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## Anexo 1: Métrica para quantificação de incertezas associadas aos atributos sísmicos

Seguindo Doyen et al. (2004), utiliza-se a métrica “erro relativo percentual” para definir as incertezas associadas aos atributos sísmicos. Por definição, um erro relativo percentual ( $ER\%$ ) associado a uma medida qualquer é dado por:

$$ER\% = \left| \frac{(V_r - V_m)}{V_r} \right| \times 100, \quad (90)$$

onde  $V_m$  corresponde ao valor medido, enquanto que  $V_r$  é o valor real.

Ou seja, diante de um valor medido e do “erro relativo percentual” associado à esta medição, entende-se que o valor verdadeiro encontra-se no intervalo:

$$\left[ \left( V_m - \frac{ER\%}{100\%} V_m \right), \left( V_m + \frac{ER\%}{100\%} V_m \right) \right]. \quad (91)$$

Nesta tese, as incertezas associadas a um atributo sísmico são definidas através de uma distribuição Gaussiana. O valor médio dessa distribuição é dado pelo valor medido, enquanto que o desvio padrão é dado pelo desvio padrão da distribuição Uniforme definida pelos erros relativos percentuais (pelo intervalo definido na equação (91)). Seguindo a formulação do desvio padrão da distribuição Uniforme (Evans et al., 2000), obtém-se:

$$\sigma = \sqrt{\frac{(2(ER\%/100\%)V_m)^2}{12}}, \quad (92)$$

onde  $\sigma$  é o desvio padrão associado ao atributo estimado por inversão sísmica.



## Anexo 2: Amostras sintéticas

Os ensaios sintéticos utilizados para simular a calibração dos modelos de física de rochas (caso 1 e caso 2) são apresentados respectivamente pelas Tabelas 7 e 8. Nas Figuras 48 e 49, apresenta-se a eficácia da calibração para os casos 1 e 2.

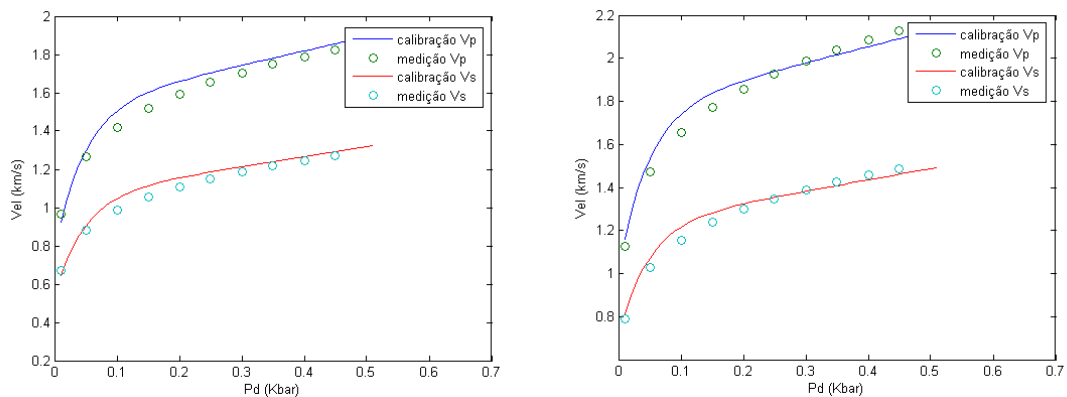


Figura 48. Ensaios sintéticos em amostras não consolidadas e análise da calibração. À esquerda, amostra 4:  $\phi = 0.201$  e  $C = 0.419$ . À direita, amostra 9:  $\phi = 0.175$   $C = 0.123$ .

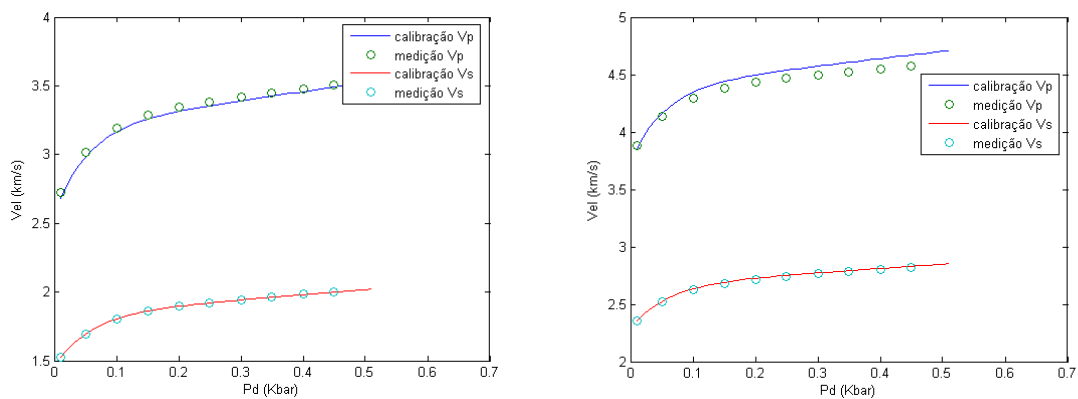


Figura 49. Ensaios sintéticos em amostras consolidadas e análise da calibração. À esquerda, amostra 2:  $\phi = 0.303$  e  $C = 0.211$ . À direita, amostra 13:  $\phi = 0.1347$   $C = 0.07$ .

Tabela 7. Ensaios sintéticos em amostras não consolidadas.

Amostra	Vp (Km/s)	Vs (Km/s)	Pd (Kbar)	C	ϕ	Amostra	Vp (Km/s)	Vs (Km/s)	Pd (Kbar)	C	ϕ
1	1.053	0.733	0.01	0.351	0.105	11	1.064	0.742	0.01	0.205	0.205
	1.377	0.959	0.05	0.351	0.105		1.391	0.971	0.05	0.205	0.205
	1.545	1.076	0.10	0.351	0.105		1.561	1.090	0.10	0.205	0.205
	1.653	1.151	0.15	0.351	0.105		1.671	1.166	0.15	0.205	0.205
	1.734	1.208	0.20	0.351	0.105		1.753	1.223	0.20	0.205	0.205
	1.800	1.254	0.25	0.351	0.105		1.819	1.269	0.25	0.205	0.205
	1.856	1.292	0.30	0.351	0.105		1.875	1.309	0.30	0.205	0.205
	1.904	1.326	0.35	0.351	0.105		1.924	1.343	0.35	0.205	0.205
	1.947	1.356	0.40	0.351	0.105		1.967	1.373	0.40	0.205	0.205
	1.985	1.383	0.45	0.351	0.105		2.006	1.400	0.45	0.205	0.205
2	1.075	0.750	0.01	0.212	0.181	12	1.078	0.751	0.01	0.305	0.099
	1.405	0.980	0.05	0.212	0.181		1.409	0.982	0.05	0.305	0.099
	1.577	1.101	0.10	0.212	0.181		1.582	1.102	0.10	0.305	0.099
	1.688	1.178	0.15	0.212	0.181		1.692	1.179	0.15	0.305	0.099
	1.771	1.235	0.20	0.212	0.181		1.776	1.237	0.20	0.305	0.099
	1.838	1.282	0.25	0.212	0.181		1.843	1.284	0.25	0.305	0.099
	1.894	1.322	0.30	0.212	0.181		1.900	1.324	0.30	0.305	0.099
	1.944	1.356	0.35	0.212	0.181		1.949	1.358	0.35	0.305	0.099
	1.987	1.387	0.40	0.212	0.181		1.993	1.389	0.40	0.305	0.099
	2.027	1.414	0.45	0.212	0.181		2.033	1.416	0.45	0.305	0.099
3	1.064	0.744	0.01	0.083	0.305	13	1.064	0.743	0.01	0.157	0.244
	1.392	0.973	0.05	0.083	0.305		1.391	0.971	0.05	0.157	0.244
	1.562	1.092	0.10	0.083	0.305		1.561	1.090	0.10	0.157	0.244
	1.672	1.169	0.15	0.083	0.305		1.670	1.167	0.15	0.157	0.244
	1.754	1.226	0.20	0.083	0.305		1.753	1.224	0.20	0.157	0.244
	1.820	1.273	0.25	0.083	0.305		1.819	1.270	0.25	0.157	0.244
	1.876	1.312	0.30	0.083	0.305		1.875	1.309	0.30	0.157	0.244
	1.925	1.346	0.35	0.083	0.305		1.924	1.343	0.35	0.157	0.244
	1.968	1.376	0.40	0.083	0.305		1.967	1.374	0.40	0.157	0.244
	2.007	1.404	0.45	0.083	0.305		2.006	1.401	0.45	0.157	0.244
4	0.967	0.673	0.01	0.419	0.202	14	1.100	0.769	0.01	0.088	0.248
	1.264	0.880	0.05	0.419	0.202		1.439	1.006	0.05	0.088	0.248
	1.419	0.987	0.10	0.419	0.202		1.615	1.129	0.10	0.088	0.248
	1.518	1.056	0.15	0.419	0.202		1.728	1.208	0.15	0.088	0.248
	1.593	1.108	0.20	0.419	0.202		1.812	1.267	0.20	0.088	0.248
	1.653	1.150	0.25	0.419	0.202		1.881	1.315	0.25	0.088	0.248
	1.704	1.186	0.30	0.419	0.202		1.939	1.356	0.30	0.088	0.248
	1.748	1.217	0.35	0.419	0.202		1.990	1.391	0.35	0.088	0.248
	1.788	1.244	0.40	0.419	0.202		2.034	1.422	0.40	0.088	0.248
	1.823	1.269	0.45	0.419	0.202		2.075	1.451	0.45	0.088	0.248
5	0.988	0.687	0.01	0.478	0.120	15	1.086	0.759	0.01	0.123	0.239
	1.292	0.898	0.05	0.478	0.120		1.420	0.992	0.05	0.123	0.239
	1.450	1.008	0.10	0.478	0.120		1.594	1.114	0.10	0.123	0.239
	1.552	1.079	0.15	0.478	0.120		1.705	1.192	0.15	0.123	0.239
	1.628	1.132	0.20	0.478	0.120		1.789	1.250	0.20	0.123	0.239
	1.689	1.175	0.25	0.478	0.120		1.857	1.297	0.25	0.123	0.239
	1.742	1.211	0.30	0.478	0.120		1.914	1.338	0.30	0.123	0.239
	1.787	1.243	0.35	0.478	0.120		1.964	1.372	0.35	0.123	0.239
	1.827	1.271	0.40	0.478	0.120		2.008	1.403	0.40	0.123	0.239
	1.863	1.296	0.45	0.478	0.120		2.048	1.431	0.45	0.123	0.239
6	0.912	0.634	0.01	0.435	0.288	16	1.039	0.725	0.01	0.253	0.205
	1.192	0.829	0.05	0.435	0.288		1.359	0.948	0.05	0.253	0.205
	1.338	0.931	0.10	0.435	0.288		1.526	1.064	0.10	0.253	0.205
	1.431	0.996	0.15	0.435	0.288		1.632	1.138	0.15	0.253	0.205
	1.502	1.045	0.20	0.435	0.288		1.712	1.194	0.20	0.253	0.205
	1.559	1.084	0.25	0.435	0.288		1.777	1.239	0.25	0.253	0.205
	1.607	1.118	0.30	0.435	0.288		1.832	1.278	0.30	0.253	0.205
	1.649	1.147	0.35	0.435	0.288		1.880	1.311	0.35	0.253	0.205
	1.686	1.173	0.40	0.435	0.288		1.922	1.340	0.40	0.253	0.205
	1.719	1.196	0.45	0.435	0.288		1.960	1.367	0.45	0.253	0.205
7	1.028	0.717	0.01	0.222	0.248	17	0.952	0.664	0.01	0.271	0.334
	1.345	0.938	0.05	0.222	0.248		1.245	0.868	0.05	0.271	0.334
	1.510	1.053	0.10	0.222	0.248		1.398	0.975	0.10	0.271	0.334
	1.615	1.127	0.15	0.222	0.248		1.496	1.043	0.15	0.271	0.334
	1.694	1.182	0.20	0.222	0.248		1.569	1.094	0.20	0.271	0.334
	1.759	1.227	0.25	0.222	0.248		1.628	1.135	0.25	0.271	0.334
	1.813	1.265	0.30	0.222	0.248		1.679	1.170	0.30	0.271	0.334
	1.860	1.298	0.35	0.222	0.248		1.722	1.201	0.35	0.271	0.334
	1.902	1.327	0.40	0.222	0.248		1.761	1.228	0.40	0.271	0.334
	1.940	1.353	0.45	0.222	0.248		1.796	1.252	0.45	0.271	0.334
8	0.915	0.636	0.01	0.476	0.253	18	1.092	0.762	0.01	0.171	0.188
	1.197	0.832	0.05	0.476	0.253		1.428	0.997	0.05	0.171	0.188
	1.343	0.934	0.10	0.476	0.253		1.603	1.119	0.10	0.171	0.188
	1.437	0.999	0.15	0.476	0.253		1.715	1.197	0.15	0.171	0.188
	1.508	1.049	0.20	0.476	0.253		1.799	1.256	0.20	0.171	0.188
	1.565	1.088	0.25	0.476	0.253		1.867	1.304	0.25	0.171	0.188
	1.613	1.122	0.30	0.476	0.253		1.925	1.344	0.30	0.171	0.188
	1.655	1.151	0.35	0.476	0.253		1.975	1.379	0.35	0.171	0.188
	1.693	1.177	0.40	0.476	0.253		2.020	1.410	0.40	0.171	0.188
	1.726	1.200	0.45	0.476	0.253		2.060	1.438	0.45	0.171	0.188
9	1.127	0.787	0.01	0.124	0.175	19	1.100	0.768	0.01	0.154	0.191
	1.474	1.030	0.05	0.124	0.175		1.438	1.004	0.05	0.154	0.191
	1.654	1.156	0.10	0.124	0.175		1.614	1.127	0.10	0.154	0.191
	1.770	1.237	0.15	0.124	0.175		1.727	1.206	0.15	0.154	0.191
	1.857	1.297	0.20	0.124	0.175		1.812	1.265	0.20	0.154	0.191
	1.927	1.347	0.25	0.124	0.175		1.880	1.313	0.25	0.154	0.191
	1.987	1.388	0.30	0.124	0.175		1.939	1.354	0.30	0.154	0.191
	2.038	1.424	0.35	0.124	0.175		1.989	1.389	0.35	0.154	0.191
	2.084	1.456	0.40	0.124	0.175		2.034	1.420	0.40	0.154	0.191
	2.126	1.485	0.45	0.124	0.175		2.074	1.448	0.45	0.154	0.191
10	1.120	0.783	0.01	0.094	0.212	20	1.109	0.774	0.01	0.143	0.186
	1.464	1.024	0.05	0.094	0.212		1.450	1.013	0.05	0.143	0.186
	1.644	1.149	0.10	0.094	0.212		1.627	1.137	0.10	0.143	0.186
	1.759	1.229	0.15	0.094	0.212		1.741	1.216	0.15	0.143	0.186
	1.845	1.290	0.20	0.094	0.212		1.827	1.276	0.20	0.143	0.186
	1.915	1.339	0.25	0.094	0.212		1.896	1.324	0.25	0.143	0.186
	1.974	1.380	0.30	0.094	0.212		1.955	1.365	0.30	0.143	0.186
	2.025	1.416	0.35	0.094	0.212		2.005	1.401	0.35	0.143	0.186
	2.071	1.448	0.40	0.094	0.212		2.050	1.432	0.40	0.143	0.186
	2.112	1.476	0.45	0.094	0.212		2.091	1.461	0.45	0.143	0.186

Tabela 8. Ensaios sintéticos em amostras consolidadas.

Amostra	C	φ	Pd (Kbar)	Vp (Km/s)	Vs (Km/s)	Amostra	C	φ	Pd (Kbar)	Vp (Km/s)	Vs (Km/s)
1	0.4751	0.1424	0.01	3.0425	1.6376	11	0.0289	0.1753	0.01	3.7702	2.3101
			0.05	3.3300	1.8034				0.05	4.0200	2.4767
			0.10	3.5033	1.9118				0.10	4.1786	2.5855
			0.15	3.5915	1.9692				0.15	4.2613	2.6432
			0.20	3.6446	2.0045				0.20	4.3117	2.6786
			0.25	3.6827	2.0302				0.25	4.3482	2.7044
			0.30	3.7144	2.0517				0.30	4.3787	2.7260
			0.35	3.7432	2.0714				0.35	4.4066	2.7458
			0.40	3.7706	2.0903				0.40	4.4332	2.7648
			0.45	3.7974	2.1089				0.45	4.4593	2.7835
2	0.3034	0.2112	0.01	2.7238	1.5271	12	0.4066	0.0827	0.01	3.6213	2.0055
			0.05	3.0162	1.6945				0.05	3.8908	2.1702
			0.10	3.1952	1.8038				0.10	4.0514	2.2778
			0.15	3.2870	1.8618				0.15	4.1327	2.3348
			0.20	3.3426	1.8974				0.20	4.1816	2.3699
			0.25	3.3826	1.9233				0.25	4.2167	2.3954
			0.30	3.4159	1.9450				0.30	4.2457	2.4167
			0.35	3.4462	1.9649				0.35	4.2721	2.4363
			0.40	3.4751	1.9840				0.40	4.2973	2.4551
			0.45	3.5033	2.0028				0.45	4.3218	2.4736
3	0.4456	0.2858	0.01	1.6852	0.9731	13	0.0694	0.1347	0.01	3.8825	2.3526
			0.05	2.0921	1.1425				0.05	4.1367	2.5182
			0.10	2.3165	1.2532				0.10	4.2968	2.6265
			0.15	2.4270	1.3118				0.15	4.3800	2.6839
			0.20	2.4927	1.3478				0.20	4.4306	2.7191
			0.25	2.5396	1.3740				0.25	4.4672	2.7448
			0.30	2.5783	1.3960				0.30	4.4977	2.7663
			0.35	2.6133	1.4161				0.35	4.5255	2.7860
			0.40	2.6466	1.4355				0.40	4.5521	2.8049
			0.45	2.6789	1.4545				0.45	4.5782	2.8235
4	0.2282	0.0850	0.01	3.8595	2.2476	14	0.0994	0.2430	0.01	2.9612	1.7535
			0.05	4.1274	2.4124				0.05	3.2310	1.9217
			0.10	4.2905	2.5200				0.10	3.4002	2.0316
			0.15	4.3738	2.5770				0.15	3.4879	2.0898
			0.20	4.4240	2.6121				0.20	3.5413	2.1256
			0.25	4.4602	2.6376				0.25	3.5799	2.1516
			0.30	4.4902	2.6590				0.30	3.6121	2.1734
			0.35	4.5175	2.6785				0.35	3.6414	2.1934
			0.40	4.5436	2.6973				0.40	3.6695	2.2126
			0.45	4.5690	2.7158				0.45	3.6970	2.2315
5	0.4107	0.2001	0.01	2.6326	1.4364	15	0.1361	0.1337	0.01	3.6910	2.1898
			0.05	2.9362	1.6035				0.05	3.9520	2.3554
			0.10	3.1196	1.7127				0.10	4.1152	2.4637
			0.15	3.2130	1.7705				0.15	4.1996	2.5210
			0.20	3.2693	1.8061				0.20	4.2509	2.5563
			0.25	3.3098	1.8320				0.25	4.2880	2.5819
			0.30	3.3435	1.8536				0.30	4.3188	2.6034
			0.35	3.3741	1.8735				0.35	4.3470	2.6231
			0.40	3.4032	1.8926				0.40	4.3739	2.6420
			0.45	3.4317	1.9113				0.45	4.4002	2.6606
6	0.3077	0.2938	0.01	1.9399	1.1172	16	0.0076	0.2816	0.01	3.1486	1.9376
			0.05	2.2922	1.2867				0.05	3.4049	2.1068
			0.10	2.4971	1.3976				0.10	3.5676	2.2174
			0.15	2.6000	1.4563				0.15	3.6525	2.2760
			0.20	2.6618	1.4923				0.20	3.7043	2.3120
			0.25	2.7060	1.5186				0.25	3.7418	2.3382
			0.30	2.7427	1.5406				0.30	3.7732	2.3602
			0.35	2.7760	1.5608				0.35	3.8018	2.3803
			0.40	2.8077	1.5801				0.40	3.8292	2.3996
			0.45	2.8386	1.5992				0.45	3.8561	2.4186
7	0.4609	0.2793	0.01	1.7287	0.9866	17	0.2225	0.3316	0.01	1.7726	1.0661
			0.05	2.1297	1.1558				0.05	2.1389	1.2368
			0.10	2.3520	1.2664				0.10	2.3490	1.3484
			0.15	2.4617	1.3249				0.15	2.4541	1.4075
			0.20	2.5269	1.3609				0.20	2.5170	1.4439
			0.25	2.5735	1.3871				0.25	2.5621	1.4703
			0.30	2.6120	1.4091				0.30	2.5995	1.4925
			0.35	2.6468	1.4292				0.35	2.6333	1.5128
			0.40	2.6798	1.4485				0.40	2.6656	1.5323
			0.45	2.7120	1.4674				0.45	2.6970	1.5514
8	0.0881	0.1895	0.01	3.4118	2.0393	18	0.2330	0.1930	0.01	3.0141	1.7243
			0.05	3.6714	2.2061				0.05	3.2918	1.8913
			0.10	3.8351	2.3152				0.10	3.4640	2.0004
			0.15	3.9202	2.3729				0.15	3.5528	2.0582
			0.20	3.9720	2.4084				0.20	3.6066	2.0937
			0.25	4.0094	2.4343				0.25	3.6455	2.1195
			0.30	4.0407	2.4559				0.30	3.6778	2.1412
			0.35	4.0692	2.4758				0.35	3.7073	2.1611
			0.40	4.0965	2.4948				0.40	3.7355	2.1801
			0.45	4.1232	2.5135				0.45	3.7630	2.1988
9	0.4677	0.3276	0.01	0.8904	0.7380	19	0.4231	0.2218	0.01	2.4129	1.3152
			0.05	1.5509	0.9086				0.05	2.7311	1.4829
			0.10	1.8396	1.0201				0.10	2.9211	1.5924
			0.15	1.9730	1.0792				0.15	3.0175	1.6504
			0.20	2.0503	1.1155				0.20	3.0755	1.6861
			0.25	2.1047	1.1419				0.25	3.1172	1.7121
			0.30	2.1492	1.1641				0.30	3.1518	1.7338
			0.35	2.1892	1.1843				0.35	3.1833	1.7538
			0.40	2.2269	1.2038				0.40	3.2132	1.7729
			0.45	2.2633	1.2229				0.45	3.2425	1.7917
10	0.2051	0.3213	0.01	1.9413	1.1480	20	0.1013	0.2615	0.01	2.8067	1.6595
			0.05	2.2833	1.3184				0.05	3.0815	1.8281
			0.10	2.4842	1.4298				0.10	3.2532	1.9384
			0.15	2.5857	1.4888				0.15	3.3421	1.9967
			0.20	2.6466	1.5250				0.20	3.3962	2.0326
			0.25	2.6904	1.5514				0.25	3.4353	2.0588
			0.30	2.7267	1.5735				0.30	3.4678	2.0806
			0.35	2.7596	1.5938				0.35	3.4975	2.1007
			0.40	2.7911	1.6133				0.40	3.5259	2.1199
			0.45	2.8217	1.6324				0.45	3.5537	2.1389