A recent experimental study of the phase relations of carbonat-  
ed eclogite (Yaxley and Green 1994) revealed that (a) carbon-  
ate is a refractory phase in a rutile eclogite residue, even in the  
presence of high degrees of partial silicate melting to form dac-  
tic to rhyodacitic melts, and (b) the equilibrium carbonate com-  
position depends on PT and bulk composition. In compositions  
with high Ca/Mg, the low pressure (P<2.0 kbar) assemblage of  
Mg-calcite + Py-rich garnet transforms to dolomite + Gr-rich  
garnet at high pressures (P>2.0 kbar). In compositions with low  
Ca/Mg, the low pressure assemblage of dolomite + Py-rich gar-  
net transforms to Ca-magnesite + Gr-rich garnet at higher pres-  
sures.

Five carbonate-bearing eclogites from the Czech part of the  
Saxothuringian Zone exhibit natural evidence for the above phase  
relations. Samples with the most magnesian bulk-rock geochem-  
istry (K670, H321 and H323) contain magnesite (Mg# = 81-85)  
± calcite (Mg# = 27 at core to 79 at rim) cores surrounded by  
thin rims of dolomite (Mg# = 83-87), associated with garnet.  
Garnet is Py-poor and Gr-rich in the cores (e.g., Gr27Py10Alm63  
in K670). The calcite cores are inferred to be pre-eclogitic (low  
Mg#) and have undergone partial or complete replacement by  
magnesite, which has approached equilibrium with garnet cores  
under eclogite facies conditions. This prograde metamorphic path  
was followed by a brief, near-isobaric heating event during which  
dolomite rims formed on the magnesite ± calcite cores. The do-  
lomite rims approached equilibrium with adjacent garnet rims,  
which are Gr-poor and Py-rich (e.g., Gr17Py24Alm59 in K670).  

In contrast, samples with more calcic bulk-rock composi-  
tions (D521 and H324) display dolomite cores (Mg# = 84) sur-  
rounded by thin calcite rims (Mg# = 83). Dolomite has replaced  
inferred pre-eclogitic calcite during prograde metamorphism and  
the dolomite cores have approached equilibrium with adjacent  
garnet cores under eclogite facies conditions. A heating event at  
eclogite pressures resulted in the formation of high Mg# calcite  
rims. Dolomite rather than magnesite in equilibrium with garnet  
cores under eclogitic pressures is a response to varying bulk  
compositions rather than attainment of higher pressures by the  
magnesite-bearing group.

Comparisons between compositions of the experimentally  
and naturally crystallized garnet-carbonate pairs suggest that  
the eclogites achieved peak metamorphic pressure at P<2.5 kbar  
at temperatures of 650-700 °C. This was followed by a brief  
thermal event to ~750 °C at similar or slightly lower pressures.  
These temperatures are in agreement with the estimates based  
on the garnet-clinopyroxene Fe-Mg exchange thermometer ac-  
cording to Ellis and Green, 1979 (in Klápová 1990). Peak pres-  
sure estimates made on eclogites from the same area were cal-  
culated from equilibria among garnet, clinopyroxene and pheng-  
ite using the calibration as proposed by Waters and Martin  
(1993). Calculated peak pressures correspond to 25.6-26.1 kbar  
at 650-700 °C with a suggested uncertainty of ± 2.5 kbar  
(Klápová et al. 1998) and are also in agreement with the herein  
made estimates.

References
ELLIS D.J. and GREEN D.H. 1979. An experimental study of  
the effect on Ca upon garnet-clinopyroxene Fe-Mg exchange  
equilibria. Contributions to Mineralogy and Petrology, 71,  
13-22.
KLÁPOVÁ H. 1990. Eclogites of the Bohemian part of the  
Saxothuringicum. Rozpravy ČSAV, řada Mat.-Přír.,100, 5,  
1-86.
Eclogites from the Czech part of the Erzgebirge: multi-stage  
metamorphic and structural evolution. Journal of the Geo-  
WATERS D.J. and MARTIN H.N. 1993. Geobarometry in  
YAXLEY G.M. and GREEN D.H. 1994. Experimental demon-  
stration of refractory carbonate-bearing eclogite and siliceous  
melt in the subduction regime. Earth and Planetary Science  
Letters, 128 (3-4), 315-325.