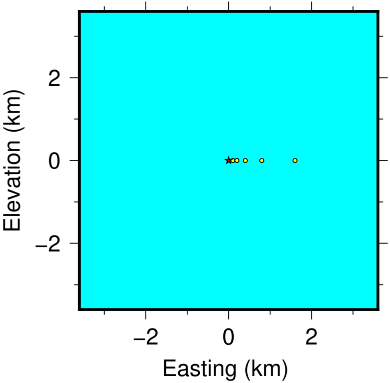
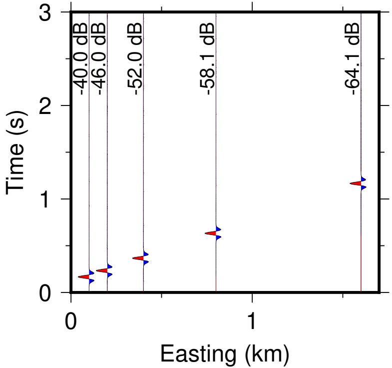
Case 1: homogeneous water free space

a slice of 3D model on the X-Z plane, where the source is at origin, and the receivers are at the ranges of 0.1, 0.2, 0.4, 0.8 and 1.6 km



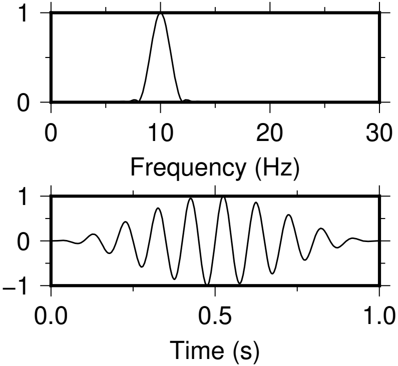
Sound pressure signals recorded by the receivers

plotted with the amplitudes normalized by their own peak values (dB re 1m) // the probing source signal is a Ricker wavelet @ 10 Hz



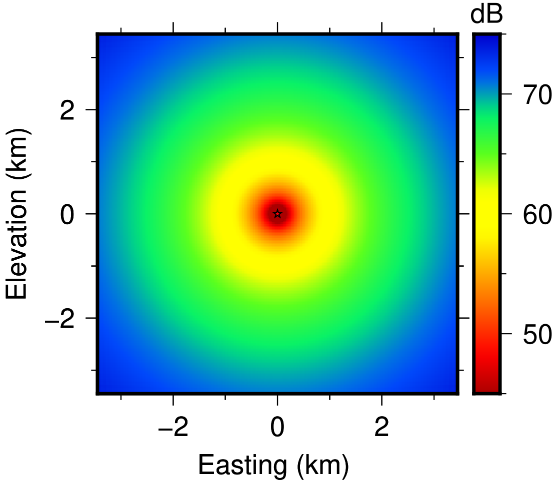
Calculating dependence of transmission loss on frequency

Driving with a quasi-time-harmonic narrowband source, e.g., a 10-period sine in Hanning window



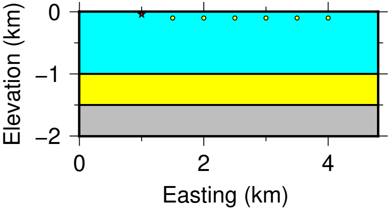
Transmission loss on the X-Z plane

narrow band signal@ 10 Hz, dB re 1m



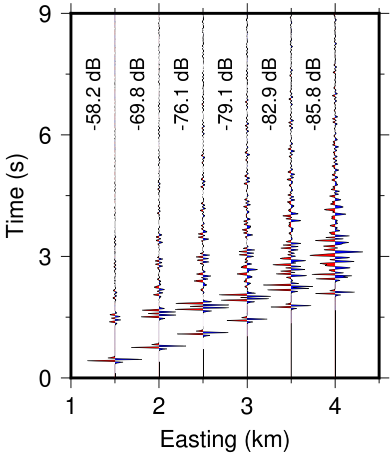
Case 2: Flat layers of water, sediment and baserock

a slice of 3D model on the X-Z plane, where the source is at (1, -0.04) km, and the receivers are at the eastings of 1.5, 2 ... 4 km and the depth of 0.1 km



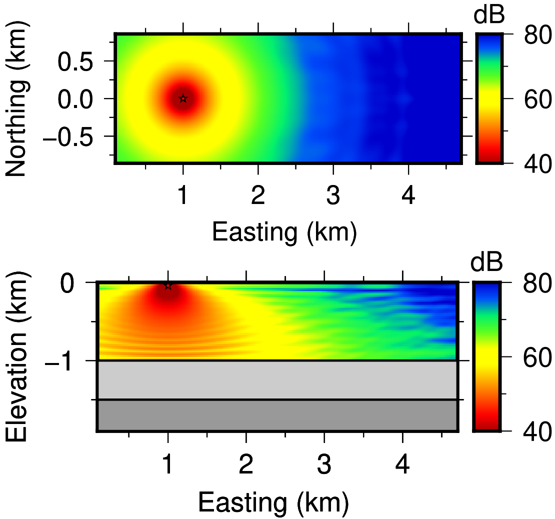
Sound pressure signals recorded by the receivers

plotted with the amplitudes normalized by their own peak values (dB re 1m) // the probing source signal is a Ricker wavelet @ 10 Hz



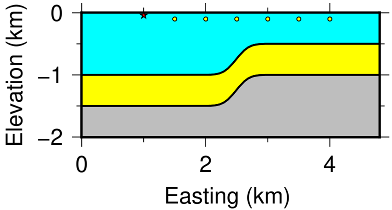
Transmission loss on the horizontal plane at 0.1 km depth and the X-Z plane

narrow band signal@ 10 Hz, dB re 1m



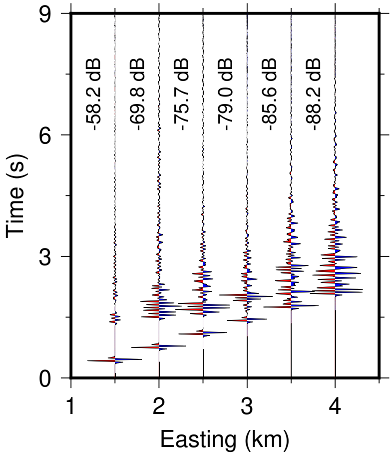
Case 3: Slope with layers of water, sediment and baserock

a slice of 3D model on the X-Z plane, where the source is at (1, -0.04) km, and the receivers are at the eastings of 1.5, 2 ... 4 km and the depth of 0.1 km



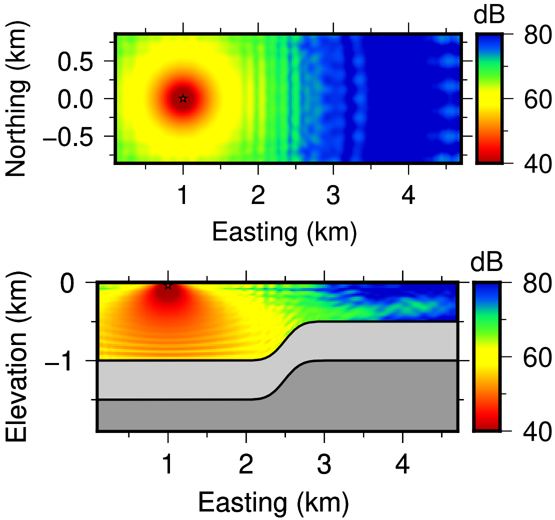
Sound pressure signals recorded by the receivers

plotted with the amplitudes normalized by their own peak values (dB re 1m) // the probing source signal is a Ricker wavelet @ 10 Hz



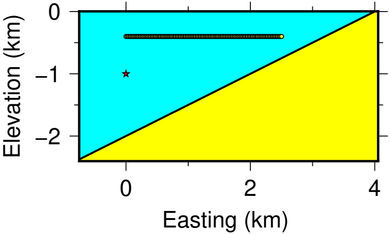
Transmission loss on the horizontal plane at 0.1 km depth and the X-Z plane

narrow band signal@ 10 Hz, dB re 1m



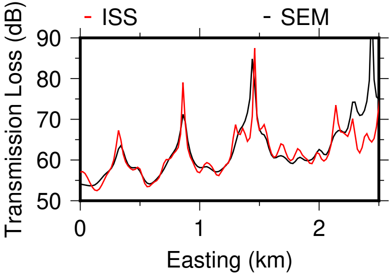
Comparing results between Spectral Element Method and Image Source Solution

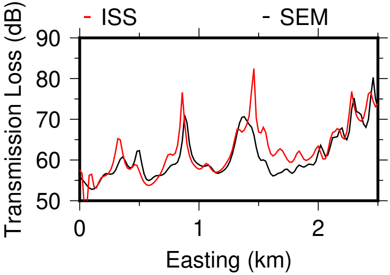
Wedge shaped water layer over a fluid /solid bottom



Transmission Loss comparation: left(fluid bottom) and right(solid bottom)

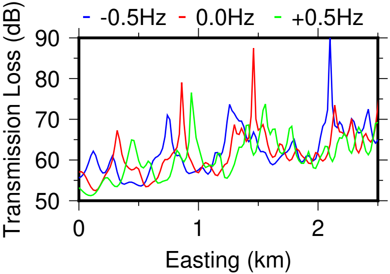
narrow band signal@10 Hz, dB re 1m





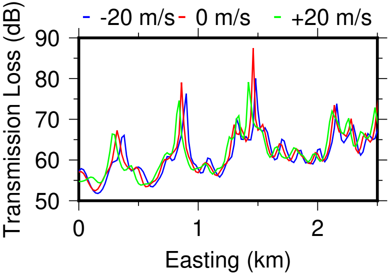
Transmission loss, phase sensitive due to coherent wave interferences

source frequency perturbation



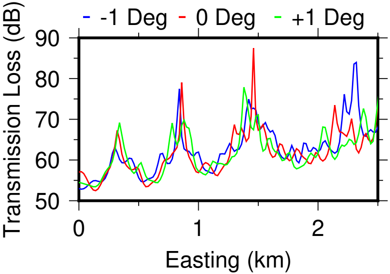
Transmission loss, phase sensitive due to coherent wave interferences

water sound speed perturbation



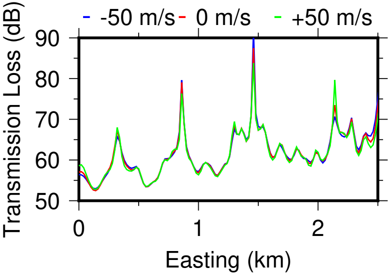
Transmission loss, phase sensitive due to coherent wave interferences

water geometry/slope angle perturbation



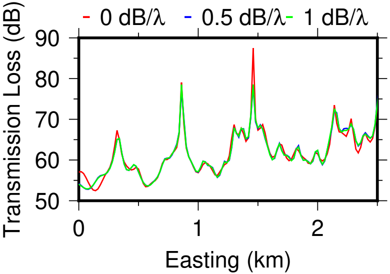
Transmission loss, phase sensitive due to coherent wave interferences

bottom sound speed perturbation



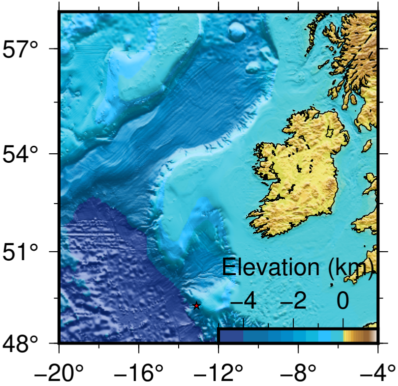
Transmission loss, phase sensitive due to coherent wave interferences

bottom sound attenuation perturbation



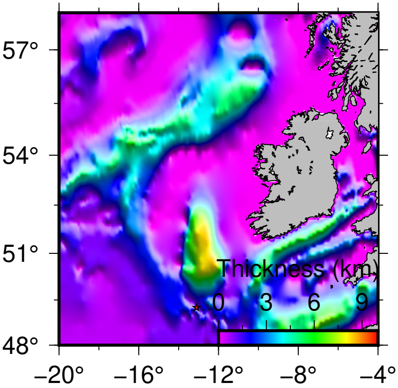
3D realistic model of Irish Waters: I. Geological structure

bathymetry: GEBCO



3D realistic model of Irish Waters: I. Geological structure

sediment thickness: NOAA



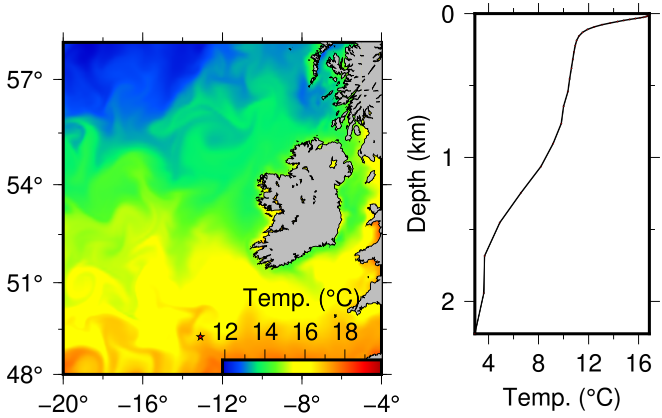
3D realistic model of Irish Waters: I. Geological structure

sediment classification: EMODNET

Seabed substrate view as per this link

3D realistic model of Irish Waters: II. Hydrological structure

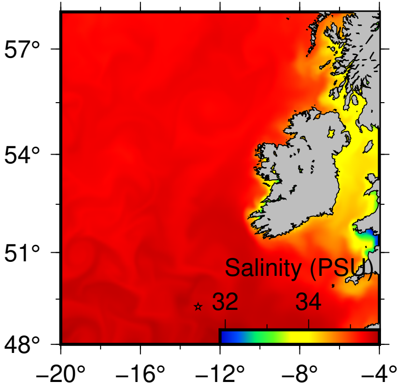
temperature: Copernicus Ocean
plotted on the surface and in depth at source position

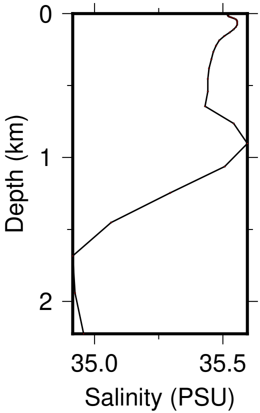


3D realistic model of Irish Waters: II. Hydrological structure

salinity: Copernicus Ocean

plotted on the surface and in depth at source position

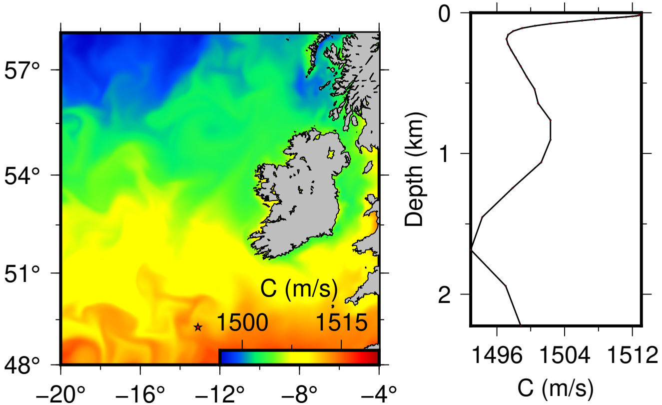




3D realistic model of Irish Waters: III. acoustical structure

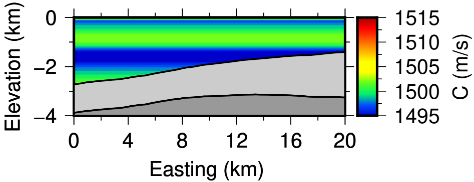
sound speed

plotted on the surface and in depth at source position



3D realistic model for calculation

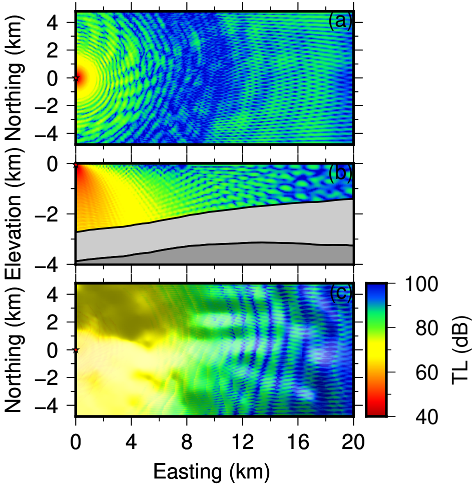
A vertical slice



Transmission loss at single frequency

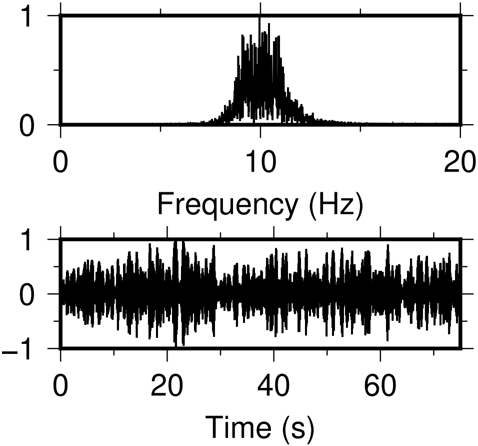
driving with a time-harmonic signal at 10 Hz

plotted on the horizontal slice at 150m depth, the vertical slice and at the ocean bottom



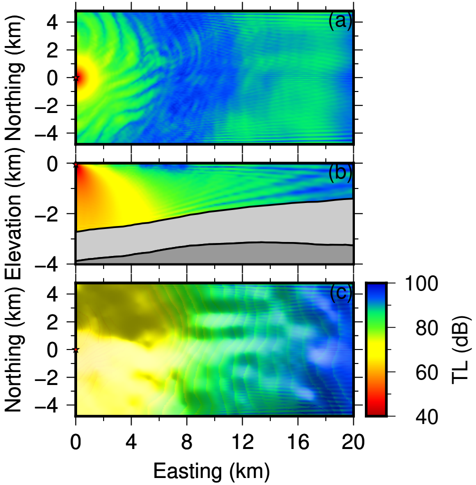
Transmission loss over one-third octave band. I

driving with a white noise through a 1/3 octave band filter



Transmission loss over one-third octave band. II

plotted on the horizontal slice at 150m depth, the vertical slice and at the ocean bottom



- an realistic model can now be built for a source deployed at any time and place
- may borrow some indicators in room/physco-acoustics to describe the sound quality of ocean enviroment