SHRIMP zircon ages of eclogites in the Stak massif, northern Pakistan.

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Retrogressed eclogites were reported by Le Fort et al. (1997) near the village of Stak from the Indus suture zone on the eastern side of the Nanga Parbat-Haramosh massif. The eclogite assemblage occurs in lenses and boudins in the matrix of phengite-bearing metasedimentary rocks and marbles. It is composed of pyrope rich garnet, omphacitic pyroxene, phengite, dolomite and rutile. New P-T estimates give a minimum pressure of ~ 2.3 GPa for 750°C (e.g. Guillot et al., this volume). The eclogites are distinctly mafic in mineralogy and compositions compared with UHP rocks at Tso Morari and Kaghan Valley both of them originated from the crustal material of the Indian continental margin (Guillot et a. 1997, O'Brien et al. 2001). The eclogites in the Stak massif contain high Mg (~9 wt%) and low Si (~48 wt%), yet high incompatible elements, including fluid-immobile elements. The bulk chemical compositions suggest that they are alkaline mafic igneous rocks most likely associated with a mantle plume.

Well-crystallized zircon grains are common within and adjacent to garnet in the eclogites. We hand-picked 34 grains, and mounted them into an Epoxy resin together with zircon grains with known ages from Fish Canyon Tuff, and Temara 2 for the CL-SEM examination and SHRIMP age determination at the Geological Survey of Canada in Ottawa. Zircon grains yielded 206Pb/238U ages varying from 80.0 to 48.1 ± 1.4 Ma with peaks at around 51.3 ± 0.7 Ma and 60.4 ± 0.6 Ma in the age distribution histogram. Outer rims of several grains are 51 Ma, suggesting that this likely represents the age of the eclogitization. The timing of the eclogitization at Stak is comparable to the 53.3 +-0.7 Ma age for the Tso Morari massif (Leech et al. 2005) but older than the age of 46.2+-0.7 Ma for the Kaghan unit (Kaneko et al. 2003, Parrish et al. 2006). The protolith of the Stak eclogites is most likely between 70 and 80 Ma and younger ages are due to varying degrees of Pb-loss during the metamorphism because grains with

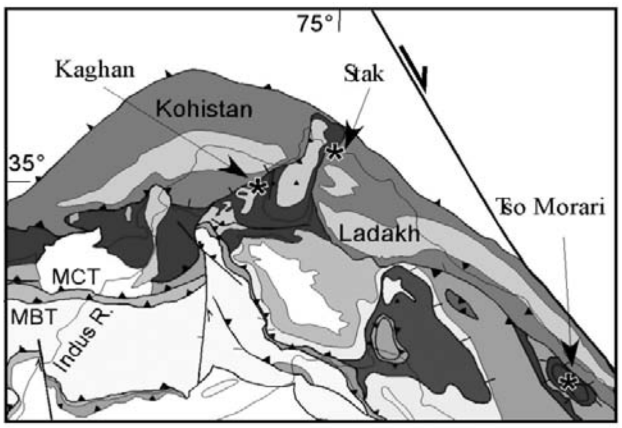

FIGURE 1. The location of the Stak eclogites

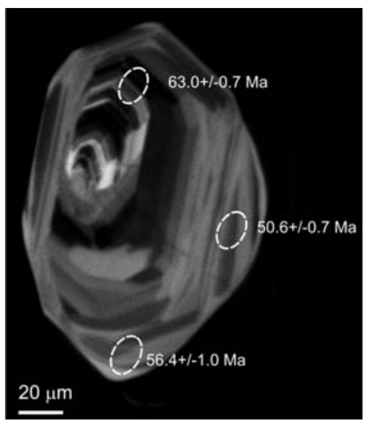

FIGURE 2. CL-SEM image of zircon grain16 showing the areas for the SHRIMP age determination. The overgrowth yielded the age of the eclogitization, whereas theinterior with oscillatory zoning shows two different ages. These ages are interpreted as reset ages by Pb loss during the metamorphism.

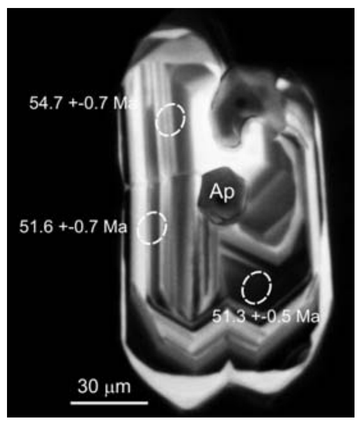

FIGURE 3. CL-SEM image of zircon grain 8 showing the areas for the SHRIMP age determination Ap= apatite

well-preserved igneous textures, such as oscillatory zoning and sector twinning, yielded different ages among different grains and even within individual grains. The data suggest either the protolith is igneous rocks associated with the Reunion hotspot on the distal part of the Indian continental margin (e.g. Mahoney et al. 2002) or a seamount/oceanic island formed on the Tethys Sea.

One small grain with low Th/U shows 31.3 ± 0.4 and 31.7 ± 0.5 Ma. This is interpreted as the secondary zircon formed in a late aplite-pegmatite dyke common in the area (Patterson and Windley 1985).

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