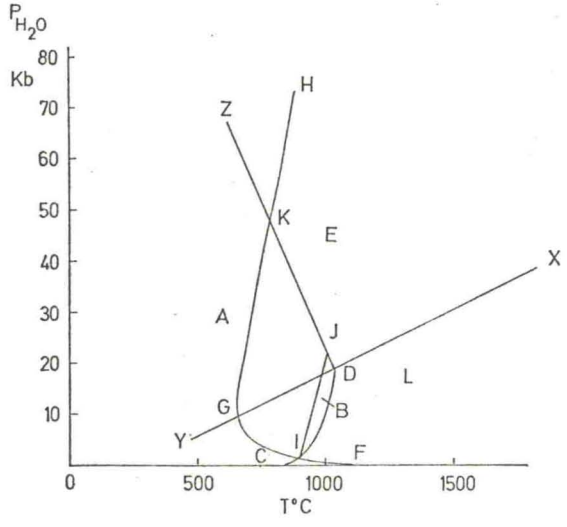

Fig. 3. An approximate diagram showing the region of stability of eclogites (region bounded by *Z-K-H*) in a system with excess water. For further details see text

Line *I-J* is a curve for the reaction: amphibolite-melt without excess water, a reaction which must have positive slope.

The field of amphibolite lies below the curves *C-I-J-K-Z*. Partial melting will occur in the field bounded by *F-G-K-H* is excess water is present. If excess water is not present, then liquids will form from amphibolites to the right of the *F-I-J-K-H*. Eclogite and water, without melt, will exist in the area bounded by *Z-K-H*. It is clear that this region is not within any normal crust.

All the simple boundaries shown must be highly smeared by solid or liquid solution phenomena. It should be noted that the amphibolite-eclogite boundary (*D-K-Z*) represents a metastable equilibrium between eclogite and plagioclase amphibolite. As the latter will transform to more stable plagioclase-free amphibolite somewhere above *X-Y*, amphibolite will restrict the eclogite field even further than shown.

Our conclusion is, that crustal eclogites form in dry environments where $P_{\text{Load}} \geqslant P_{H_2O} \cdot P_{\text{Load}}$ need not be very high according to the line *X-Y*. P_{H_2O} is likely to be determined and buffered by incomplete hydration reactions.

It perhaps seems feasible that the necessary conditions for eclogite formation could be generated by suitable water buffers in the environment. Thus, one might ask the question: is the not uncommon association of eclogites with partially serpentinized ultrabasic rocks due to a low partial pressure of water generated by the buffer system

$$\text{pyroxene} + \text{olivine} + \text{water} = \text{serpentine}\,?$$

For such a buffer system to lower water pressure to an extent that amphiboles are dehydrated requires that their vapour pressure should be lower than that of hornblendes at the same temperature. As amphiboles tend to have very low vapor pressures and hence high thermal stability relative to almost all common hydrates, it appears unlikely that this is a common way by which eclogites could be formed. In fact, if water could diffuse freely, eclogites would be expected to