origins of the enigmatic North Atlantic Igneous Province volcanism, the evolution and deep structure of the Iceland Hotspot and its effect on the evolution of the region. To minimize the effect of data errors on the model, extensive quality control has been applied to the available global and regional network data, including extensive checks of the correctness of the instrument response information, which can influence the accuracy of the structural information yielded by seismograms. The quality control revealed a number of problems with the response files at stations from various of networks. The problems are being fixed in joint efforts with the data centers and network operators.