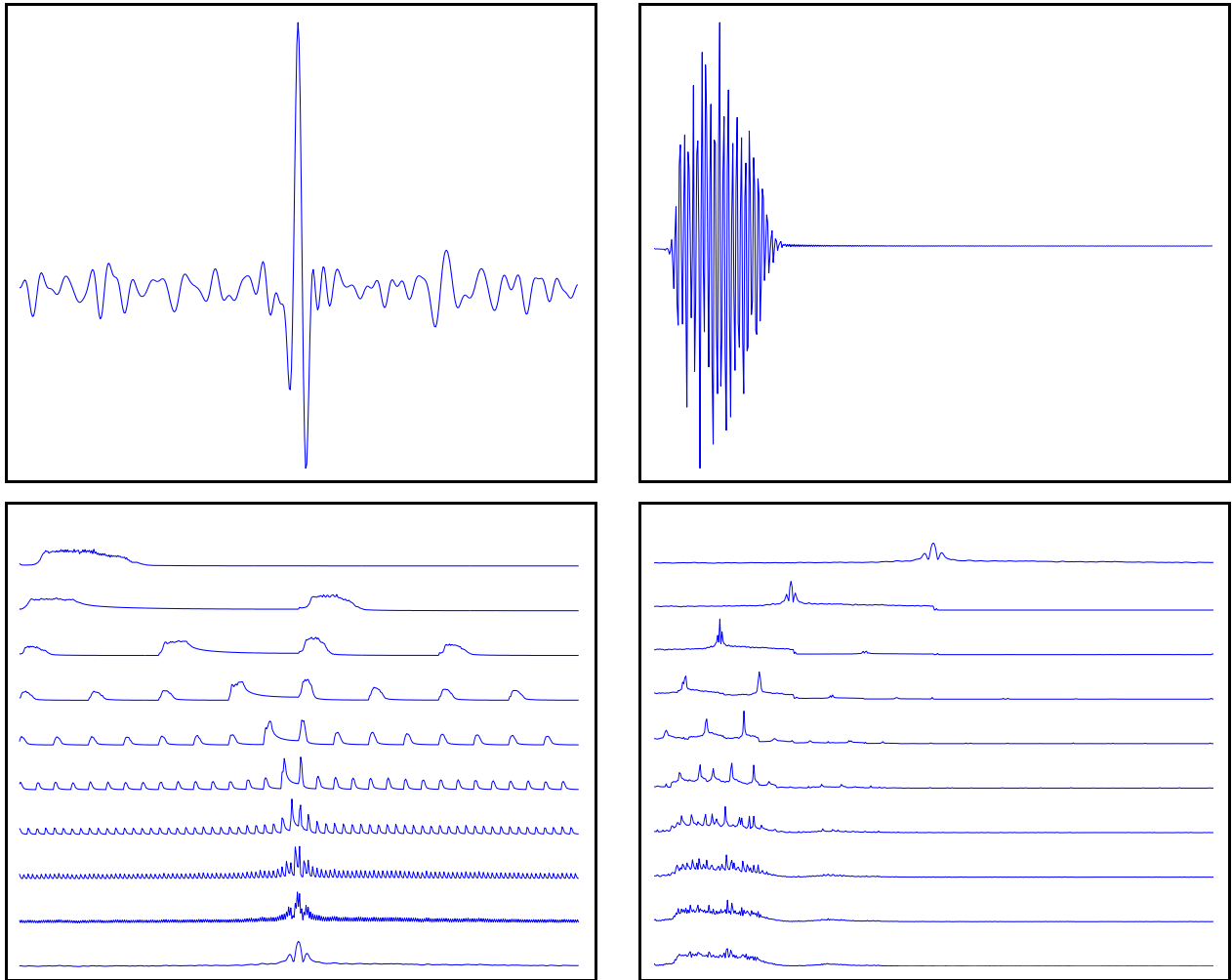


# Acoustic Backscatter Data

- Collected by NSWCC CSS under MCM program (Dr. Gerry Dobeck)  
ONR 321 Tactical Sensing (Dr. Randy Jacobson)  
ONR 342 BioSonar program (Dr. Harold Hawkins)
- 6 objects: metal cylinder, cone-shaped plastic object, a water-filled barrel, limestone rock, granite rock, and a water-logged wooden log.
- Variability: 5 degree intervals, 360 deg.
- Narrow band: Pulse between 20-60KHz FM modulation
- Wide band: Pulse between 30-110KHz FM modulation
- Pulse duration 1 MSec
- Signal/Noise 12-20db. The noise is an accurate modeling of the bottom reverberation.
- Data was normalized by Dr. Gerry Dobeck.

# Acoustic backscattered data



Top left: Raw signal, right: Best Basis from Local Cosine. Bottom left: Local Cosine packet, right Wavelet Packet (Symmlet-6).

# Backscattered data classification 40KHz Frequency Band

	Local Cosine	Symmlet-6	Coiflet-3
BB	18.6(1.2)	33.1(1.4)	41.1(1.4)
LDB	18.7(0.8)	40.0(1.4)	39.9(1.6)
LDB-40	17.5(1.4)		
Wavelet	28.9(1.3)	42.7(1.8)	41.8(1.0)
Quadratic	18.7(1.5)	29.9(1.3)	30.3(0.8)
LDB*	19.3(.9)		

## Wide-band Results

15 Coeffs	Symmlet-8	Coiflet-5	Ensemble
Wavelet <sup>1</sup>	7.3	6.0	6.3
Wavelet <sup>2</sup>	9.2	7.0	6.9
QDB <sup>1</sup>	7.0	6.5	6.3
QDB <sup>2</sup>	9.6	6.9	7.4
<b>Ensemble</b>	6.4	5.7	5.7
12 Coeffs			
Wavelet <sup>1</sup>	8.6	6.9	7.8
Wavelet <sup>2</sup>	15.5	14.0	14.4
QDB <sup>1</sup>	7.3	8.3	7.4
QDB <sup>2</sup>	11.9	7.5	8.0
<b>Ensemble</b>	6.9	6.3	6.6
<b>Sup Ensemble</b>	6.7	5.4	6.1

Percent error classification. Numbers in brackets represent standard deviations. Wavelet<sup>1</sup> uses the first 15 wavelet coefficients of the signal while Wavelet<sup>2</sup> stands for a discrimination based on  $L^2$  distance of the distributions of the two classes. QDB<sup>1</sup> means that first the quadratic discrimination best basis is found (see text for details) and then the first 12 or 15 coefficients of this basis are used. In Quadratic<sup>2</sup>, the discriminating coefficients based on the  $L^2$  distance of the distributions of the two classes are found from the same best basis.. In all cases the discrimination is done on each dimension separately.