

Abstract Submitted
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Dimensions of continents and oceans – water has carved a perfect cistern JOHN A WHITEHEAD, Woods Hole Ocean Inst — The ocean basins have almost exactly the correct surface area and average depth to hold Earth's water. Two processes are responsible for this. First, Earth's continental crust is thinned by erosion so that average elevation is a few hundred meters above sea level. Second, the crust is thickened by lateral compression from mountain formation and sediments and water lost in subduction is resupplied at least in part by volcanics. The resulting continents are approximately tabular in cross section, resulting in the well-known double hypsometric curve for Earth's elevation. Therefore, erosion and mountain building have enabled water to carve its own cistern in the form of all the ocean basins. A theoretical fluid model, suggested partly by laboratory experiments, produces such a tabular continent with a surface above sea level. A simple hydrostatic balance gives a first approximation for the average depth and area of oceans and continents for present Earth as a function of material volumes and densities. Using a wide range of possible crust volumes with the present water volume, the average continental crust thickness exceeds 22 km and ocean area exceeds 25% of the globe. Other volumes of water produce a wide range of areas and depths of oceans and crust.

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