

Supplementary material to “A new extended software package for quantitative paleoenvironmental reconstructions”

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The Imbrie and Kipp transfer function method (IKM) and the Modern Analog Technique (MAT) are accepted tools for quantitative paleoenvironmental reconstructions. However, we found that no easy and flexible handable software was available to apply these methods on modern computer devices. For this reason the software packages [PaleoToolBox for Macintosh](#), [PaleoToolBox for Windows](#), [MacTransfer](#), [WinTransfer](#), [MacMAT](#) and [PanPlot](#) have been developed ([Fig. 1](#)).

The estimation of paleoenvironmental parameters from micropaleontological data sets has become an important tool for paleoceanographic reconstructions since the development of the (IKM), presented by Klován and Imbrie [1971] and Imbrie and Kipp [1971]. The IKM provides quantitative estimations of past hydrographic parameters (e.g. sea surface temperature, SST) preserved in the surface sediment record. The baseline of the IKM is that the composition of faunal or floral assemblages, dwelling in surface waters and preserved in the sediment record mirrors the environmental conditions in the surface waters, such as SST and productivity. This relationship between assemblages preserved in surface sediments and the surface water hydrography is applied on down-core assemblages and allows the quantitative estimation of physical parameters of past surface water conditions. First comprehensive and successful use of the IKM on various microfossil groups was established in the CLIMAP project for the reconstruction of the last glacial maximum and the last interglacial optimum [CLIMAP, 1976, 1981, 1984]. Since then the IKM and the comparable Modern Analog Technique (MAT) proposed by Hutson [1980], are widely applied tools for SST estimation using microfossil assemblages.

The PaleoToolBox package provides a flexible tool for the pre-processing of microfossil reference and down-core data as well as hydrographic reference parameters. It includes procedures

- to randomize the raw data bases
- to switch in or out specific species from the total species list
- to establish individual ranking systems (equalization of high and low abundances of microfossil species, Pichon et al., 1987, 1992; Zielinski et al., 1998) and their application on the reference and down-core data bases
- to convert the prepared data bases into the file formats of the IKM and MAT software for estimation of paleohydrographic parameters.

The PaleoToolBox package thus represents a powerful tool for the development and the application of data bases needed for the estimation of paleoenvironmental parameters with statistical methods. Additional applications within the PaleoToolBox software are a counting program for entering microfossil census data directly in the required Excel format during microscopic work and a tool for extracting oceanographic data from the WOA [Levitus, 1994] data bank available on CD.

The program MacTransfer (or WinTransfer) includes the well known subprograms of IKM (Cabfac, Regress, Thread) developed by Imbrie and Kipp [1971] that however are converted to the Macintosh (Windows)

computer system. The import file format used by MacTransfer (WinTransfer) is the same as the import file format used by the original IKM program set. Test runs with the original program and the converted Macintosh (Windows) version produced exactly the same results (for more details, see the [manual](#)).

The calculations made by MacTransfer (WinTransfer) and MacMAT are exported in a format that can be processed directly with a spreadsheet software or the PanPlot program. [PanPlot](#) was developed originally as a visualization tool for the information system [PANGAEA](#) [Diepenbroek et al., 1997] in order to plot sedimentological data versus sediment core depth. It can be used as a stand-alone application or started directly by the information system PANGAEA. Modified for the PaleoToolBox package, PanPlot visualizes calculated SST versus core depth directly. Data format requirements for PanPlot are files saved in plain ASCII. The user can create this file with a spreadsheet program like MS-Excel or with the information system. The default scales and graphic features within PanPlot can be easily modified according to the user's application requirements. PanPlot graphs are exportable in platform-specific interchange formats (EMF, PICT). These files in turn can be imported by every conventional graphic program. The freeware program [PanPlot](#) is available for MacOS and for Windows 95/NT 4.0.

The programs PaleoToolBox, MacTransfer, WinTransfer and MacMAT are freeware and can be downloaded from <http://doi.pangaea.de/10.1594/PANGAEA.788423>.

This is contribution No. 205 of the Sonderforschungsbereich 261 and publication No. 1478 of the Alfred Wegener Institute for Polar and Marine Research.

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