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The eruption history of the quaternary Eifel volcanic fields: Implications from the ELSA – Tephra – Stack

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Numerous tephra layers occur in maar sediments in the quaternary Eifel volcanic fields. The sediments were systematically drilled and cored since 1998 by the Eifel Laminated Sediment Archive project (ELSA) (Sirocko et al. 2013). These maar sediments are laminated and the tephra is easily recognizeable by a coarser grain size. Additionaly, tephra layers appear dark grey to black in color. The ashes were sieved to a fraction of 250 – 100 μm and sorted into grains of: reddish and greyish sandstone, quartz, amphibole, pyroxene, scoria and pumice, sanidine, leucite and biotite. A minimum of 100 grains for each tephra layer were used for a sediment petrographic tephra characterisation (SPTC). The grain counts resemble the vol. -% of each grain species. Three types of tephra could be identified by their distinctive grain pattern:
(1) phreatomagmatic tephra, rich in basement rocks like greyish/reddish sandstone and quartz.
(2) Strombolian tephra, rich in scoria and mafic minerals like pyroxene.
(3) evolved tephra, rich in sanidine and pumice.
16 drill-cores, covering the last 500 000 years have been examined. Younger cores were dated by 14C ages and older cores by optical stimulated luminescence. Independently from this datings, the drill-cores were cross-correlated by pollen and the occurences of specific marker-tephra layers, comprising characteristic grain-types. These marker-tephra layers are especially thick and of evolved composition with a significant abundance of sanidine and pumice. The most prominent tephra layers of this type are the Laacher See tephra, dated to 12 900 b2k by Zolitschka (1998), the 40Ar/39Ar dated tephra layers of Dümpelmaar, Glees and Hüttenberg, dated to 116 000 b2k, 151 000 b2k and 215 000 b2k by van den Bogaard & Schmincke (1990), van den Bogaard et al. (1989). These datings set the time-frame for the eruption-phases of the quaternary Eifel Volcanic Fields. Our study refines these findings and shows that phases of activity are very periodically, peaking at 450 000 to 500 000, 140 000, 100 000 and 50 000 b2k in the West Eifel Volcanic Field and 400 000, 200 000, 150 000 and 12 900 b2k in the East Eifel Volcanic Field. These phases are seperated by long dormant intervals and cluster around times of climate and sea level changes. The youngest phase of intense activity in the West Eifel Volcanic Field occured from $\sim$60 000 to 27 800 b2k. All young maar volcanoes with open maar lakes like the Pulvermaar, Meerfelder Maar and Dauner Maar Group erupted in this cluster. Only one maar postdates this interval of increased activity, the 11 000 b2k Ulmener Maar.

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