"A function $\psi \in L_2(R)$ is called an orthonormal wavelet if the family $\{\psi_{j,k}\}$ defined

$$\psi_{j,k}(x) = 2^{j/2}\psi(2^j x - k)\forall j,k \in Z$$

is an orthonormal basis of $L_2(R)$ where $\langle \psi_{j,k}, \psi_{l,m} \rangle = \delta_{j,l}\delta_{k,m}, \forall j,k,l,m \in Z$ and every $f \in L_2(R)$ can be written as

$$f(x) = \sum_{j,k=-\infty}^{\infty} c_{j,k}\psi_{j,k}(x)$$

where the series convergences and is

$$f(x) = \sum_{j,k=-\infty}^{\infty} c_{j,k}\psi_{j,k}(x)$$

in $L_2(R)$ such that

$$\lim_{M_1,M_2,N_1,N_2} ||f - \sum_{j=-M_2}^{N_2} \sum_{k=-M_1}^{N_1} c_{j,k}\psi_{j,k}|| = 0$$

The simplest example of orthonormal wavelets is the Haar Transform."