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New map of global groundwater depths

Despite groundwater's importance to ecosystems, little is known about its global distribution. Researchers have now developed a model to map groundwater, revealing that ecosystems covering 22-32% of the Earth's surface rely on this important resource.

Groundwater is vital for many ecosystems, providing crucial support to plants and animals, especially during droughts. 'Shallow' groundwater, in particular, near the earth's surface, is an essential source of water for many ecosystems, maintaining important wetland habitats and recharging rivers and streams in times of low rainfall. However, information on the depth of groundwater reserves is patchy and often limited to developed countries.

In this study researchers used measurements of water table depth from 1,603,781 well-sites. These data came partly from government datasets, but, as these were often unavailable for developing countries, particularly in Africa and Asia, they also used published literature including both peer-reviewed studies and other sources of information, such as water company reports and PhD theses.

To fill in the gaps of missing data, and to identify global patterns in groundwater distributions, researchers used a model which predicted the levels of groundwater based on climate, terrain and sea level across 1 km grid squares. This model predicted natural patterns of water table depth and so did not account for any pumping or irrigation carried out by humans.

At global scales, the model showed that sea level was the main driver of water table depth, with 'shallower' water tables nearer coasts and extending further inland where the land was lower and flatter. At regional scales, climate had a more significant effect; water tables were deeper in areas of low rainfall, such as deserts, but shallow in areas with high recharge rates, such as tropical swamps.

At smaller local scales, terrain had the greatest effect, with water tables closest to the surface in valleys. This effect was particularly strong in river valleys in areas where rainfall was low; in this case, water was concentrated into these small areas across the landscape.

Overall, the model predicted that 22-33% of the global land area is affected by shallow groundwater in multiple ways. Groundwater feeds lakes and rivers, wetland habitats rely on groundwater in times of low rainfall and, finally, shallow groundwater provides an important water source for vegetation.

To assess the accuracy of the model, the researchers compared the model's predictions and actual measurements. These comparisons showed that, although there were some differences, the model accurately reflected overall, broad-scale patterns in groundwater depth.

The researchers conclude that this study gives an insight into natural patterns of groundwater around the world. However, they also call for better monitoring of this important resource. The large gaps in data across countries, as well as the fact that measurements were taken at different times, mean that the model could be substantially improved if better data were available.

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