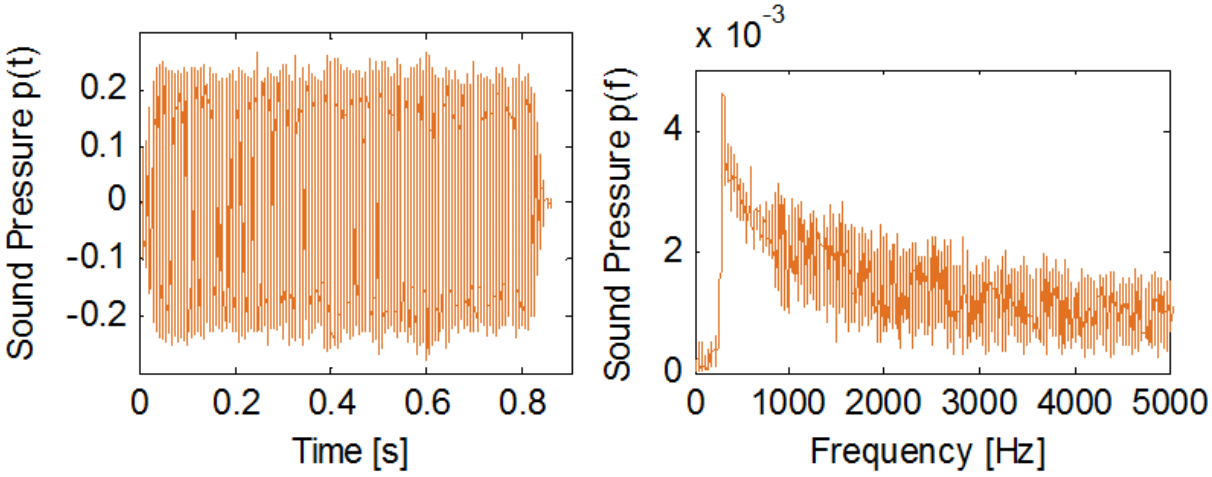
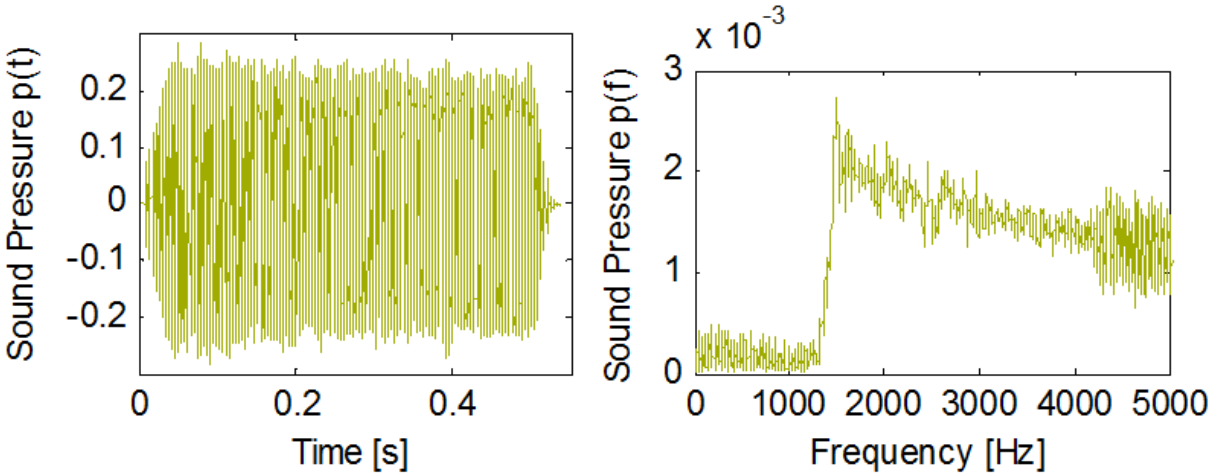
MOOC@TU9 - Models in Civil Engineering: From Cardiology to Fishery
Task of the Week

The results of acccoustic measurements for two different ice layers are given.

Layer 1:



Layer 2:



a) Compute the thickness of the ice layers.

Use the following material parameters for ice:

- Young's Modulus $E = 9.1 \cdot 10^9 \frac{\mathrm{N}}{\mathrm{m}^2}$
- Density $\rho = 916.7 \frac{\mathrm{kg}}{\mathrm{m}^3}$
- Poisson's Ratio $\nu = 0.33$

Use the following constant (frequency independent) wave velocity for air:

- Wave velocity $c_A = 340 \frac{\mathrm{m}}{\mathrm{s}}$

Would you jump on the ice?

b) Is the applied model conservative (on the save side)? Please compare your results with the results published by Lundmark (2001)[1] and comment on the differences. Under what circumstances would you trust the results in order to jump on the ice?

c) Estimate the stiffness of the water using the model of an elastically suppported plate. Comment on the model of an elastic support of the plate.

[1] G. Lundmark, „Skating on thin ice - And the acoustics of infinite plates“, Proceedings of the International Congress and Exhibition on Noise Control Engineering, The Hague, 2001