



How to find a true date: Match making or calibrating

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The problem of translating a measured ^{14}C concentration into a true sample age is both an old and a difficult one. Many years of tree ring measurements have resulted in a reliable calibration curve covering the full Holocene back to 12.4 kyr ago. The reconstructed fluctuations in atmospheric ^{14}C concentration during the Holocene have been relatively minor, if we neglect the past 50 years. Yet, they have been sufficient to cause ^{14}C age plateaus and periods, where two or more calendar periods give the same measured ^{14}C value. For such periods wiggle matching, in which several independent ^{14}C dates are connected and supplemented by stratigraphic information, has to be used to find the true age.

The atmospheric ^{14}C concentrations beyond the range of tree ring calibration, during the glacial-interglacial transition and the glacial period back to the limit of radiocarbon dating, are still poorly known. The evidence, which stems almost exclusively from marine records, indicates that major ^{14}C fluctuations have occurred in connection with changes in the strength of the earth magnetic field and in oceanic circulation. Recent evidence from selected ocean cores indicates large changes in local oceanic ^{14}C concentrations (reservoir ages) over the glacial-interglacial transition. The Holocene problem of different time periods providing the same measured ^{14}C content will thus be even more serious in this older range, whereby one may expect that also the solar modulation observed during the Holocene will have been active during those earlier times. The precise and accurate chronologies necessary for the reconstruction of human development, past climates and the earth system response to climate and environmental change will have to be derived in most cases by combining different lines of evidence, including ^{14}C , and making an optimum match. Available pre-Holocene ^{14}C concentrations derived from different records and their use in estimating a true

age will be discussed.