Supplementary material

Stochastic Evaluation of Landscapes Transformed by Renewable Energy Installations and Civil Works. https://doi.org/10.3390/en12142817

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This supplementary material contains image analysis of art paintings and landscapes transformed by renewable energy installations and civil works through the application of the climacogram methodology 2D-C.

1. Benchmark Climacograms in Stochastic Analysis of Art Paintings.

It appears that the works by Leonardo da Vinci and Kandinski, even if they have total different content, exhibit stochastic similarity (Figure S3 Figure S8). Instead, Picasso's artworks (in stochastic view) display a wide range of fluctuations (Figure S7). Patterns can be observed in terms of the dependence structure among the different artistic movements as well, with Renaissance and Baroque painters having a strong persistence structure (Average $H \approx 0.89$), and modern works by Van Gong, Picasso and Kandinski corresponding to a weaker (but still HK-type) structure (Average $H \approx 0.85$).

2. Stochastic Evaluation of Landscapes Transformed by Renewable Energy Installations and Civil Works

In order to evaluate the impact of renewables on the original landscape, we analyze images of landscapes by adding or removing renewable energy installations and civil works with the software Photoshop CS5.

Figure 1. Landscapes. withought renewable energy instalations.

Climacograms of the landscape characterize some aspects of the landscape transformation. Figure S10- Figure S24 show the variation of the climacograms corresponding to different RE installations.

3. Landscape Analysis, the Case of Plastiras Lake

Plastiras lake is an artificial lake and the level of lake changes fast as a result of water usage for hydroelectric power, irrigation and water supply of city of Karditsa. Many studies have been done to evaluate the transformation of Plastiras lake landscape and here we evaluated it also with climacograms.
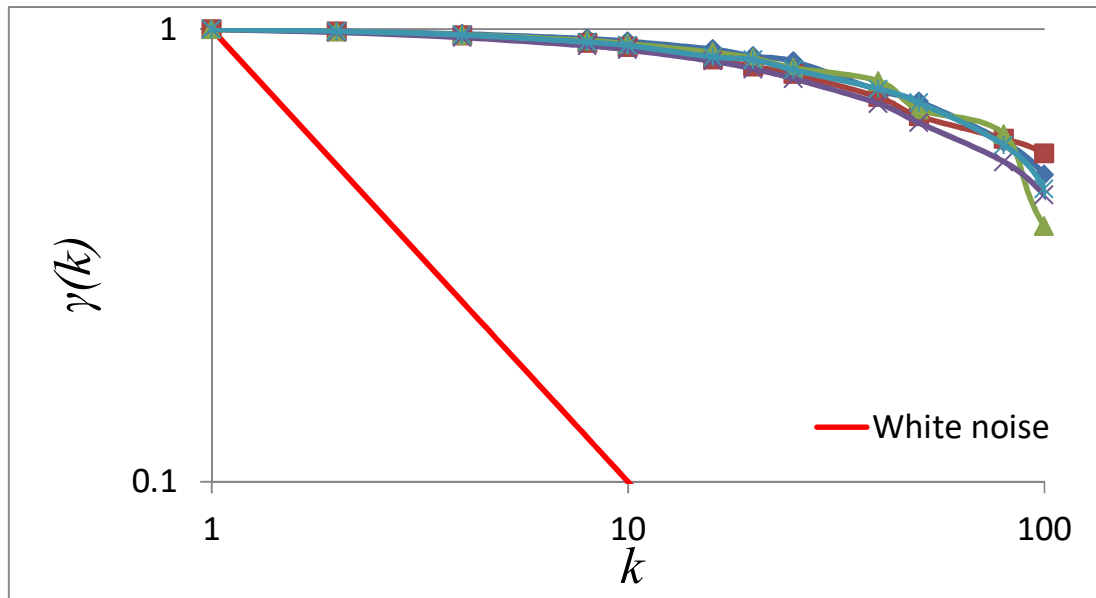

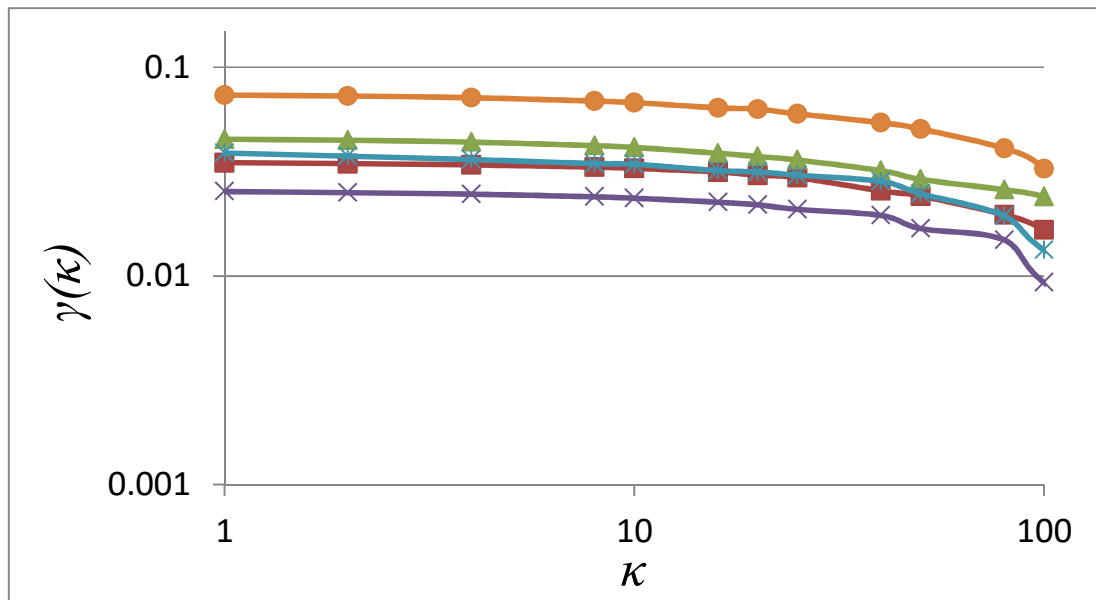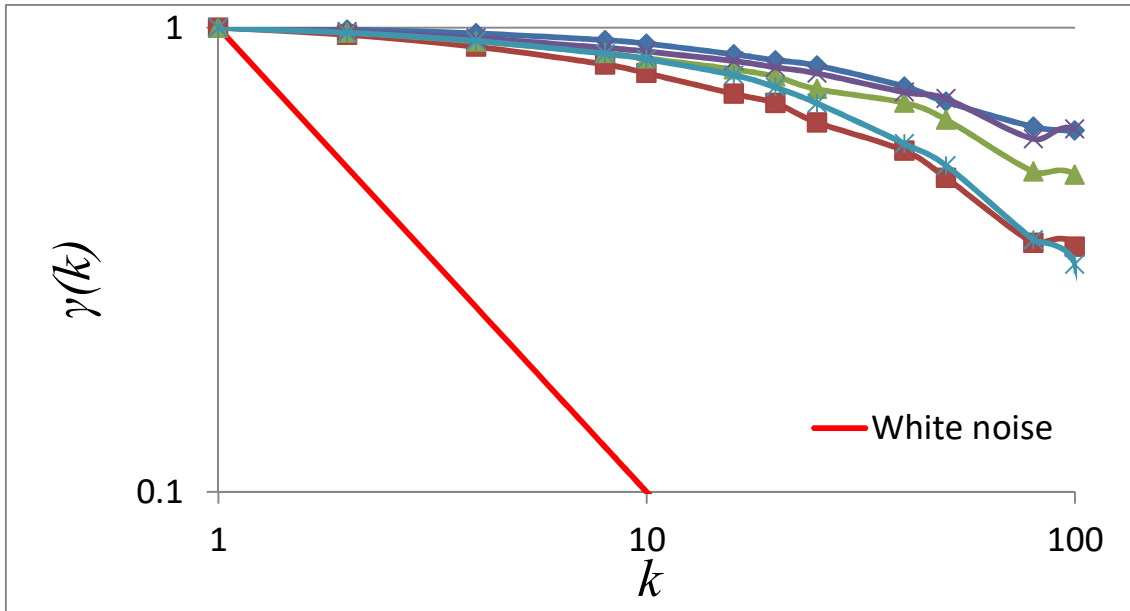**Figure 2.** Transformation of the landscape of Plastiras lake.

Art Painting Analysis

(a)

(b)

(c)

Figure S3: (a) Paintings of Leonardo da Vinci (1452-1519); (b) Standardized climacograms of the art paintings of Leonardo da Vinci; (c) climacograms of the art paintings of Leonardo da Vinci.

(a)

(b)
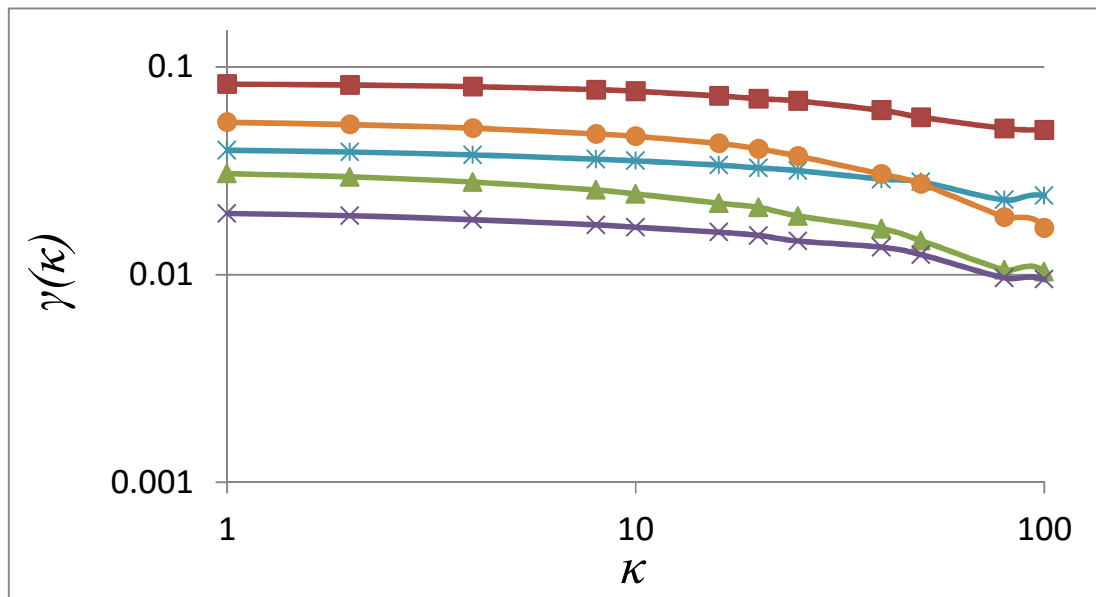
(c)

Figure S4: (a) Paintings of Michelangelo Merisi da Caravaggio (1571-1610); (b) Standardized climacograms of the art paintings of Caravaggio; (c) climacograms of the art paintings of Caravaggio.

(a)
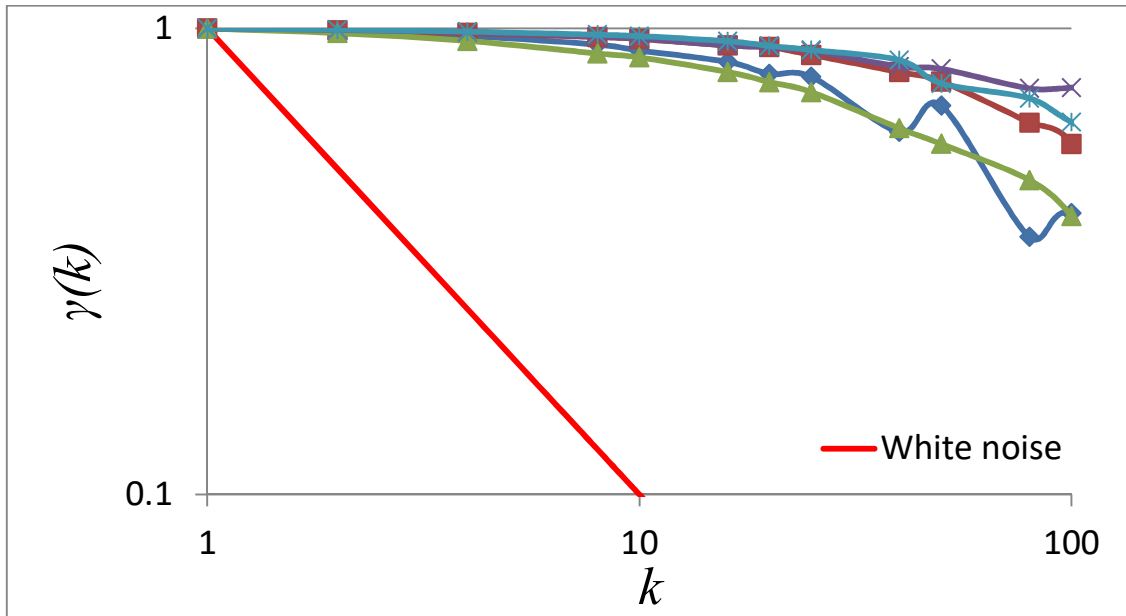
(b)
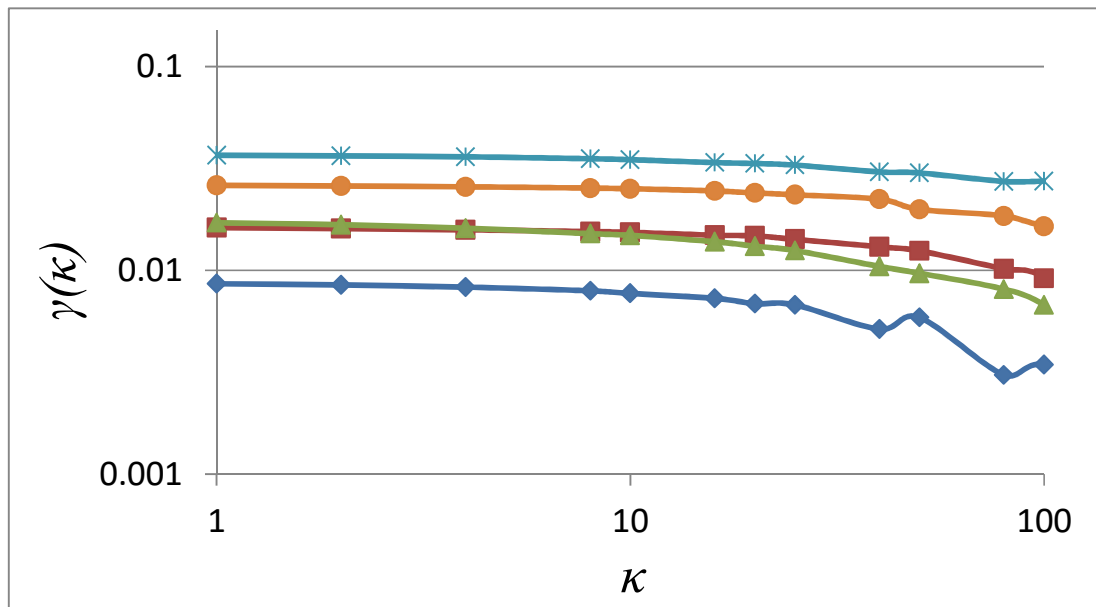
(c)

Figure S5: (a) Paintings of Rembrandt Harmenszoon van Rijn (1606-1669); (b) Standardized climacogram of the art paintings of Rembrandt; (c) climacograms of the art paintings of Rembrandt.

(a)
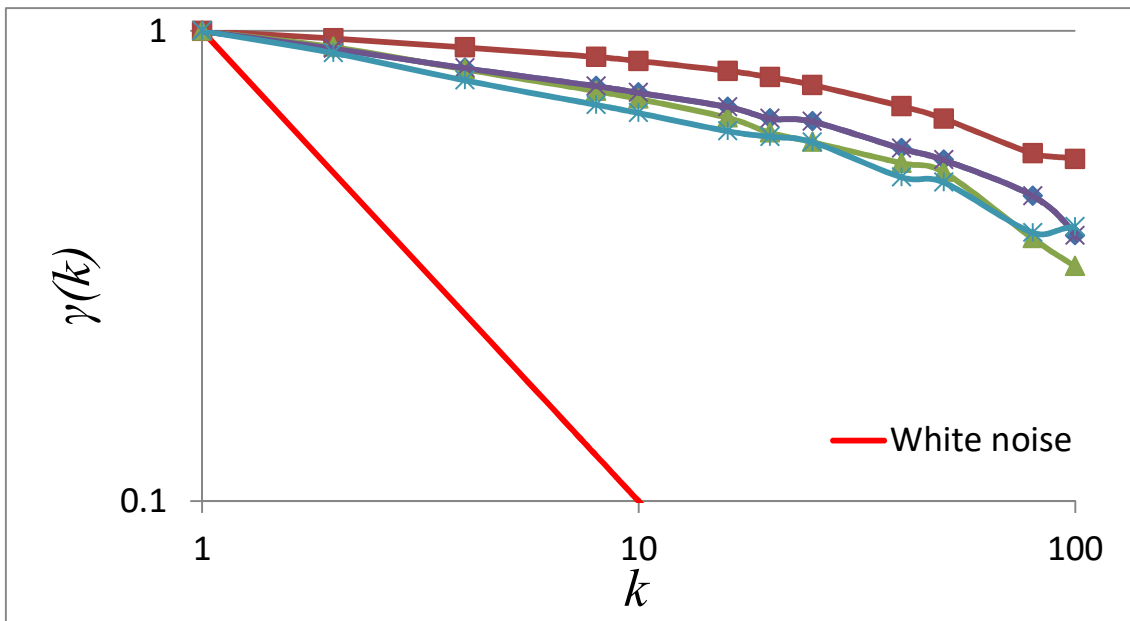
(b)
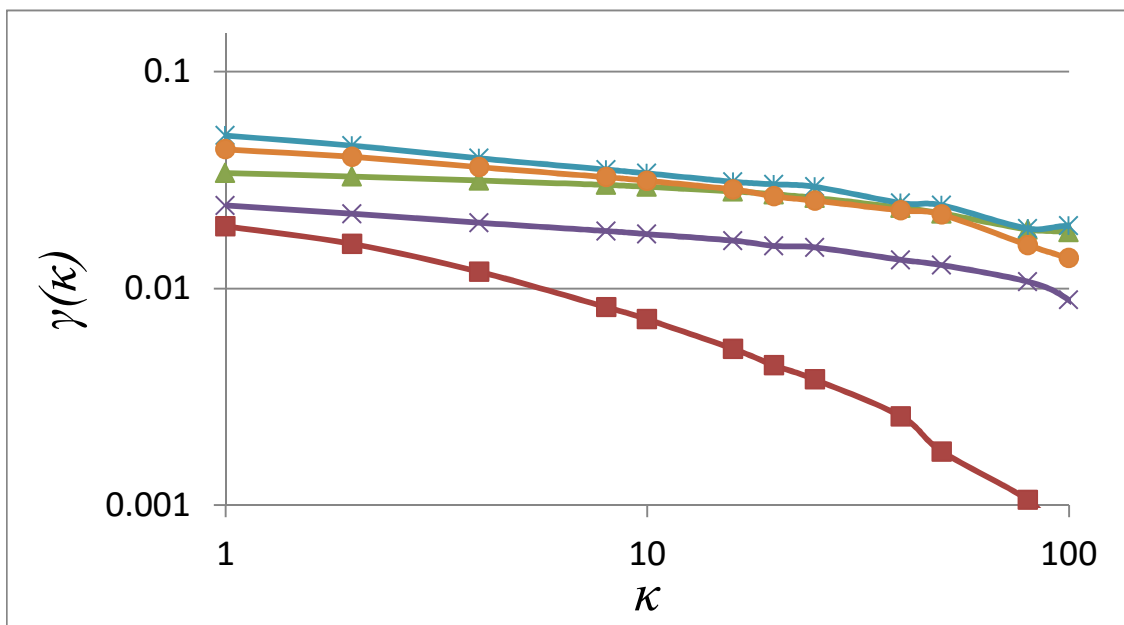
(c)

Figure S6: (a) Paintings of Vincent van Gogh (1853-1890); (b) Standardized climacogram of the art paintings of Vincent van Gogh; (c) climacograms of the art paintings of Vincent van Gogh.

(a)
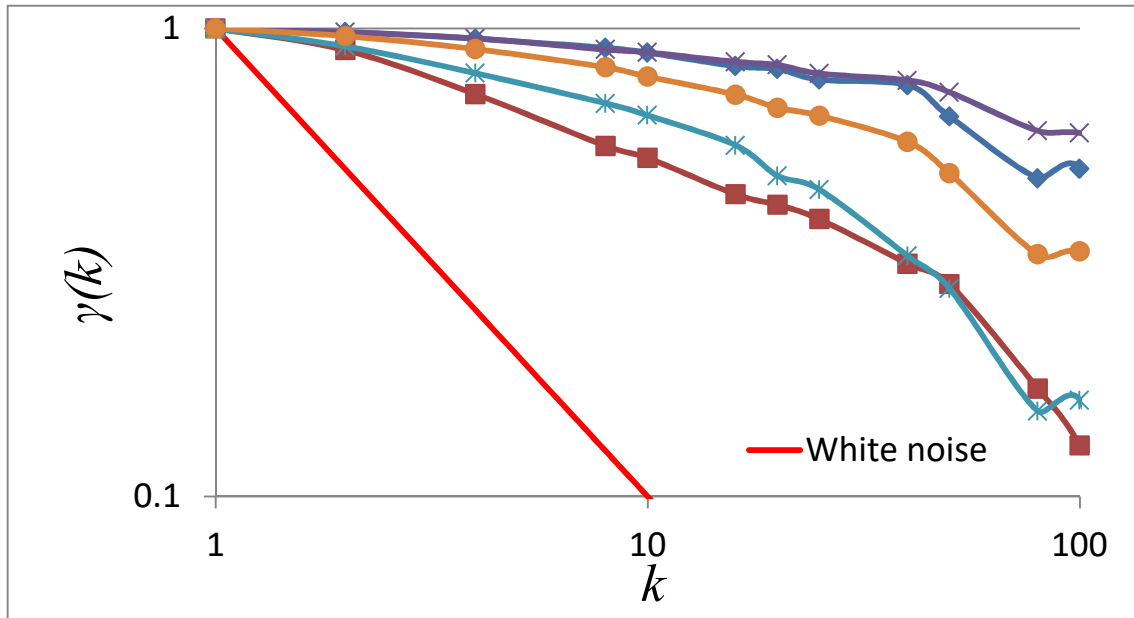
(b)
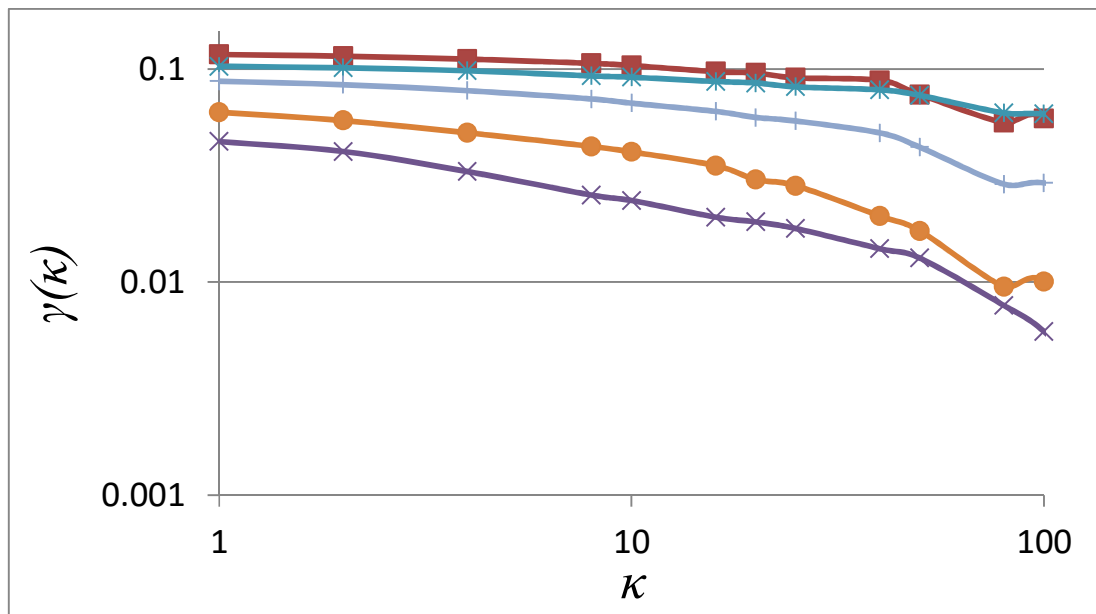
(c)

Figure S7: (a) Paintings of Pablo Picasso (1881-1973); (b) Standardized climacogram of the art paintings of Picasso; (c) climacograms of the art paintings of Picasso.
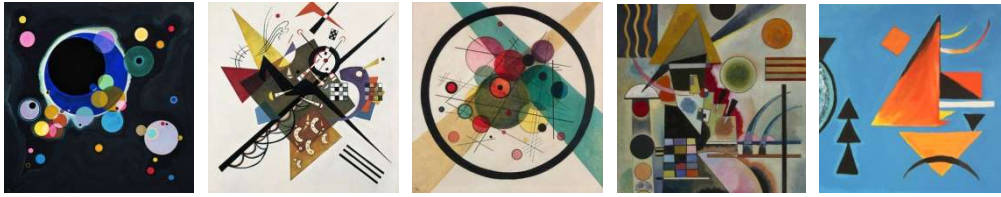
(a)
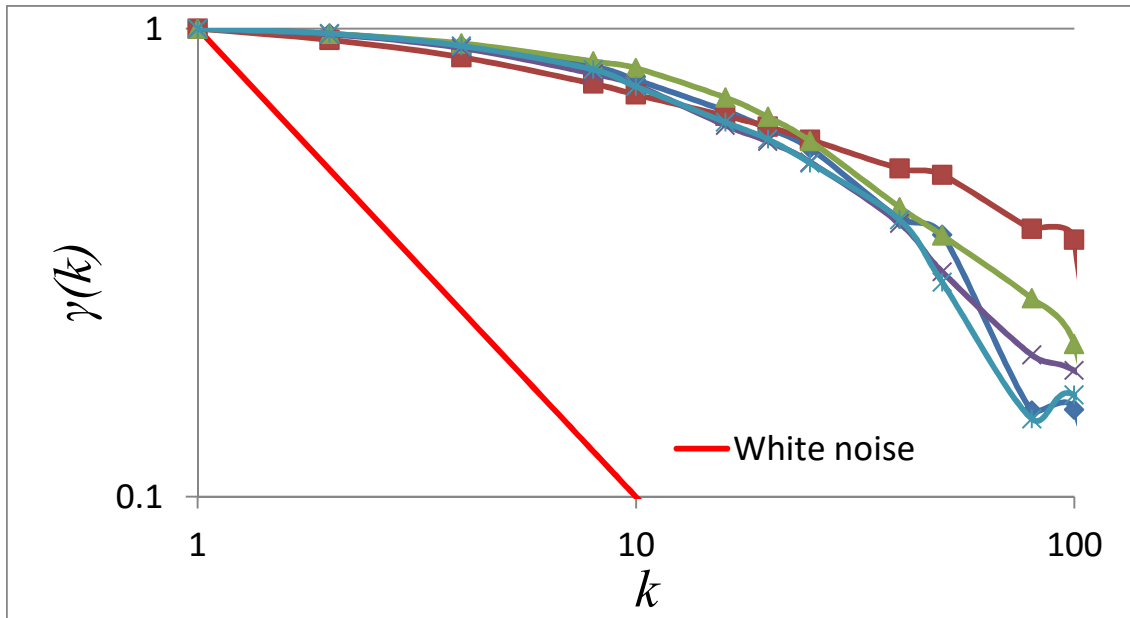
(b)
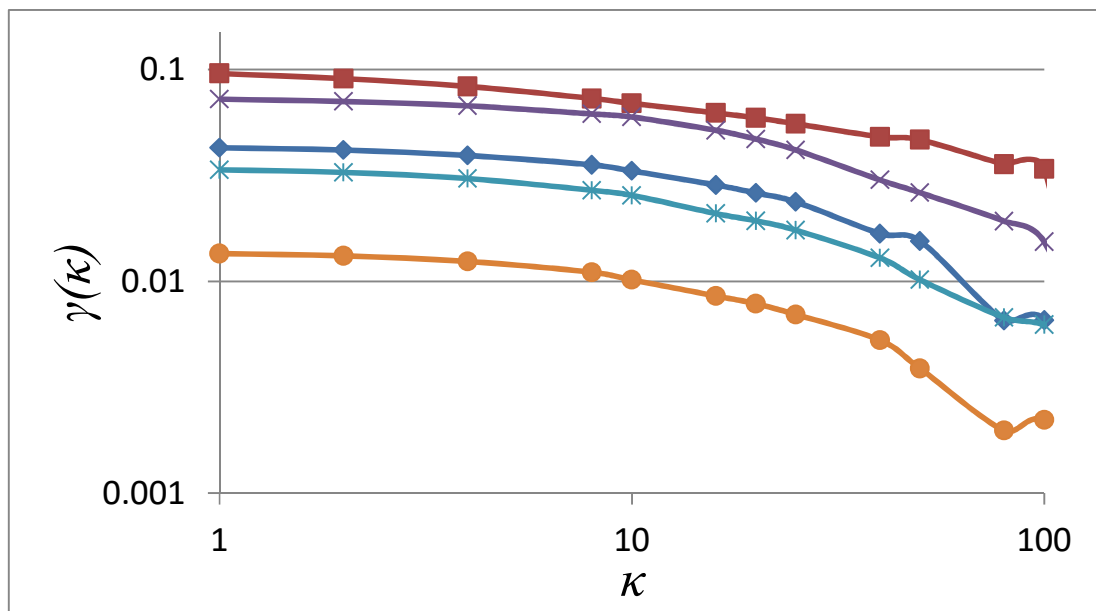
(c)

Figure S8: (a) Paintings of Wassily Kandinsky (1866-1944); (b) Standardized climacogram of the art paintings of Kandinsky; (c) climacograms of the art paintings of Kandinsky.
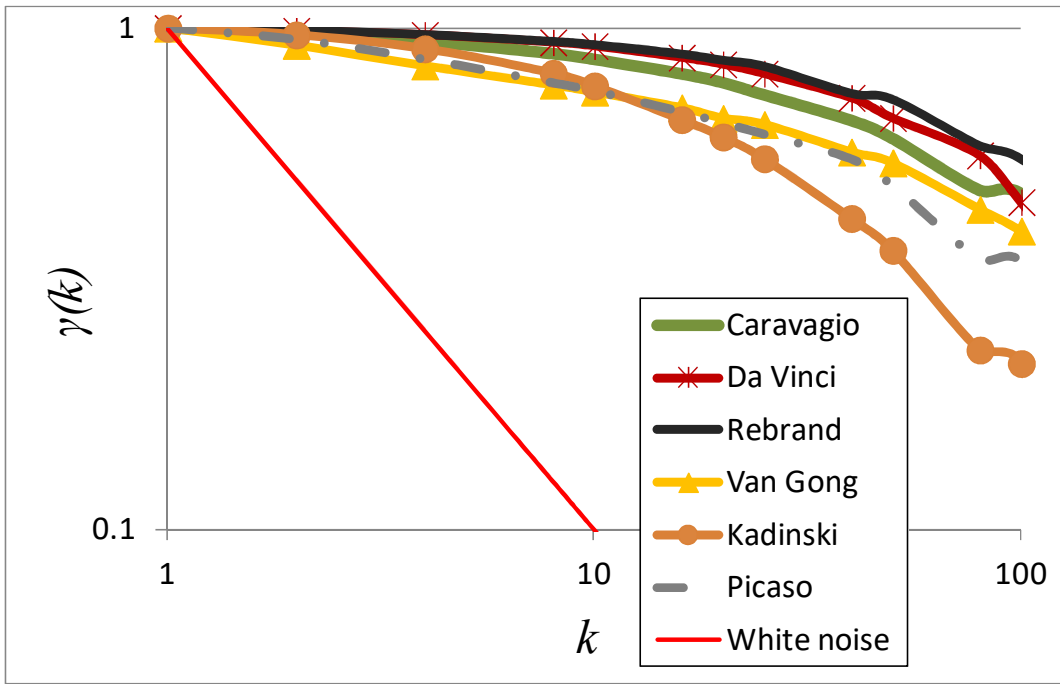
(a)
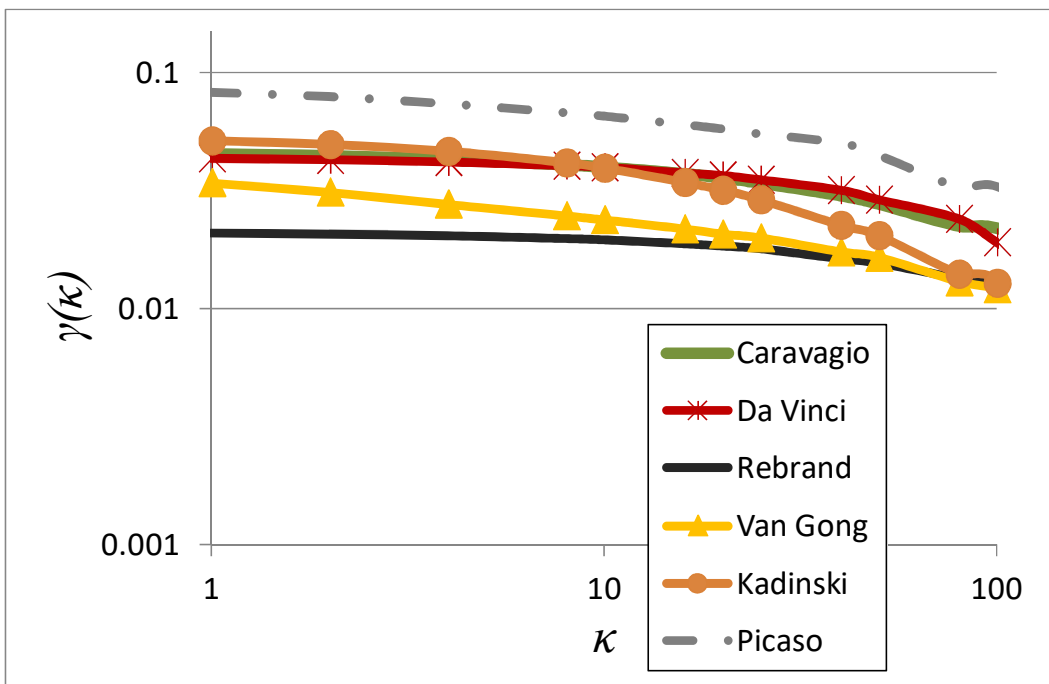
(b)

Figure S9: Averages of the examinee paintings by different artists; (b) Standardized climacogram of the art paintings; (c) climacograms of the art paintings.

Transformation of the Landscapes and Analysis

(a)

(b)

(c)

(d)
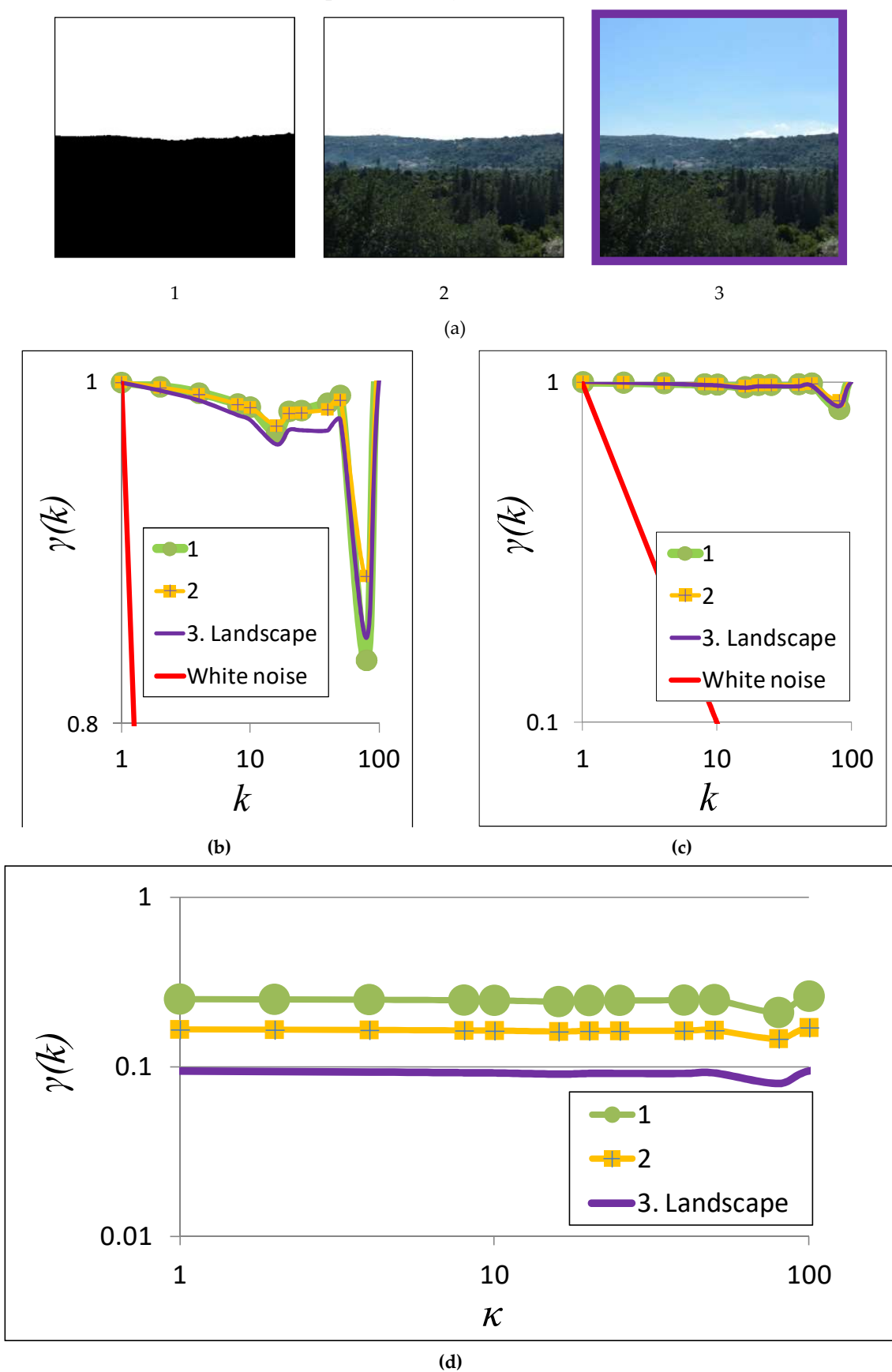
Figure S10: (a1) Shape of the landscape; (a2) Landscape withought sky; (a3) original landscape; (b), (c) standardized climacograms of images (a1)–(a3); (d) climacogram of images (a1)–(a3).
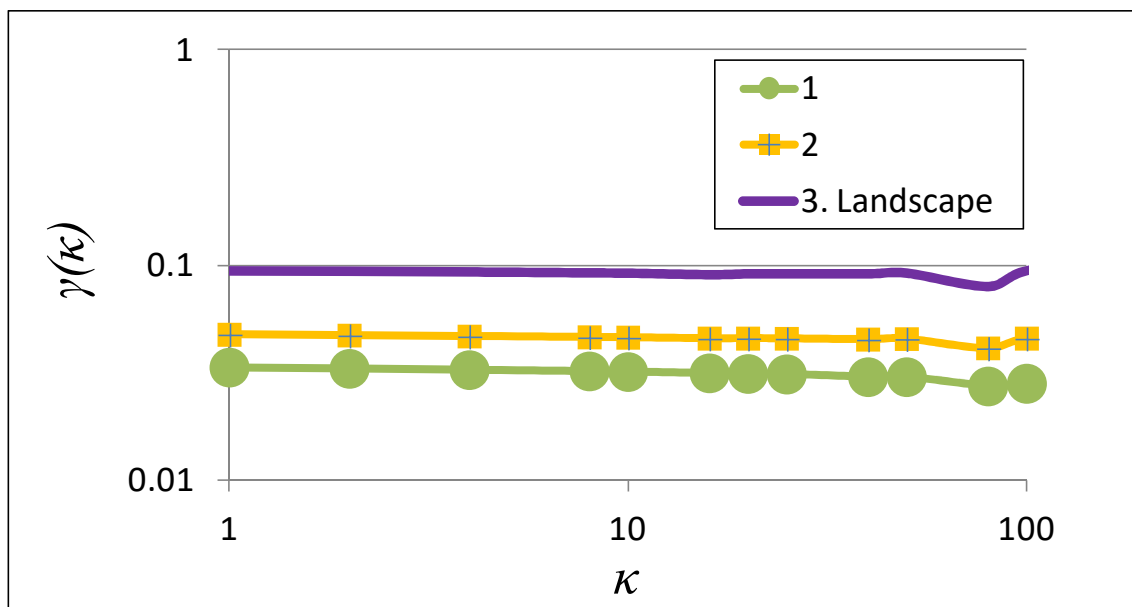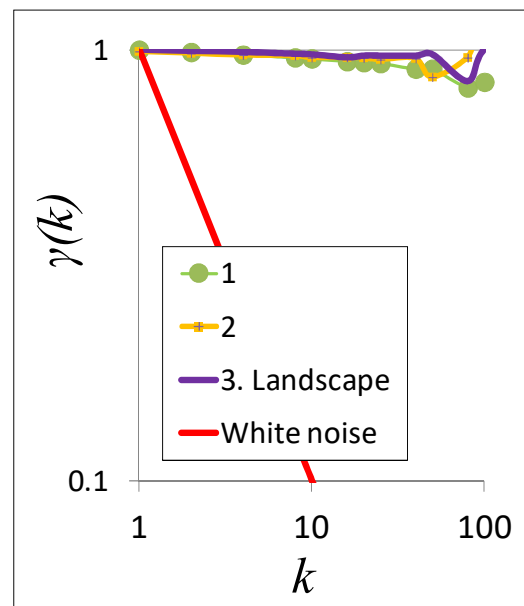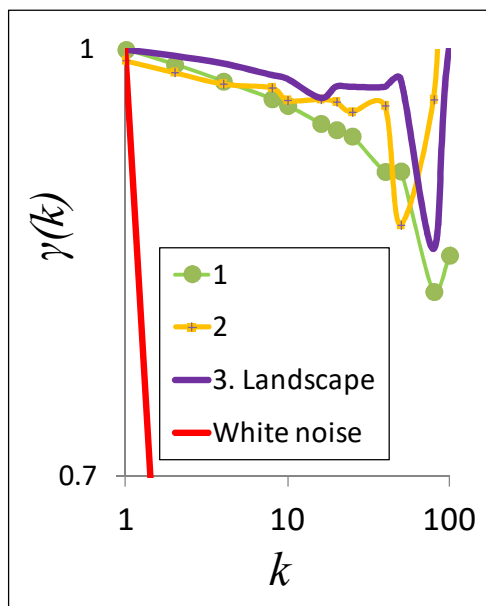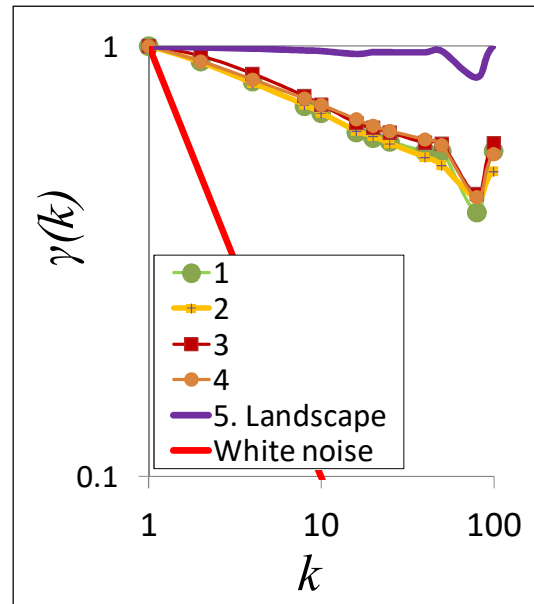
Figure S11: (a1) (a2 (a3) Landscape with different sky; (b), (c) standardized climacograms of images (a1)–(a3); (d) climacogram of images (a1)–(a3).

1   2   3

(a)

(b)

(c)
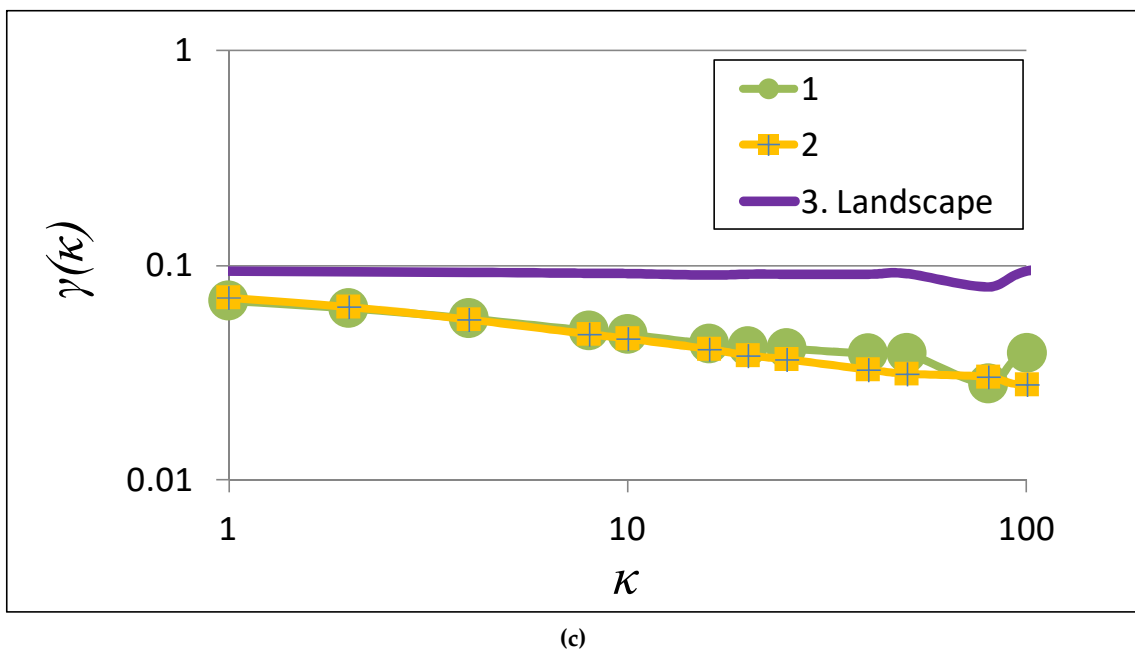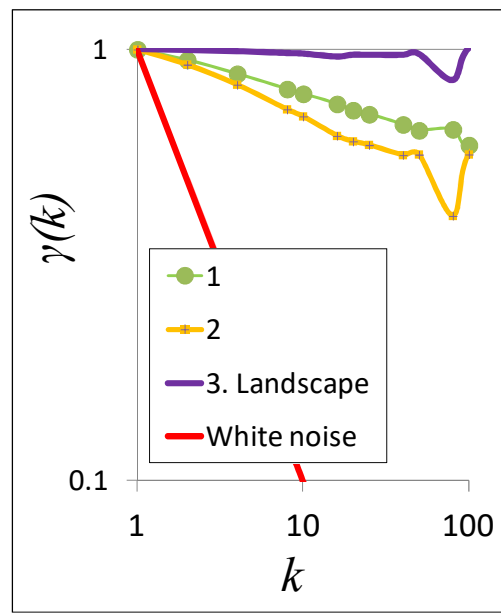
Figure S12: (a1) City above the horizon; (a2) City below the horizon; (a3) original landscape; (b) standardized climacogram of images (a1)–(a3); (c) climacogram of images (a1)–(a3).
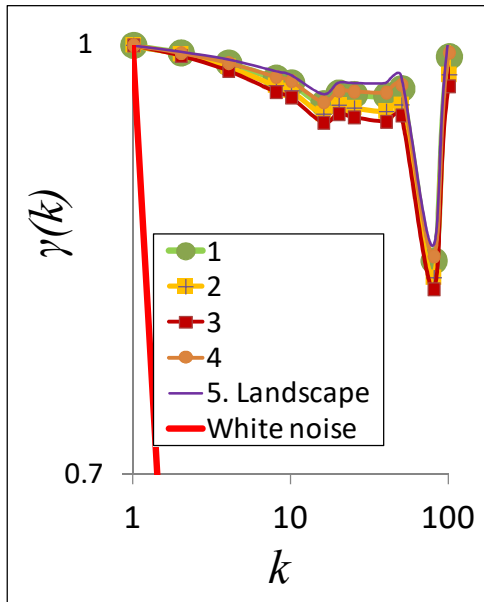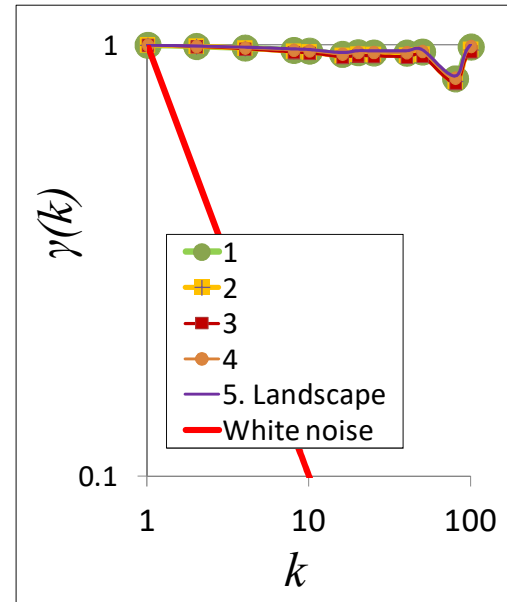
(a)
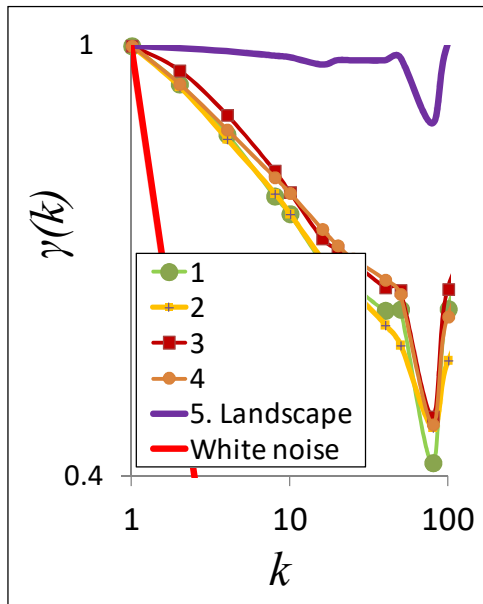
(b)

(c)
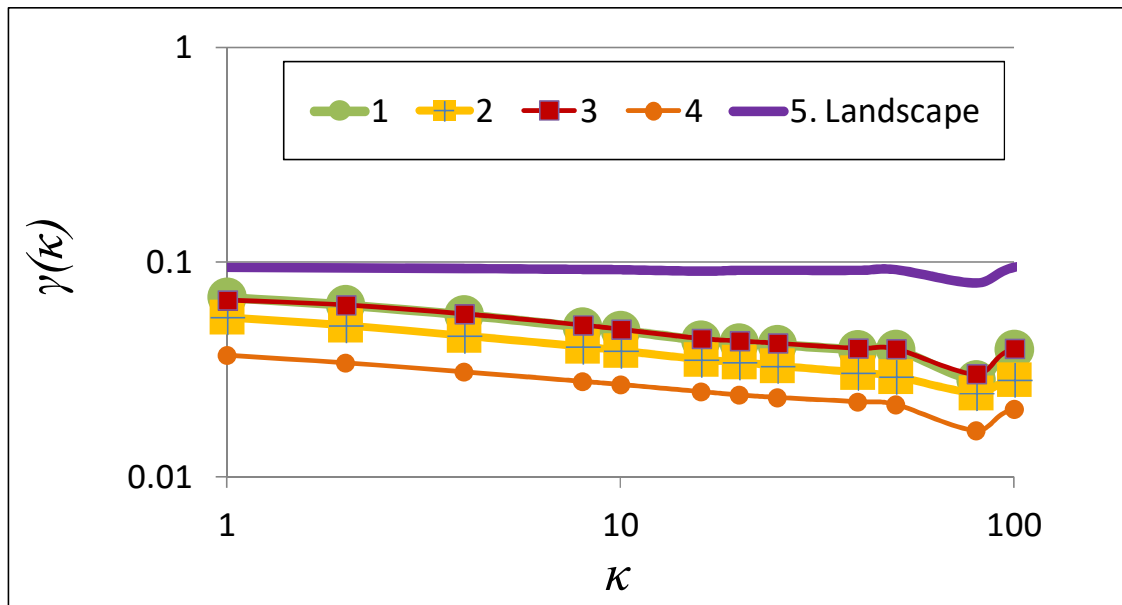
(d)

Figure S13: (a1)–(a4) Cities in the landscape (a1) Original landscape; (b), (c) standardized climacograms of images (a1)–(a5); (d) climacogram of images (a1)–(a5).
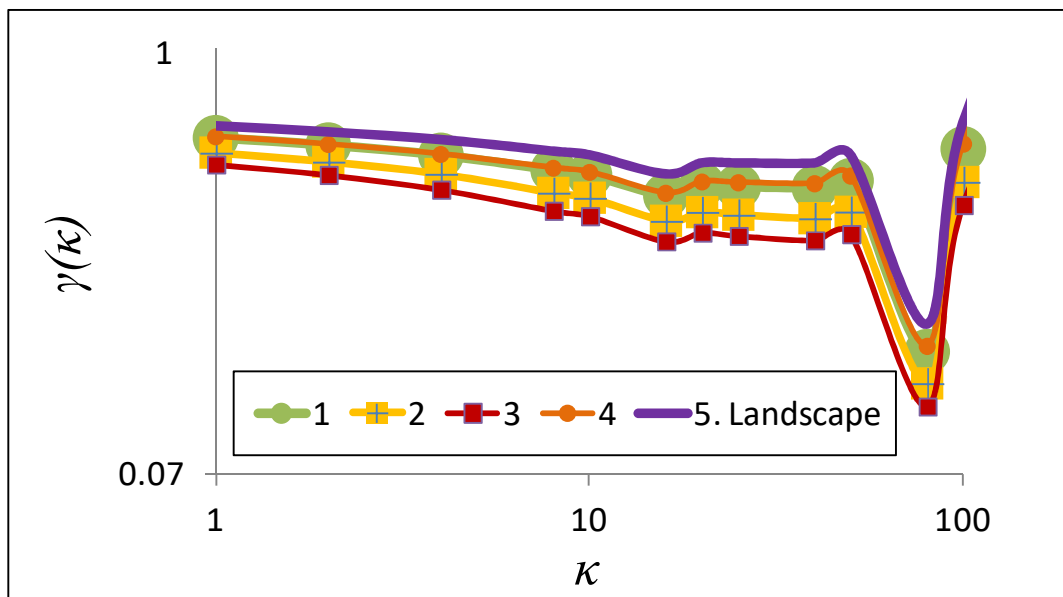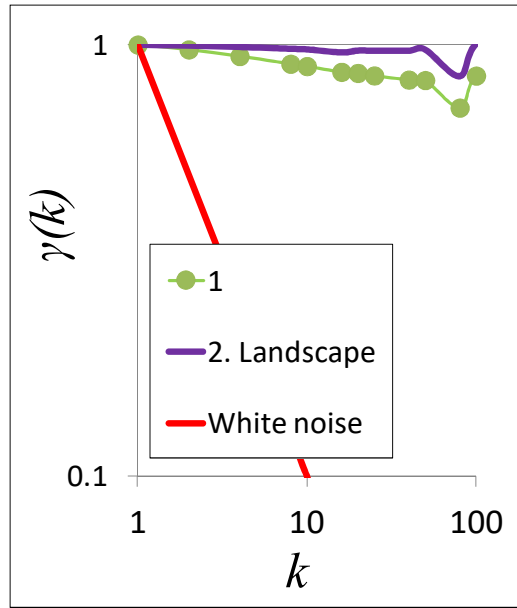
Figure S14: (a1)–(a4) Wind turbines in the landscape; (a5) Original landscape; (b), (c) standardized climacograms of images (a1)–(a5); (d) climacogram of images (a1)–(a5).
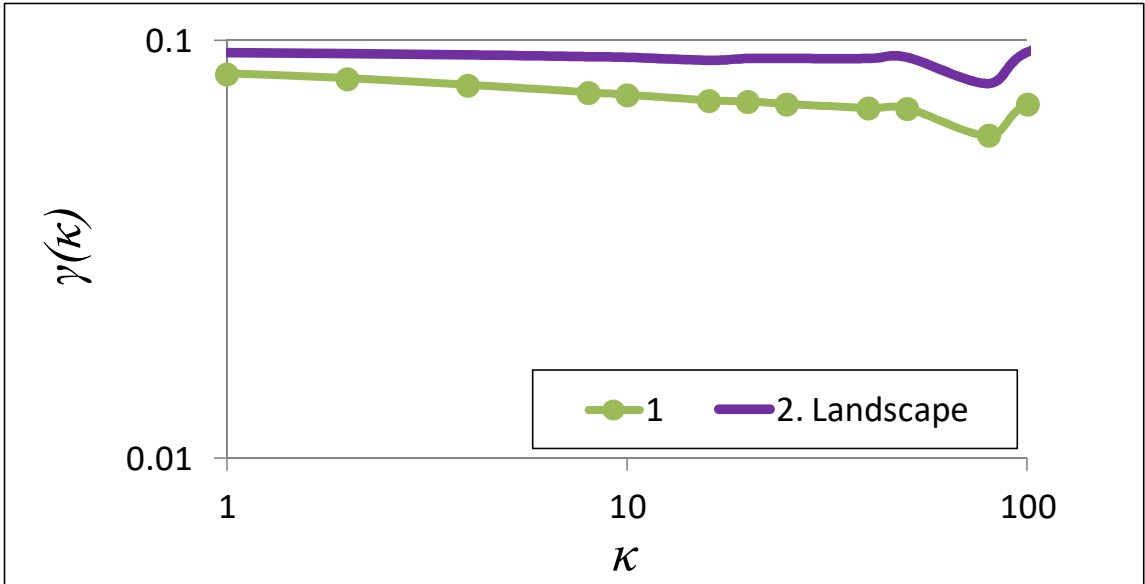
(a)

(b)

(c)

Figure S15: (a1) Solar panels in the landscape; (a2) Original landscape; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).
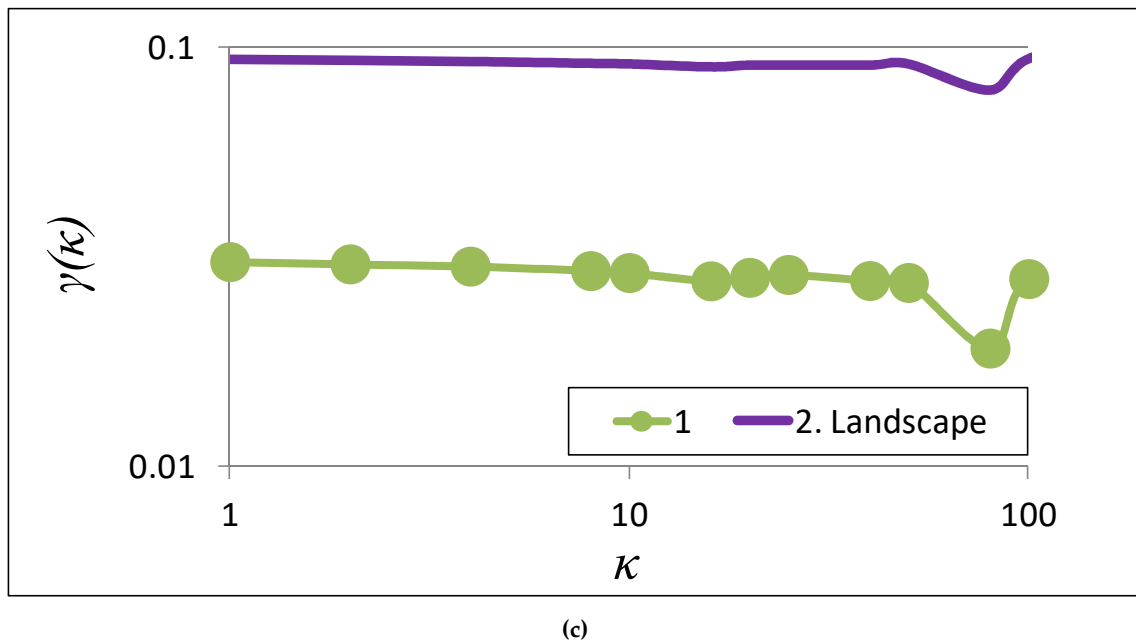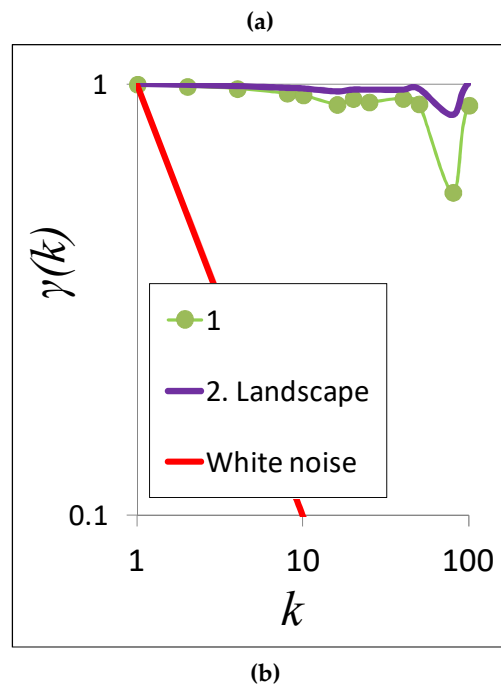
(a)

(b)

(c)

Figure S16: (a1) Lake in the landscape; (a2) Original landscape; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).
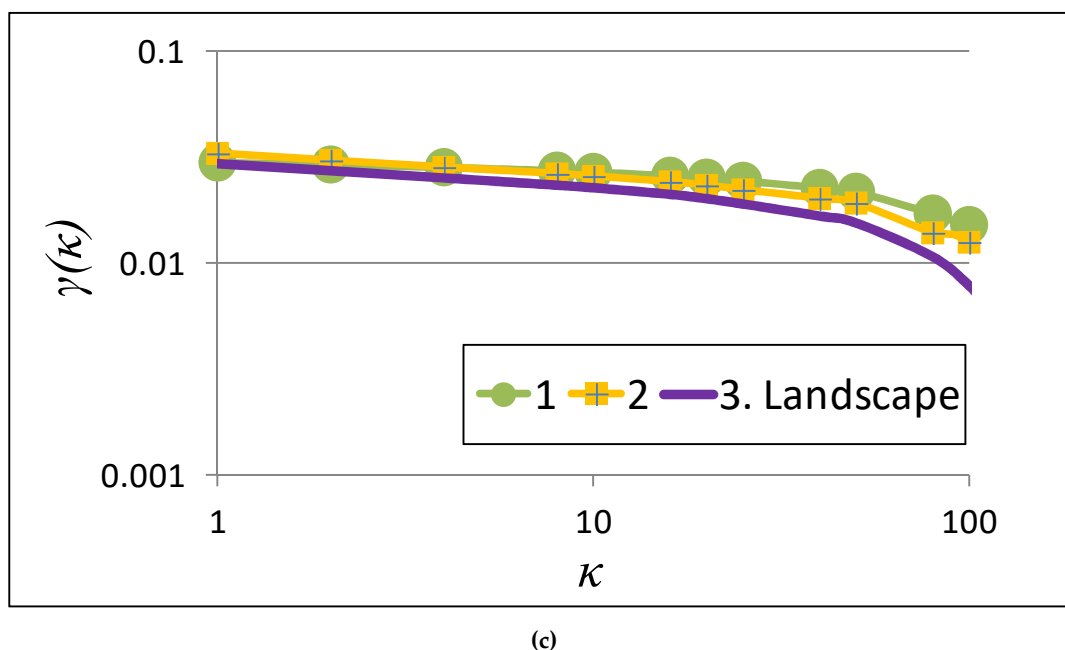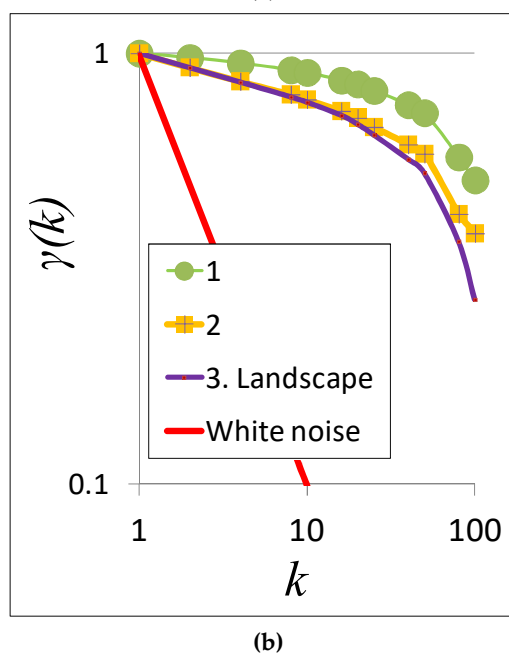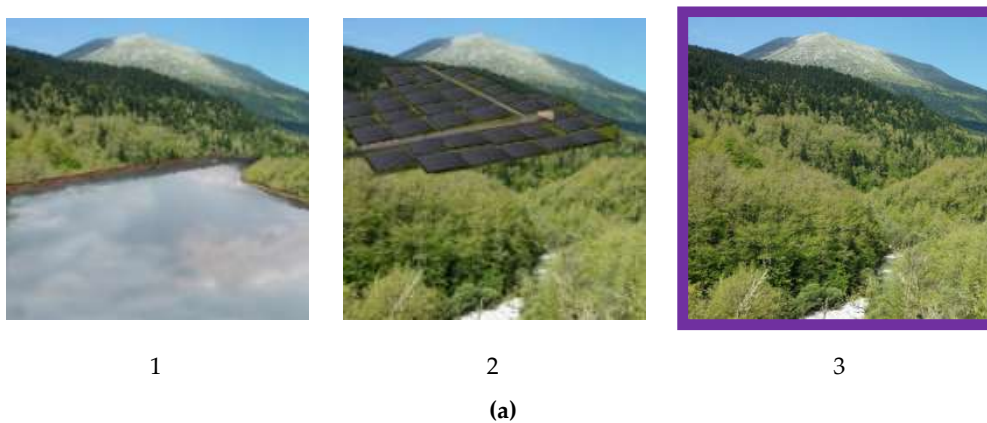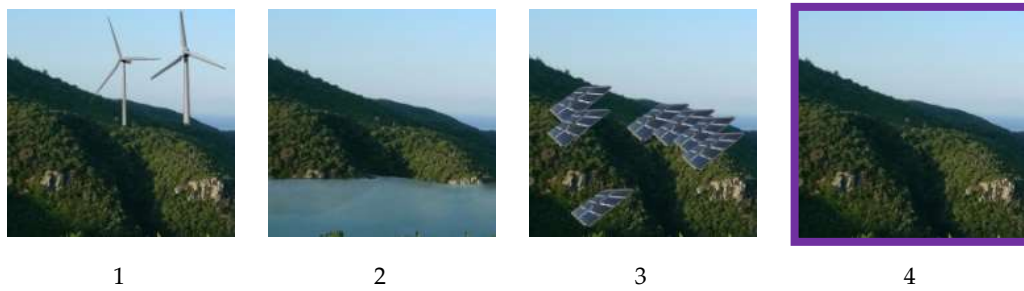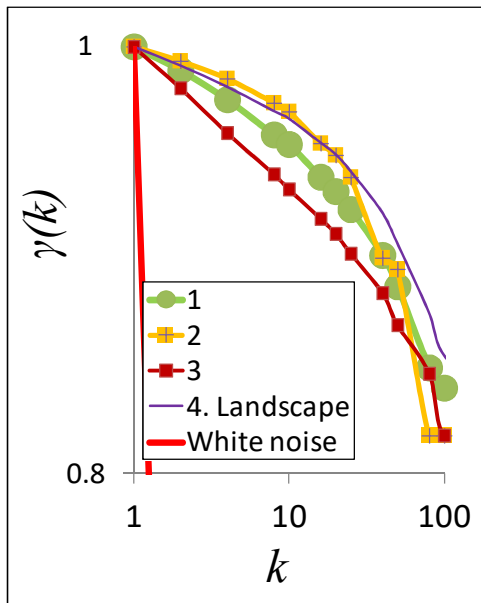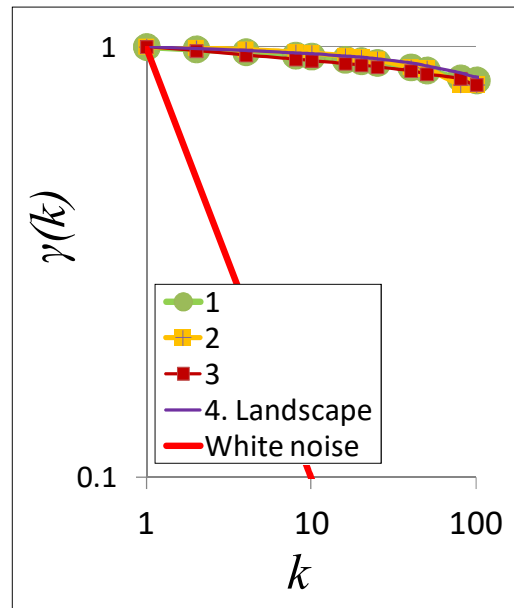
(a)

(b)

(c)

Figure S17: (a1) Lake in the landscape; (a2) Solar panels in the landscape; (a3) Original landscape; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a3).
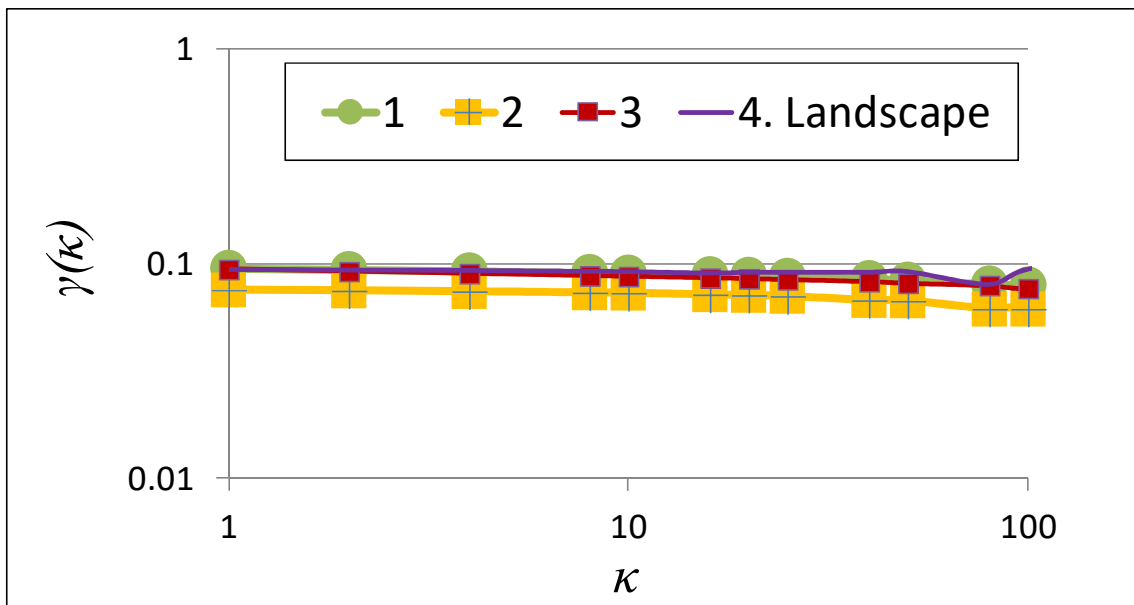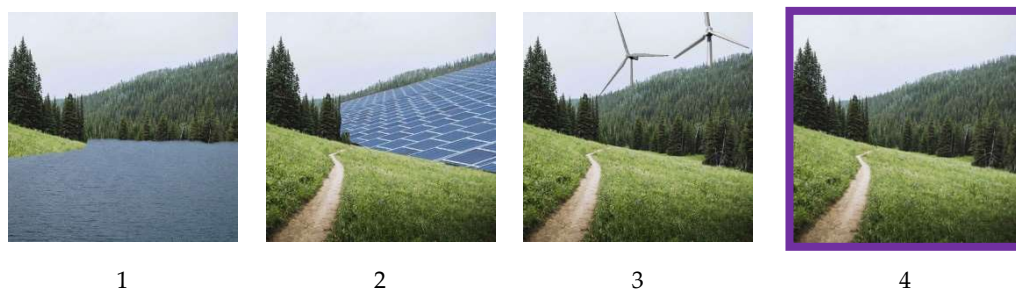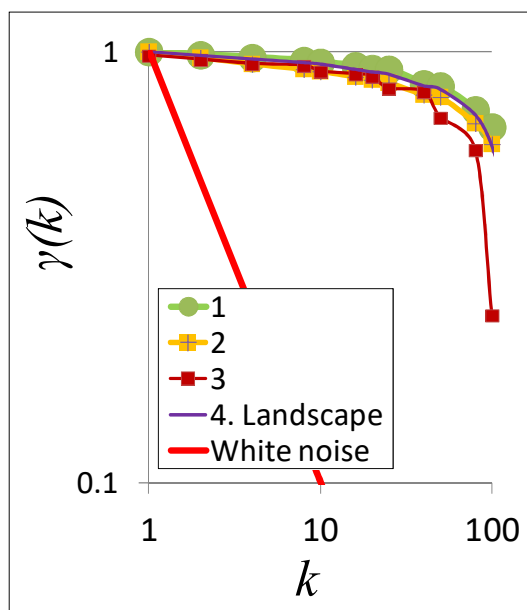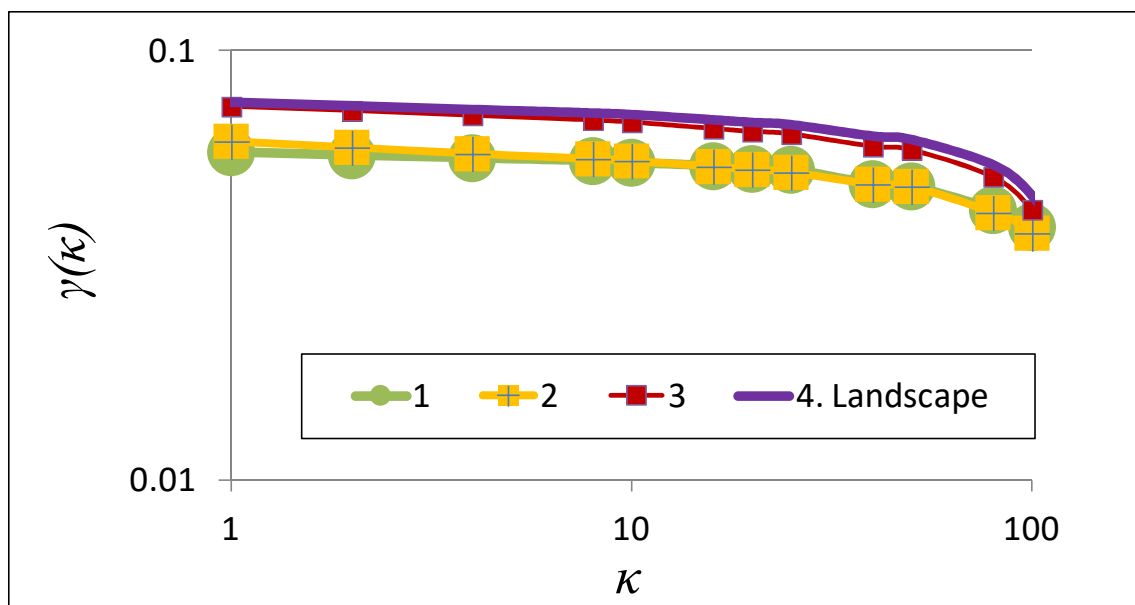
(a)

(b)

(c)

(d)

Figure S18: (a1) Wind turbine in the landscape; (a2) Lake in the landscape; (a3) Solar panels in the landscape; (a4) original landscape; (b), (c) standardized climacograms of images (a1)–(a4); (d) climacogram of images (a1)–(a4).
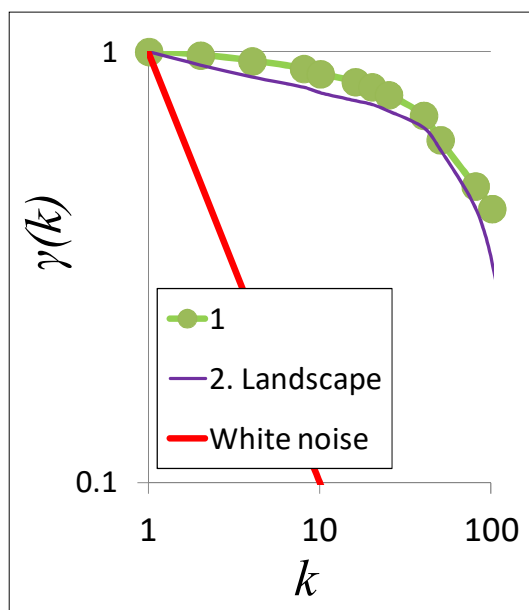
(a)

(b)

(c)

Figure S19: (a1) Lake in the landscape; (a2) Solar panels in the landscape; (a3) Wind turbine in the landscape; (a4) original landscape; (b) standardized climacograms of images (a1)–(a4); (c) climacogram of images (a1)–(a4);
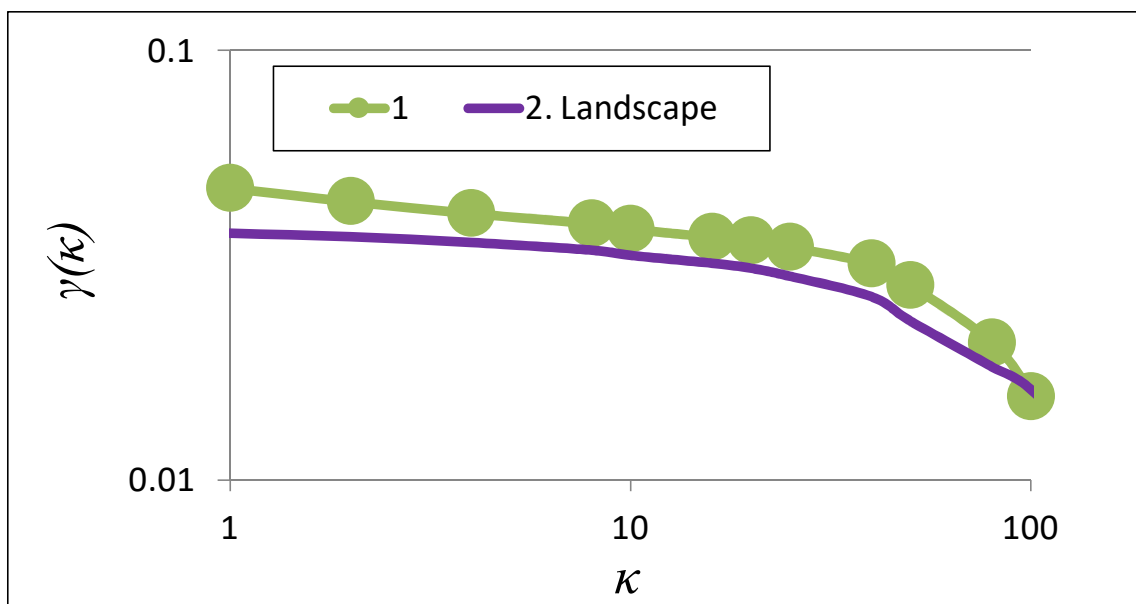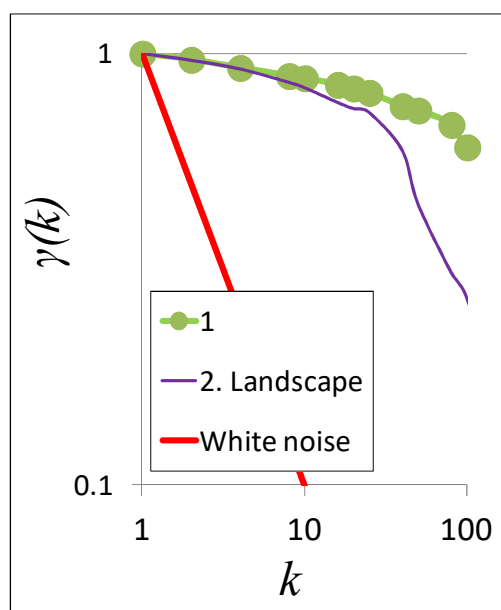
(a)

(b)

(c)

Figure S20: (a1) Solar panels in the landscape; (a2) original landscape; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).

Figure S21: (a1) Solar panels in the landscape; (a2) original landscape; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).
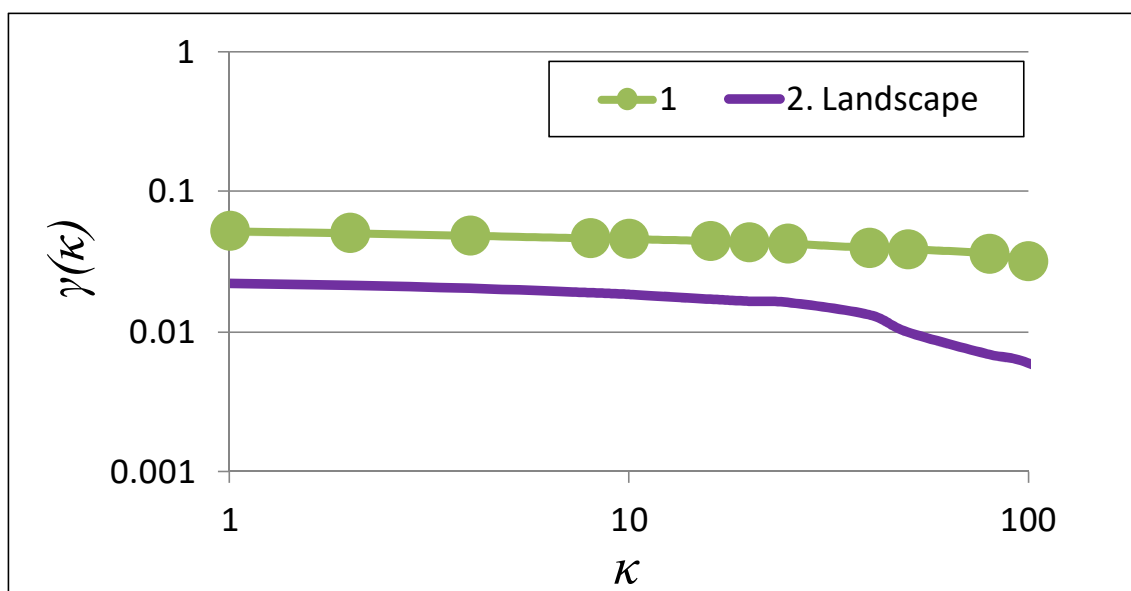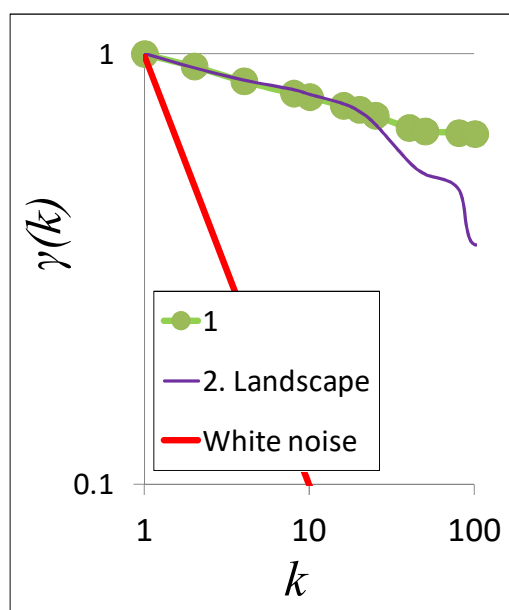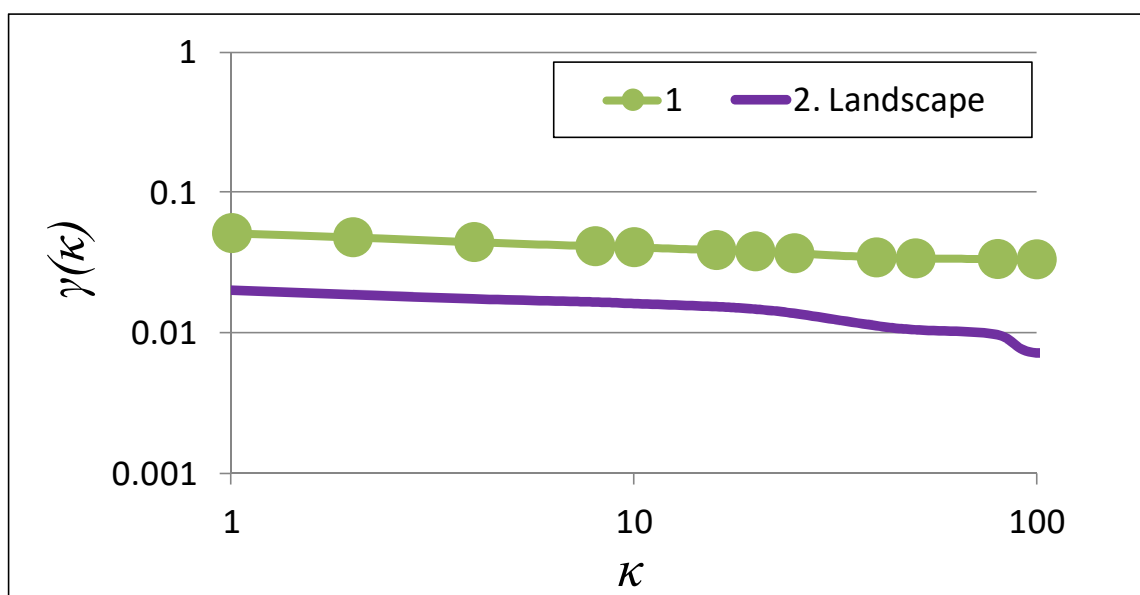
(a)

(b)

(c)

Figure S22: (a1) Solar panels in the landscape; (a2) original landscape; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).
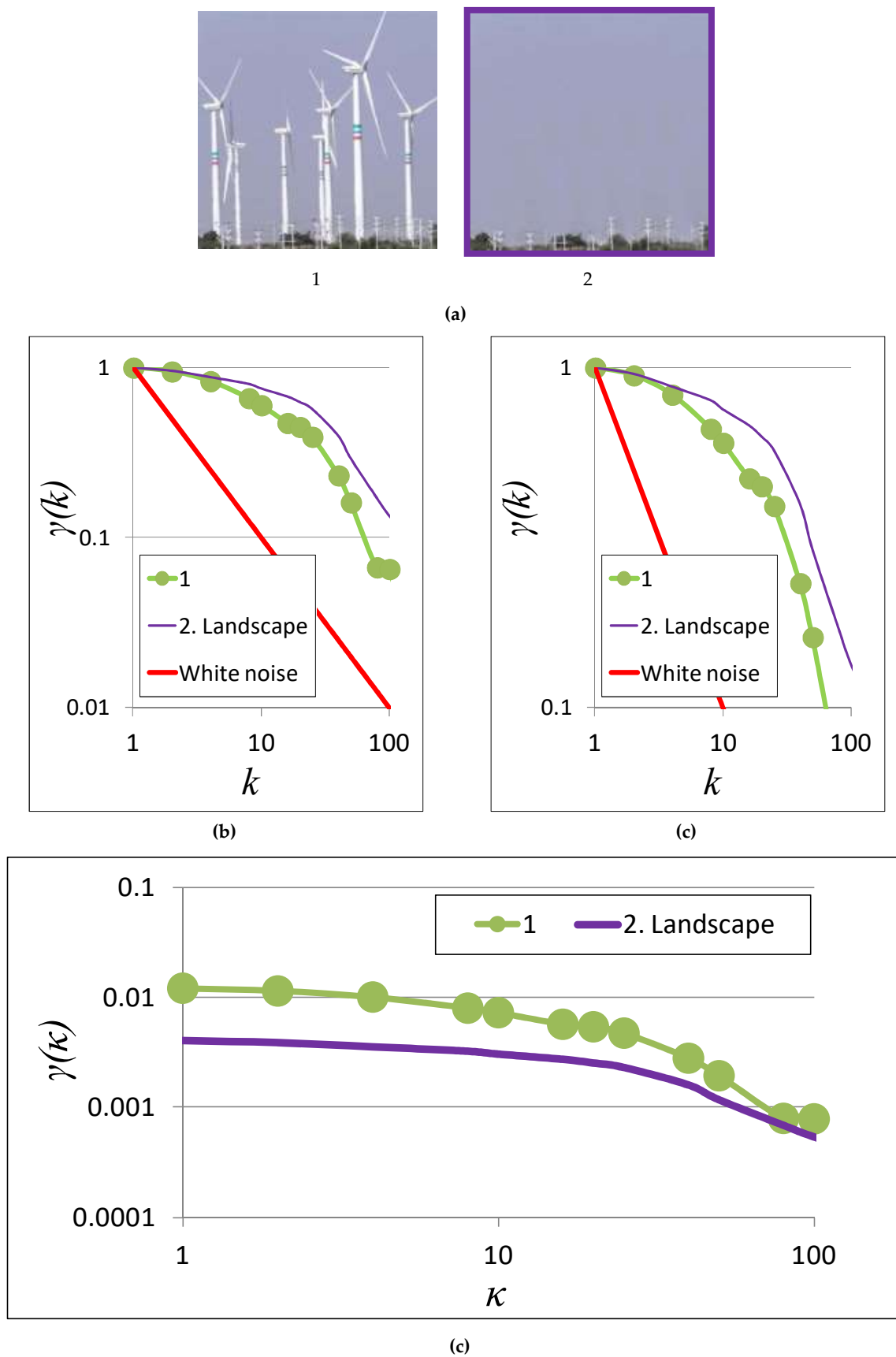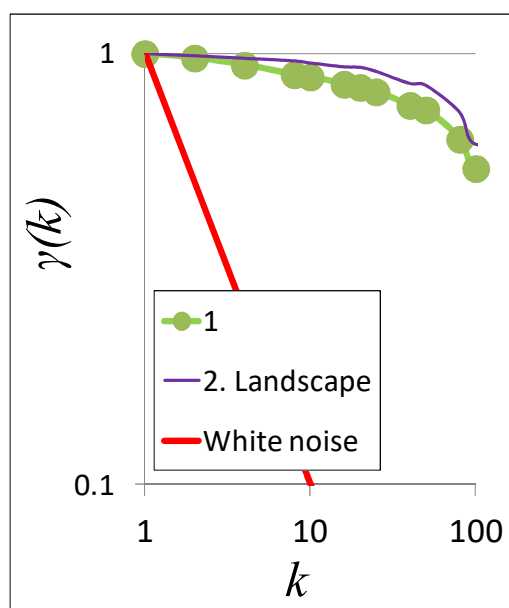
(a)

(b)

(c)

(c)

Figure S23: (a1) Wind park in the landscape; (a2) landscape without renewable energy installations; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).

(a)

(b)

(c)

Figure S24: (a1) Wind park in the landscape; (a2) landscape without renewable energy installations; (b) standardized climacograms of images (a1)–(a2); (c) climacogram of images (a1)–(a2).
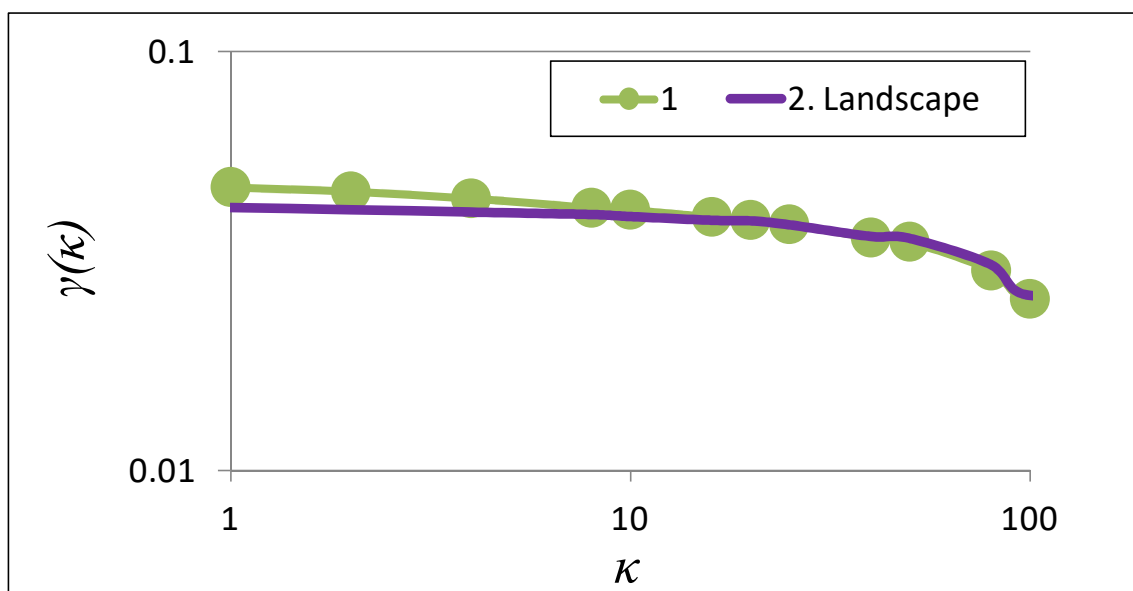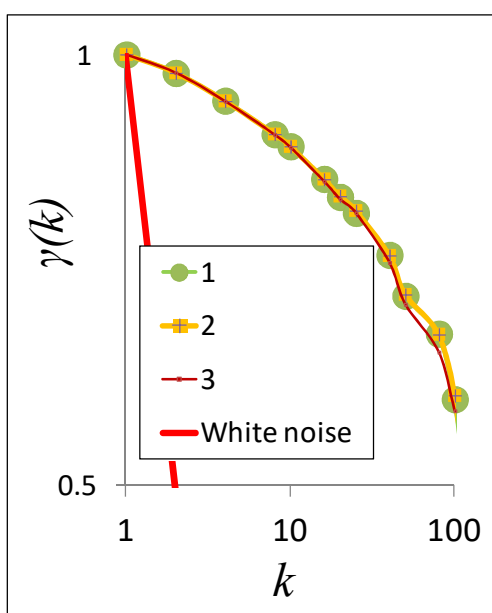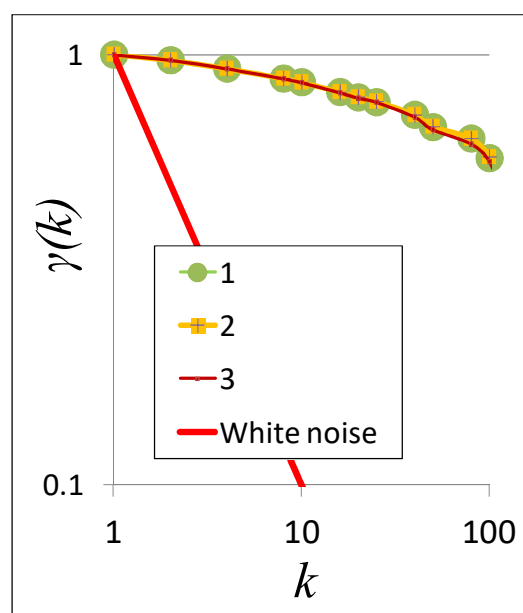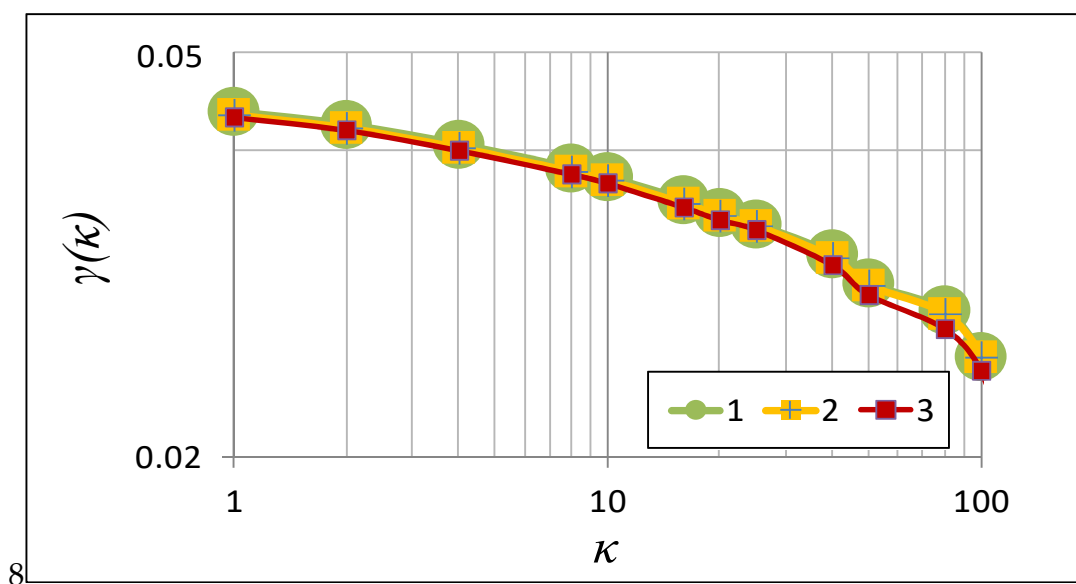
Evaluating Lake Plastiras Landscape

(a)

(b)

(c)

(d)

Figure S25: (a1)–(a3) Transformation of landscape of Plastiras caused by the balance of the lake in the area of subnormal dead zone; (b), (c) standardized climacograms of images (a1)–(a3); (d) climacogram of images (a1)–(a3).

Figure S26: (a1)–(a3) Transformation of landscape of Plastiras caused by the balance of the lake in the area of normal dead zone; (b), (c) standardized climacograms o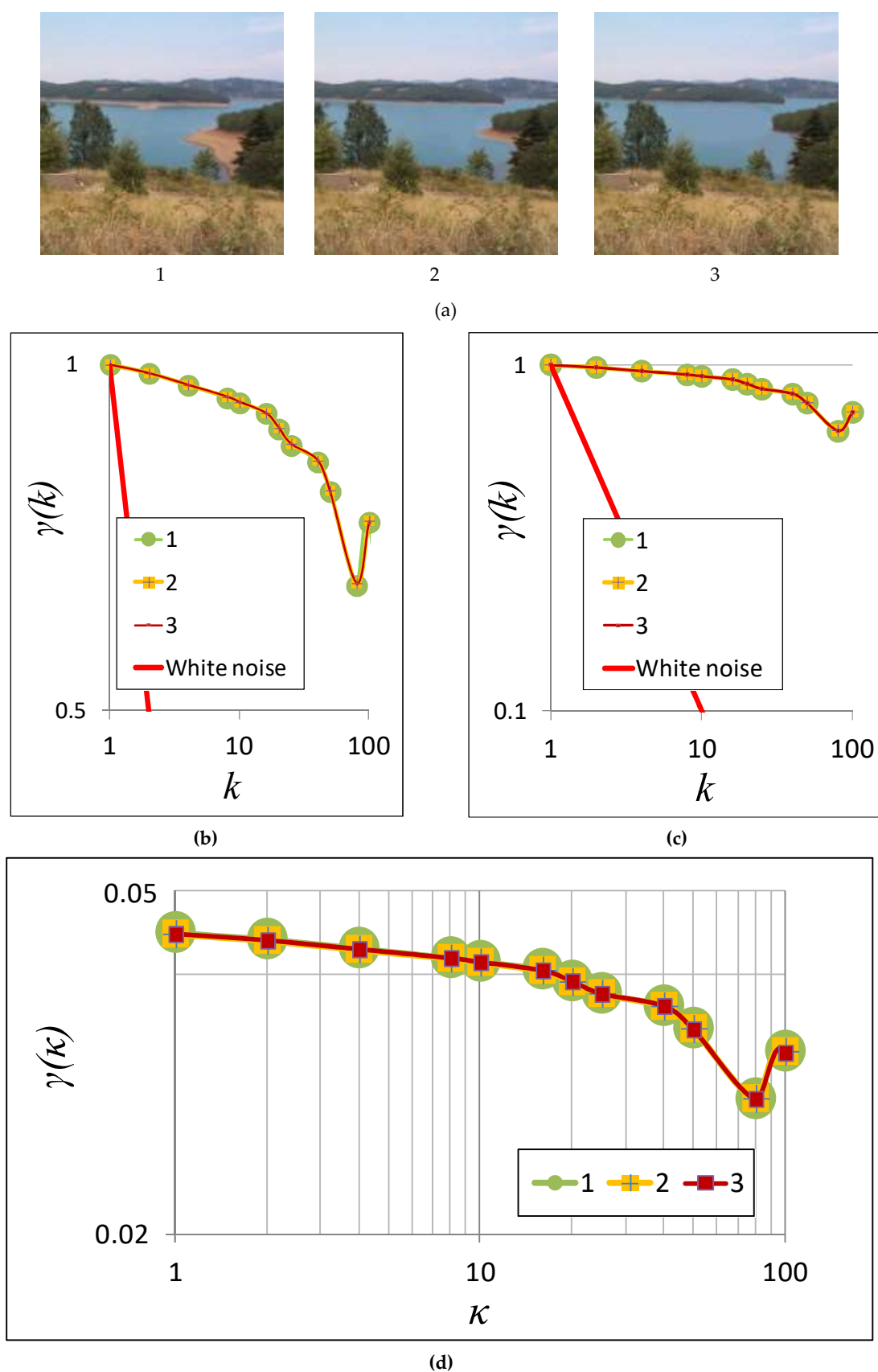f images (a1)–(a3); (d) climacogram of images (a1)–(a3).