Is the Length of a Coastline Infinite?

The Difference Between Fractals in Mathematics and in Nature

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## Abstract

According to the coastline paradox, the length of a coastline increases without limit as the scale of measurement keeps decreasing. This is because the coastline is an example of fractals in nature. However, fractals in nature are not the same as fractals in mathematics. A coastline in nature needs width on each side to prove itself a sea-land dividing line. Therefore, the coastline becomes a two-dimension coastline-belt, resulting in a finite length due to the finite area of the land. I explored the relations between the scale of measurement and the measured length as well as the area of the island and the length capable of the coastline with a self-made model. The results of the simulations are two-fold. First, when the scale of measurement is small enough, the coastline length value will approach a constant, precise value. Second, the more narrow the coastline-belt is, the longer coastline the island can accommodate.