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Structure of Bred vectors in spatiotemporal chaos

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It has been demonstrated that the spatiotemporal dynamics of characteristic Lyapunov vectors in spatially extended chaotic systems can be related to properties of scale invariant growing surfaces. This is based on a Hopf Cole transformation, which reveales that the Lyapunov vectors corresponding to the largest Lyapunov exponents are "piecewise copies" of the first Lyapunov vector. We study now, whether similar scaling properties, can also be observed for bred vectors. Moreover we propose a new method to estimate the spectrum of Lyapunov exponents corresponding to the most expanding directions using bred vectors. Both results are developed by investigating bred vectors in the model proposed by Lorenz in 1996.