Calculating the annual aridity index.

The aridity index $AIann$ for a given year at a location is calculated in four steps from monthly temperature and precipitation data, which are freely available from any climate station:

$$Peq(mon) = 2 \cdot \max(0, T(mon)) \tag{1}$$

$$QT(mon) = \frac{T(mon)}{Tmax} \tag{2}$$

$$QTann = \sum_{mon=1}^{12} QT(mon) \tag{3}$$

$$AIann = 100 \cdot \sum_{mon=1}^{12} \frac{Peq(mon) - \min(Peq(mon), Pp(mon))}{Peq(mon)} \cdot \frac{QT(mon)}{QTann} \tag{4}$$

In equation (1) the "equivalent precipitation" $Peq(mon)$ for each month of a year is calculated from the monthly mean temperature. For negative monthly temperatures $Peq(mon)$ is set to zero.

The ratio $Peq(mon) = 2 \times T(mon)$ to distinguish arid from humid months was already suggested by Walter & Lieth (1960, Climate Diagram World Atlas, Fischer Jena), and has been widely accepted.

The quotient $QT(mon)$, equation (2), after relativation by its annual sum $QTann$ is used to weight the contribution of the monthly aridity index to the annual aridity index, by considering the relative monthly temperature.

In equation (4) the number of arid months is not only summarized for $AIann$ but the strength of the aridity according to the precipitation deficit is used. The factor 100 in equation (4) scales the aridity index to percent. 0 % means 12 humid months per year. 100 % means extreme aridity with no precipitation in the entire year (numerical problems, which may occur in equation (4) with $Peq(mon) = 0$, can easily be intercepted in the program).