Table 3. V_p/V_s and σ as Function of Pressure

Name Specimens (s) Rocks (r)		200 MPa		400 MPa		600 MPa		800 MP		1000 MPa	
		V_p/V_s	σ	V_p/V_s	σ	V_p/V_s	σ	V_p/V_s	σ	V_p/V_s	σ
Andesite (AND)											
s=30	Average	1.823	0.285	1.844	0.292	1.858	0.296	1.865	0.298	1.870	0.300
r=10	S.D.	0.090	0.030	0.085	0.027	0.085	0.027	0.113	0.032	0.176	0.039
Basalt (BAS)											
s=252	Average	1.838	0.290	1.846	0.292	1.851	0.294	1.856	0.295	1.859	0.296
r=145	S.D.	0.047	0.016	0.046	0.015	0.046	0.015	0.047	0.015	0.048	0.015
Diabase (DIA)											
s=45	Average	1.800	0.277	1.802	0.278	1.805	0.279	1.807	0.279	1.809	0.280
r=15	S.D.	0.049	0.017	0.047	0.016	0.046	0.016	0.045	0.015	0.044	0.015
Granite-granodiorite (GRA)											
s=108	Average	1.702	0.237	1.705	0.238	1.707	0.239	1.709	0.240	1.710	0.240
r=38	S.D.	0.051	0.024	0.046	0.022	0.045	0.021	0.043	0.020	0.043	0.020
Diorite (DIO)											
s=24	Average	1.759	0.261	1.766	0.264	1.771	0.266	1.775	0.267	1.777	0.268
r=8	S.D.	0.024	0.010	0.026	0.011	0.028	0.011	0.031	0.012	0.032	0.012
Gabbro-norite-troctolite (GAB)											
s=174	Average	1.848	0.293	1.852	0.294	1.854	0.295	1.856	0.296	1.858	0.296
r=58	S.D.	0.048	0.015	0.048	0.015	0.050	0.015	0.050	0.015	0.051	0.015
Metagraywacke (MGW)											
s=27	Average	1.711	0.241	1.725	0.247	1.735	0.251	1.742	0.254	1.748	0.257
r=9	S.D.	0.077	0.032	0.076	0.031	0.079	0.031	0.089	0.033	0..96	0.034
Slate (SLT)											
s=27	Average	1.865	0.298	1.862	0.297	1.861	0.297	1.859	0.297	1.858	0.296
r=9	S.D.	0.071	0.021	0.065	0.019	0.062	0.019	0.056	0.017	0.054	0.017
Phyllite, phyllonite (PHY)											
s=57	Average	1.762	0.262	1.766	0.264	1.769	0.265	1.772	0.266	1.774	0.267
r=19	S.D.	0.068	0.026	0.068	0.026	0.069	0.026	0.070	0.026	0.070	0.027
Zeolite facies basalt (BZE)											
s=54	Average	1.851	0.294	1.858	0.296	1.863	0.298	1.866	0.299	1.869	0.300
r=18	S.D.	0.037	0.011	0.037	0.011	0.037	0.011	0.038	0.011	0.038	0.011
Prehnite-pumpellyite facies basalt (BPP)											
s=36	Average	1.792	0.274	1.800	0.277	1.806	0.279	1.810	0.280	1.814	0.282
r=12	S.D.	0.036	0.013	0.036	0.013	0.037	0.013	0.039	0.013	0.040	0.014
Greenschist facies basalt (BGR)											
s=36	Average	1.756	0.260	1.760	0.262	1.763	0.263	1.764	0.263	1.766	0.264
r=12	S.D.	0.028	0.011	0.024	0.009	0.023	0.009	0.023	0.009	0.023	0.009
Granite gneiss (GGN)											
s=72	Average	1.716	0.243	1.730	0.249	1.732	0.250	1.731	0.250	1.729	0.249
r=24	S.D.	0.046	0.021	0.047	0.021	0.048	0.021	0.050	0.022	0.051	0.022
Biotite (tonalite) gneiss (BGN)											
s=156	Average	1.740	0.253	1.745	0.255	1.747	0.257	1.749	0.257	1.751	0.258
r=52	S.D.	0.079	0.034	0.077	0.033	0.077	0.033	0.075	0.032	0.075	0.032
Mica quartz schist (QSC)											
s=87	Average	1.777	0.268	1.780	0.269	1.782	0.270	1.784	0.271	1.785	0.271
r=29	S.D.	0.147	0.054	0.145	0.053	0.146	0.054	0.142	0.051	0.141	0.051
Amphibolite (AMP)											
s=78	Average	1.756	0.260	1.761	0.262	1.764	0.263	1.766	0.264	1.767	0.265
r=26	S.D.	0.041	0.017	0.042	0.017	0.043	0.017	0.044	0.017	0.044	0.017
Felsic granulite (FGR)											
s=87	Average	1.777	0.268	1.783	0.270	1.787	0.272	1.790	0.273	1.792	0.274
r=29	S.D.	0.066	0.025	0.063	0.023	0.064	0.023	0.065	0.023	0.065	0.023
Paragranulite (PGR)											
s=72	Average	1.766	0.264	1.770	0.265	1.772	0.266	1.774	0.267	1.776	0.268
r=14	S.D.	0.064	0.024	0.062	0.023	0.062	0.022	0.061	0.022	0.060	0.022
Anorthositic granulite (AGR)											
s=30	Average	1.855	0.295	1.860	0.297	1.863	0.298	1.865	0.298	1.867	0.299
r=10	S.D.	0.033	0.011	0.030	0.010	0.030	0.010	0.031	0.010	0.032	0.010
Mafic granulite (MGR)											
s=102	Average	1.815	0.282	1.817	0.283	1.817	0.283	1.818	0.283	1.818	0.283
r=34	S.D.	0.041	0.015	0.036	0.013	0.035	0.012	0.036	0.013	0.038	0.013

Table 3. (continued)

Name Specimens (s) Rocks (r)		200 MPa		400 MPa		600 MPa		800 MP		1000 MPa	
		V_p/V_s	σ	V_p/V_s	σ	V_p/V_s	σ	V_p/V_s	σ	V_p/V_s	σ
Mafic garnet granulite (GGR)											
s=81	Average	1.789	0.273	1.796	0.275	1.801	0.277	1.804	0.278	1.807	0.279
r=27	S.D.	0.039	0.014	0.041	0.014	0.043	0.015	0.044	0.016	0.046	0.016
Mafic eclogite (ECL)											
s=51	Average	1.786	0.272	1.785	0.271	1.785	0.271	1.785	0.271	1.785	0.271
r=17	S.D.	0.044	0.017	0.043	0.016	0.044	0.016	0.044	0.016	0.044	0.016
Serpentinite (SER)											
s=30	Average	2.051	0.344	2.077	0.349	2.094	0.352	2.108	0.355	2.119	0.357
r=10	S.D.	0.053	0.011	0.052	0.010	0.053	0.010	0.056	0.010	0.059	0.011
Quartzite (QTZ)											
s=24	Average	1.478	0.077	1.485	0.085	1.492	0.092	1.498	0.098	1.502	0.102
r=8	S.D.	0.027	0.027	0.025	0.024	0.025	0.023	0.024	0.022	0.024	0.022
Calcite marble (MBL)											
s=21	Average	1.893	0.307	1.873	0.301	1.860	0.297	1.850	0.294	1.841	0.291
r=7	S.D.	0.087	0.023	0.083	0.023	0.081	0.024	0.079	0.025	0.078	0.026
Anorthosite (ANO)											
s=45	Average	1.910	0.311	1.913	0.312	1.914	0.312	1.916	0.313	1.917	0.313
r=15	S.D.	0.071	0.018	0.070	0.018	0.070	0.018	0.070	0.018	0.070	0.018
Hornblendite (HBL)											
s=6	Average	1.749	0.257	1.749	0.257	1.752	0.258	1.755	0.260	1.759	0.261
r=2	S.D.	0.004	0.002	0.007	0.003	0.007	0.003	0.006	0.003	0.006	0.002
Pyroxenite (PYX)											
s=27	Average	1.741	0.254	1.747	0.256	1.751	0.258	1.754	0.259	1.756	0.260
r=9	S.D.	0.068	0.029	0.066	0.028	0.065	0.027	0.066	0.027	0.066	0.027
Dunite (DUN)											
s=36	Average	1.754	0.259	1.755	0.260	1.756	0.260	1.756	0.260	1.756	0.260
r=12	S.D.	0.045	0.018	0.044	0.017	0.044	0.017	0.044	0.017	0.044	0.017

mately 35 km (1 GPa) for major rock types. Figure 4 illustrates this for several lithologies. There is a slight, barely significant, increase in Poisson's ratio with increasing pressure. Values at low pressures (below 100 MPa) not shown in Figure 4 show considerable scatter due to porosity.

Laboratory data on the influence of temperature on Poisson's ratio are rather limited. In Figure 5, Poisson's ratios calculated from Voigt-Reuss-Hill aggregate velocities are shown versus temperature for quartz and several minerals

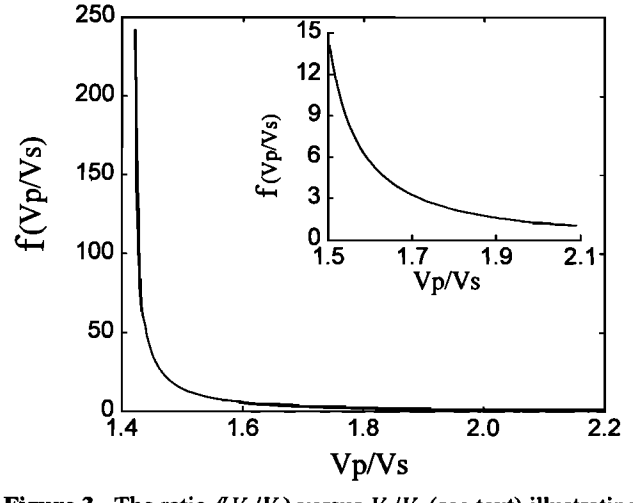

Figure 3. The ratio $f(V_p/V_s)$ versus V_p/V_s (see text) illustrating relative errors in Poisson's ratios calculated from velocities.

with olivine structures. Although it would be desirable to have more complete information for other silicates, the olivine data are of high quality and show that Poisson's ratio does not vary appreciably with temperature. At temperatures from 0°C to 400°C, Poisson's ratio decreases by 0.2% for Co_2SiO_4 olivine and increases by 0.8% to 1.1% for the other varieties of olivine. Similar calculations of Poisson's ratio from velocity measurements in rocks at high temperatures also show little change with temperature (Figure 6). From 20°C to 700°C, the average increase in Poisson's ratio for the eight rocks in Figure 6 is 1.0%, which is within the experimental error. Poisson's ratio of quartzite shows a significant decrease in the 200°C to 500°C temperature range associated with the quartz α-β phase transition [*Kern*, 1982]. Quartz-bearing granite and granulite, however, show only slight decreases in Poisson's ratio with increasing temperature up to 500°C. Since both pressure and temperature dependencies appear to be small for most rocks, laboratory determinations of Poisson's ratios should be directly applicable over a wide range of crustal depths.

Mineral and Rock Comparisons

We can make comparisons for the monomineralic rock averages included in Table 3 with theoretical Poisson's ratios calculated from single crystal elastic constants. These comparisons are summarized in Table 4. The agreement is remarkably good, considering the theoretical uncertainties in calculating average velocities from single-crystal elastic constants, the low symmetries of the single crystals, and the