Aki-Richards equation
as given in Fatti et al (1994), Geophysics 59 (9)

$$R_{\mathrm{PP}}(\theta) = (1+\tan^2\theta)\,\frac{\Delta I_{\mathrm{P}}}{2I_{\mathrm{P}}} \;-\; 8\left(\frac{V_{\mathrm{S}}}{V_{\mathrm{P}}}\right)^2 \sin^2\theta\,\frac{\Delta I_{\mathrm{S}}}{2I_{\mathrm{S}}} \;-\; \left[\frac{1}{2}\tan^2\theta - 2\left(\frac{V_{\mathrm{S}}}{V_{\mathrm{P}}}\right)^2\sin^2\theta\right]\frac{\Delta\rho}{\rho}$$

Shuey's approximation
Shuey, RT (1985), Geophysics, 50, 609-614

$$R(\theta) \approx A + B\sin^2\theta \qquad A = R_{\mathrm{P}} \approx \frac{1}{2}\left(\frac{\Delta V_{\mathrm{P}}}{V_{\mathrm{P}}} + \frac{\Delta\rho}{\rho}\right) \qquad B \approx R_{\mathrm{P}} - 2R_{\mathrm{S}}$$

Power and amplitude

dB level	Power	dB level	Amplitude
–30 dB	1/1000 = 0.001	–30 dB	$\sqrt{1/1000}$ = 0.03162
–20 dB	1/100 = 0.01	–20 dB	$\sqrt{1/100}$ = 0.1
–10 dB	1/10 = 0.1	–10 dB	$\sqrt{1/10}$ = 0.3162
–3 dB	ca. 1/2 = 0.5	–3 dB	$\sqrt{1/2}$ = 0.7071
3 dB	ca. 2	3 dB	$\sqrt{2}$ = 1.414
10 dB	10	10 dB	$\sqrt{10}$ = 3.162
20 dB	100	20 dB	$\sqrt{100}$ = 10
30 dB	1000	30 dB	$\sqrt{1000}$ = 31.62

Types of mean average

Arithmetic [1]	the sum divided by the population size, n — used when the sum is of interest
Geometric [1][2]	the nth root of the product — used when the product is of interest
Harmonic [1]	n divided by the sum of the reciprocals — used for rates and ratios
Quadratic or RMS	the square root of the arithmetic mean of the squares — used for magnitudes

[1] Pythagorean means, for which A ≥ G ≥ H [2] Only defined for +ve numbers

Meetings
Dates, place, and actual or estimated abstract deadline

EGU 9 Jan 2013 7 to 12 Apr 2013 Vienna, AUT	GeoCon Jan 2013 6 to 10 May 2013 Calgary, CAN	AAPG 11 Oct 2012 19 to 22 May 2013 Pittsburgh, USA	EAGE 15 Jan 2013 10 to 13 Jun 2013 London, GBR
SEG Apr 2013 22 to 27 Sep 2013 Houston, USA	GSA Aug 2013 27 to 30 Oct 2013 Denver, USA	AGU Aug 2013 9 to 13 Dec 2013 San Francisco, USA	SEG '14 Apr 2013 26 to 31 Oct 2014 Denver, USA

Seismic resolution

Tuning thickness is usually computed as one quarter of the wavelength, the Rayleigh criterion:

$$\text{tuning thickness} = \frac{v}{4f}$$

where v is interval velocity and f is the maximum frequency (at –20 dB). Only forward modelling can really address the question of tuning in your data.

Note that the minimum thickness for which you can interpret separate events for top and base is greater than the tuning thickness. Note also that even though you cannot interpret top and base events, it may be possible to model thickness from amplitude around the tuning thickness.

Spatial resolution (Fresnel diameter after migration) is often computed a one half of the wavelength:

$$\text{spatial resolution} = \frac{v}{2f}$$

Powers of 2 (bit depth)

Bit-depth	Values		Range
1	2^1	2	0, 1
2	2^2	4	–1 *to* +2
3	2^3	8	–3 *to* +4
4	2^4	16	–7 *to* +8
5	2^5	32	–15 *to* +16
6	2^6	64	–31 *to* +32
8	2^8	256	–127 *to* +128
16	2^{16}	65 536	-32 767 *to* +32 768
24	2^{24}	16 777 216	–8 388 607 *to* +8 388 608
32	2^{32}	4 294 967 296	–2 147 483 647 *to* +2 147 483 648
64	2^{64}	1.8×10^{19}	$\pm 9 \times 10^{18}$
128	2^{128}	3.4×10^{38}	$\pm 1.7 \times 10^{19}$

Nyquist frequency

$$f_{\mathrm{N}} = \frac{1}{2} \times \frac{1000}{S}$$

where S is sample interval
e.g. for S = 4 ms, f_{N} = 125 Hz

Common rock properties

Rock	Fluid	Porosity	Density	Velocity
Sandstone		0.0	2650 kg/m^3	3000–5500 m/s
Sandstone	wet	0.1	2500	2500–4500
Sandstone	wet	0.2	2500	2000–3500
Sandstone	oil	0.2	2320	2000–3500
Sandstone	gas	0.2	2320	1800–3500
Limestone	wet	0.0	2710	4500–7000
Limestone	wet	0.1	2540	3800–6500
Dolomite	wet	0.0	2870	4500–7500
Dolomite	wet	0.1	2680	3800–7000
Shale			2000–2800	1800–5000
Salt			2030	4200–4800
Coal			1200–1500	1800–3200

Filter kernels

Mean

1	1	1
1	1	1
1	1	1

Gauss

1	2	1
2	4	2
1	2	1

Sharp

-1	-1	-1
-1	9	-1
-1	-1	-1

Unsharp

-1	-1	-1
-1	17	-1
-1	-1	-1

Edge

-1	-1	-1
0	0	0
1	1	1

Sobel

-1	-2	-1
0	0	0
1	2	1

Horizon filters
+ Good performance ++ Excellent performance

Hall (2007), Smooth operator: smoothing seismic interpretations and attributes, The Leading Edge 26 (1)

	Random noise	Spiky noise	Edges preserved	Comments
Mean	+			Gaussian is a better choice
Gaussian	+			Less affected by spikes than mean
Conservative		+	+	Only removes very sparse spikes
Trimmed mean	++	++		Best if edges not present or not wanted
Mode	+	+	+	Only use on discrete or class attributes
Median	++	++	+	Good all-rounder
SNN	++	++	++	Best all-rounder
Kuwahara	+	++	++	Enhances edges, but use median filter first

GEOPHYSICS cheatsheet

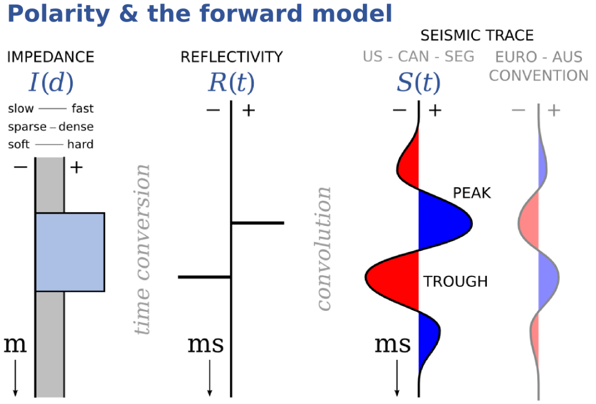
Agile*

agilegeoscience.com

Acoustic impedance

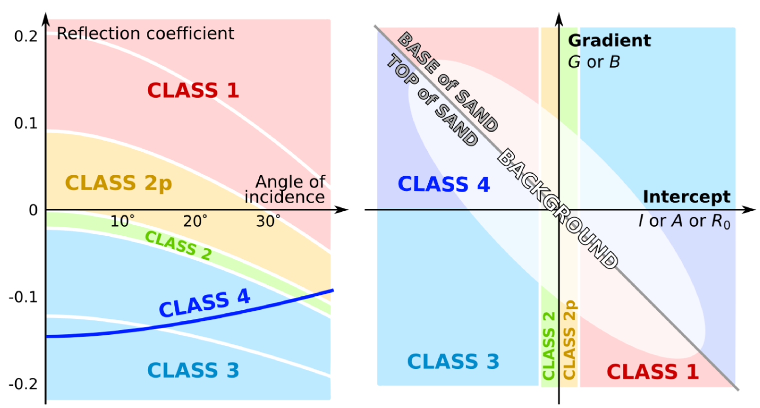
$$Z = V \times \rho$$

Polarity & the forward model



reflectivity ∗ wavelet + noise = seismic

AVO classes



Multiples