

Contribution Title:	P-ADIC PSEUDO-DIFFERENTIAL EQUATIONS AND WAVELETS
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p-Adic pseudo-differential equations are used in p-adic models instead of differential equations. Such equations arise in some applications, for example, in modeling interbasin kinetics of macromolecules and for the description of the genetic code.

A p-adic analog of the Haar basis and some other p-adic wavelet systems were recently found. It turned out that these wavelets have the following wonderful property: they are eigenfunctions of some p-adic pseudo-differential operators. Due to this property, a method for finding the exact solutions of p-adic pseudo-differential equations was developed in [1]. In particular, they solved the Cauchy problem for the Schrödinger-like semi-linear equations $\frac{\partial u(x,t)}{\partial t} + Au(x,t) + u(x,t)|u(x,t)|^{2m} = 0$, $u(x,0) = u^0(x)$, where time t is a real, $x \in Q_p^n$, A is a pseudo-differential operator. Solutions of the above Cauchy problem is soliton-like and describes diffusion processes in Q_p^n . So, wavelets are useful for the problems of p-adic mathematical physics.

To develop a general scheme for the construction of p-adic wavelets we study p-adic multiresolution analyses (MRAs). It turned out that the MRA theory in p-adics very differs from real setting. Only 1-periodic test functions may be taken as orthogonal scaling functions. Moreover, all these functions generate the same Haar MRA. On the other hand, there are infinitely many different orthogonal bases generated by the p-adic Haar MRA. All these bases were described [2]. We also suggested a method for the construction of wavelet frames and Riesz bases generated by non-orthogonal scaling functions.

[1] S.Albeverio, A.Yu.Khrennikov, V.M.Shelkovich, p-Adic semi-linear evolutionary pseudo-differential equations in the Lizorkin space, Dokl. RAN, 415, no. 3, 2007, 295-299.

[2] V.M.Shelkovich, V.Skopina, p-Adic Haar multiresolution analysis and pseudo-differential operators, to appear in J. of Fourier Analysis and Applications.