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Biostratigraphic dating of palaeolake deposits from an overdeepening in the Swiss Northern Alpine Foreland by numerical assessments of vegetation composition and the role of species dynamics

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Pollen analysis has shown that at regional to subcontinental scales interglacial vegetation successions usually follow similar patterns throughout the Middle and Late Quaternary. Yet, relevant compositional and species-specific differences among interglacials exist and contribute to their characteristic biostratigraphic fingerprint. We use these divergences to indirectly date palaeolake deposits from Spiezberg (SW margin of overdeepened lake Thun, Switzerland), which have been assigned to either MIS 5e (last interglacial) or MIS 7a (penultimate interglacial) according to the average IRSL age of 164 ± 16 ka. For this purpose, we analyzed the fossil pollen record of the Spiezberg palaeolake deposits and applied optimal partitioning and the broken stick model for zonation. Furthermore, we re-assessed local pollen assemblage zones (LPAZ) of two physically dated reference records (Beerenmösli: MIS 5e; Meikirch: MIS 7a) from the study area by using the same zonation approaches. LPAZ of all three records were then compared optically and numerically (PCA and significance tests) to test which of the two reference records is more similar to Spiezberg. Pollen data show that the major part of the Spiezberg record was sedimented during full interglacial conditions. The irrelevance of *Fagus* points towards an MIS 5e age for the sediments. This is supported by PCA axis 2, which shows a statistically significant similarity of the Spiezberg record to the MIS 5e reference. This outcome is explained by *Fagus* playing an important role in the PCA axis 2 gradient, which is probably determined by competition for light. PCA axis 1 is not taken into consideration for the correlation since it represents a climate gradient (e.g. from boreal to temperate forests) and explains most of the intra-locality but less of the inter-locality variance. We thus assign the Spiezberg record to the last interglacial and show that climate-driven compositional differences between MIS 5e and MIS 7a are not diagnostic. In contrast, distinct differences in single-species abundances (e.g. *Fagus*) are strong enough to significantly distinguish between MIS 5e and MIS 7a records. We conclude that variability across various interglacial vegetation successions (e.g. MIS 5e vs. 7a, PCA axis 2) is smaller than local vegetation variability within a full interglacial succession at the same site (PCA axis 1). This implies a very high vegetation resilience to glacial-interglacial climatic variability, the biotic properties involved might

be migration capacity, survival in refugia and adjustments to rapidly changing Quaternary environments.