1067-32-2098

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In this presentation we study regularity notions and properties of functions defined on multicomplex spaces, which are natural generalizations of the bicomplex numbers. In particular we will show how to construct an abstract Dolbeault complex in this case. Our results constitute a generalization of our previous research in this field (joint work with D.C. Struppa, and A. Vajiac). (Received September 22, 2010)