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Mineralogy of the Dehner maar tephra layers (Germany; Eifel Laminated Sediment Archive, ELSA)

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Within the Eifel Laminated Sediment Archive (ELSA) project several tephrostratigraphic and tephrocronologic investigations have been carried out on long lacustrine sequences recovered from the dry maars of the West Eifel (Germany). The present study will present the first mineralogical data from the core D3 (Dehner Maar). This core is about 88 meter long and covers the last 62 kyr. Several tephra layers are present and within them the most abundant mineral phase is clinopyroxene. Olivines and sometimes amphiboles are also present. In the attempt to differentiate the eruptions from which the tephra could originate, EPMA chemical analyses on mineral phases from six selected tephra layers were performed (D3-A: 3.34 m; D3-T: 42.89 m; D3-GG: 50.86 m; D3-KK: 52.3 m; D3-6A: 73.28 m; D3-13A: 82.64 m).

All clinopyroxenes are rich in Al (up to 0.481 atoms per formula unit; apfu), Ti (up to 0.151 apfu), Fe^{3+} (up to 0.207 apfu) and Na (up to 0.165 apfu). As regards the Mg#, the large majority shows values ranging between 86 and 96. Only few pyroxenes (less than 10 % of the analysed crystals) show Mg# values lower than 85 and they are concentrated in layers D3-T, D3-6A, D3-13A. Olivine analyses revealed that in each layer they show similar compositions and are also compositionally very similar: average of Ol_{Fo} being comprised between 86.5 and 87. The only exceptions are the few olivines analyzed in D3-T sample where Ol_{Fo} is about 89.2, slightly higher than the others. Amphiboles are very abundant (apparently the most abundant heavy phase) in the D3-T layer. All the analysed crystals fall in the field of pargasite and

Mg-hastingsite.

Duda and Schmincke (1985) performed more than 1000 analyses on different pyroxenes from the Eifel area and, according to their atomic Mg vs. Al content, plot different fields for titanoaugites, green cpx, fassaites and acmitic clinopyroxenes in foidite (F) and olivine-nephelinite and basanite (ONB) groups and titanoaugites, fassaites and acmitic clinopyroxenes in tephrites.

From the bottom to the top, D3-13A, D3-KK, D3-GG and D3-A layers are characterised by pyroxene content higher than olivine content, Ol_{Fo} between 86.8 and 87.1 and titanoaugites from F and ONB group. D3-6A shows the same features already seen coupled with the presence of titanoaugites from tephrites. D3-T shows the presence of amphiboles (pargasite and Mg-hastingsite), only few olivine (Ol_{Fo} 89) and pyroxenes from both F and ONB group and tephrite group.

The presence of different mineral assemblages and of different chemistry among the same mineral phases suggests that the analysed tephras are representative of different volcanic episodes that will be correlated with similar episodes present in other ELSA cores.

Duda A., Schmicke H.U. (1985). Contrib Mineral Petrol 91: 340-353