oxides and olivine–oxides transitions are listed in Table 2. C_p and C_b for the 420-km discontinuity are much smaller than for the olivine–spinel transition. Corresponding results were found by Liebermann [31]. C_p and C_s for the 670-km discontinuity are much larger than for the spinel–oxides transition. Thus neither discontinuity is separately consistent with a predominantly olivine mantle. Also listed in Table 3, however, are the parameters of the entire transition zone of Model B1 (some compressional effects are thus included, but these should be small). These are quite reasonably compatible with the parameters of the olivine–oxides transition. The transition zone as a whole is reasonably consistent with a uniform composition olivine model. The mismatch with the individual transitions may be the result of the poor resolution of the details of the transition zone.

6. Conclusion

The demonstration here that in many cases the ratio of elastic velocities of polymorphs of a material depend primarily on the crystal structures involved, and only secondarily on the composition, promises to allow better estimates, perhaps with accuracies of 2–3%, of the elastic velocities of phases thought to be relevant to the earth's mantle. The use of the estimated properties of isochemical simple oxide mixtures not only increases the number of data immediately available, but renders relevant the properties of materials which are not necessarily close chemical analogues of silicates. Thus, for instance, considerable progress may be possible without recourse to the synthesis of high-pressure germanate analogues of silicate phases. The detailed effects of composition will, of course, have to be investigated further, especially for the olivines and spinels.

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