Lubich convolution quadratures

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About twenty years ago Ch. Lubich considered convolution integrals of the following type

$$y(t) := k(t) * \varphi(t) = \int_0^t k(t - \tau)\varphi(\tau)\,\mathrm{d}\tau, \quad t \in [0, T],\ T < \infty$$

and, after having set $t = t_n = nh,\ h = T/N$, for the discretization of $y(t_n)$ defined a new class of quadrature formulas of the form

$$y_n(h) := k(t) *_h \varphi(t) = \sum_{j=0}^{n} \omega_{n-j}(h)\varphi(jh), \qquad n = 0, 1, \ldots, N$$

called "discrete convolution rules".

In this talk, a review of these rules, which includes their main properties, several new remarks and some conjectures, will be presented when they are applied to the heat and wave boundary integral equation formulations. Also, some generalizations will be considered.