

# Cross-check of the dating results obtained by ESR, IR-OSL and U-Th methods: implication for the Pleistocene palaeoenvironmental reconstructions

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Accurate and precise estimation of sediment ages is undoubtedly very important in Quaternary geochronology. Besides the confidence in the theoretical validity of the dating methods, highly desirable is to have practical confirmation that our methods and techniques provide accurate and reliable results in determining the age of geological sediments. Comparison of results of different dating methods applied to samples of various materials taken from the same sampling point can be regarded as one of the best ways for the verification of their applicability and suitability. Unfortunately, it is usually quite difficult to meet these conditions in practice, especially beyond the radiocarbon dating range. Nevertheless, we have succeeded in obtaining such comparative results in three main ways: first, by six parallel ESR and IR-OSL datings on shells and feldspar grains, respectively, taken from the same sediment sample; second, by ESR closed-system (ESR-CS), ESR open-system (ESR-OS) and U-Th dating on the same four shells, and third, by comparison of our IR-OSL dated fine-resolution late Pleistocene pollen record from the Voka site, south-eastern coast of the Gulf of Finland (Molodkov and Bolikhovskaya, 2010) with  $\delta^{18}\text{O}$  variations in the NGRIP ice-core the chronology of which is based on independent multi-parameter counting of annual layers (Andersen et al., 2006). Overall differences in ages determined on the samples taken from diverse temporal (56 to 110 ka) and geographical (from the Mediterranean to High Arctic) environments between different methods (ESR/IR-OSL and ESR-CS/ESR-OS/U-Th) are in the range from 1.0 to 3.8% ( $2.0 \pm 0.9\%$  in average) for ESR/IR-OSL, from 0.6 to 6.1% ( $3.6 \pm 2.1\%$  in average) for ESR-CS/U-Th, and from 0.2 to 6.5 % ( $3.2 \pm 2.9\%$  in average) for ESR-OS/U-Th. Matching the Voka chronoclimatic pattern between 39 and 33 ka to the Greenland ice-core variations shows a good fit with the palaeoclimatic signals recorded in Greenland ice cores between Greenland Interstadials 8 and 5. The results obtained in this study exemplify the potential of both combined and independent use of palaeodosimetric dating methods applied to two different minerals – feldspar and biogenic carbonate – to chronologically organize the sequence of the late Pleistocene palaeoenvironmental events. In the present study we will also discuss the comparative ESR results from much older sites, such as Acheulian-bearing cave-site deposits correlated to MIS 15 (ca 580 ka in age).

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## References

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