Meeting: 1001, Evanston, Illinois, SS 12A, Special Session on Iterated Function Systems and Analysis on Fractals

1001-28-78 **Martina C. Zhle*** (zaehle@minet.uni-jena.de), Mathematical Institute, University of Jena, D-07740 Jena, Germany. *Local structures and differentiation on fractals.*

The notions of tangent bundle distributions and related gradients on fractal d–sets F in $\mathbb{R}^n$ are introduced. The energy form arising from such a local structure is shown to be a strongly local regular Dirichlet form. Its domain is the fractal Besov space $H^1(F)$, i.e. the trace of the Euclidean Besov space $H^{1+(n-d)/2}$ on F. The generator of the Dirichlet form defines the corresponding Laplace operator with spectral dimension d. In this way gradient and Laplace operator are connected by a boundary free generalized Gauss-Green formula. All local structures on F are equivalent in a natural sense.

The Markov process on F associated with the Dirichlet form is interpreted as Brownian motion w.r.t. the given local structure and as diffusion process w.r.t. any other local structure.

For the special case of smooth submanifolds our approach agrees with the usual model from Riemannian geometry. The example of self-similar sets with the open set condition is also discussed. Here the invariance principle for the Dirichlet forms depends on the local direction distributions determined by the tangent bundle distribution. (Received August 10, 2004)