Fortran computer program FLUFF. Examination of various stages of the regression procedure revealed that the first three stages of regression calculation accounted for virtually all the variation, the last two stages accounting for only 0.3 to 0.7 percent. Furthermore the regression coefficients for the two least significant variables had t values less than 2.5, showing that they were not significant. The analysis was therefore terminated after three stages. The results are displayed in table 4. Values for V_2 were taken from the tables of Kennedy (1950) and Sharp (1962).

Experimental concentration data for SiO_2 in albite solutions can be fitted with an error of less than 2 percent in the logarithm (about 5 percent in the solubility), whereas data for soda and alumina can be fitted with an error of less than 3 percent in the logarithm (about 7 percent in the solubility). These errors approach or are within the analytical errors.

All three chemical species give markedly different types of solubility equations. The solubility of SiO_2 depends on P/T, 1/T, and 1/V in that order of importance, while that of Al depends on log V, 1/T, and log T, and that of Na on log V, 1/T, and 1/V. The experimental data show that solutions of albite in supercritical water are non-stoichiometric under the experimental conditions; extrapolation of the data by means of the derived equations suggests that stoichiometric solution cannot be achieved at any temperature or pressure.

In order to check the applicability of equation 12 to solubility data for other materials of geological interest, the data of Weill and Fyfe (1964) were analyzed by the technique outlined above. The results are tabulated in table 5. The data could be fitted to equation 12 with a maximum error in the logarithm of about 0.7 percent. The variation was found to depend almost entirely on log V and 1/T with a very weak (0.3 percent of variation) dependence of 1/V. Jasmund (1952) deduced a similar equation from other data on the solubility of quartz. The considerably better fit of the equation to the data for quartz reflects the better data for quartz solubility than for albite solubility. It would be desirable to obtain data on the solubility of feldspars by the same method used for quartz (weight loss of individual plates). However this technique is applicable only if the solid dissolves stoichiometrically, a condition not obeyed by feldspars.

The composition of the solute differs from that of albite in all parts of the pressure-temperature range studied. The experimental results show the SiO_2/Al_2O_3 ratio to be in excess of that in albite (3.47) for all parts of the P-T range (fig. 6), although the computed solubility equations shows a small p-T region centered about 450°C and 1500 bars where SiO_2/Al_2O_3 is predicted to be less than 3.47. The ratio SiO_2/Na is 7.83 in albite. In the solutions it varies from 4.57 to 19, in general increasing with temperature. Na is present in excess of the amount required for albite at temperatures below 550°C, whereas at temperatures higher than 550°C the amount present is markedly less than required to form albite. From these data it is clear that systematic motions of

TABLE 5

Solubility of quartz in supercritical water compared to computed solubility equation
(Data after Weill and Fyfe, 1964)

T (°C)	P (k bars)	V	−log X (calc)	Wt % SiO_2 (calc)	Wt % SiO_2 (observed)	T (°C)	P (k bars)	V	−log X (calc)	Wt % SiO_2 (calc)	Wt % SiO_2 (observed)
400	1.00	1.444	3.289	0.171	0.170	500	1.00	1.896	3.134	0.245	0.240
	1.25	1.382	3.238	0.192	0.185		1.50	1.576	2.957	0.367	0.372
	1.50	1.333	3.193	0.213	0.208		2.00	1.444	2.870	0.449	0.456
	1.75	1.295	3.173	0.223	0.232		2.50	1.364	2.809	0.516	0.505
	2.00	1.264	3.151	0.235	0.248		3.00	1.305	2.768	0.570	0.568
	2.25	1.239	3.122	0.251	0.258		3.50	1.256	2.735	0.613	0.612
	2.50	1.213	3.111	0.257	0.268		4.00	1.214	2.698	0.689	0.668
	2.75	1.197	3.093	0.268	0.274						
	3.00	1.178	3.080	0.277	0.276	550	1.00	2.248	3.116	0.255	0.260
	3.25	1.162	3.067	0.285	0.281		1.50	1.751	2.884	0.437	0.448
	4.00	1.118	3.033	0.308	0.290		2.00	1.549	2.769	0.566	0.569
							2.50	1.445	2.707	0.553	0.656
450	1.00	1.631	3.191	0.215	0.216		3.00	1.374	2.651	0.743	0.740
	1.25	1.518	3.109	0.259	0.260		4.00	1.266	2.570	0.895	0.879
	1.50	1.447	3.062	0.289	0.281						
	1.75	1.396	3.026	0.313	0.315	625	1.00	2.893	3.086	0.273	0.271 (avg of 5)
	2.00	1.354	2.992	0.339	0.331						
	2.25	1.322	2.966	0.359	0.356						
	2.50	1.291	2.939	0.383	0.376						
	2.75	1.266	2.922	0.399	0.396						
	3.00	1.243	2.899	0.419	0.421						
	3.50	1.202	2.874	0.466	0.453						
	4.00	1.168	2.855	0.467	0.495						

Solubility equation

$$\log X\ SiO_2 = \frac{-2142.2}{T\,(°A)} - 1.296 \log V + \frac{0.614}{V} + 0.047$$