



THE WOODS HOLE RESEARCH CENTER

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The ground we walk on: It's part of global warming

Accelerated warming is not inevitable, but changing our course requires mindfulness.

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I recently explained to my son's elementary school class that I do research on soil. What, they wanted to know, was the difference between soil and dirt? After some discussion, we concluded that soil is where most land plants grow, and dirt is the stuff that makes moms mad when it gets on the carpet and under fingernails.

As my son gets older, I'll carry the lesson further and explain that soil is black because it contains carbon, and carbon is also something that we need to keep in the soil, rather than get loose in the atmosphere. Microbes that live in the soil eat the soil carbon, and they tend to eat faster when the soil is warmer. Already, global warming is causing microbes to decompose soil carbon more rapidly, thus releasing it into the atmosphere. Global warming feeds back upon itself by making soil microbes work faster, releasing more carbon dioxide, and thus further accelerating global warming. The main culprit behind global warming is our seemingly insatiable burning of coal, oil, and natural gas, which is releasing carbon into the atmosphere.

Despite a few vocal holdouts, the debate about whether global warming is actually happening is essentially over. Just as the lingering scientific doubts about the health risks of smoking faded away in the 1970s, the global warming skeptics are fading fast now. Overwhelming evidence of melting glaciers and sea ice and early spring blooms and bird migrations has hit home for scientists and nonscientists alike. Topics addressed at scientific conventions now focus on how far and how fast global warming will go and what the consequences will be for providing food, water, and shelter for humans and habit for animals. The release of soil carbon to the atmosphere is gaining attention because of its huge potential to accelerate the rate of global warming. More than twice as much as carbon exists in soil than in the atmosphere or in living plants.

There are some possibilities for increasing soil carbon storage, such as encouraging farmers to adopt modern practices that minimize the tillage needed to plant crops. In addition to causing global warming, the extra carbon dioxide now in the atmosphere also has a modest salutary effect of helping some plants to grow faster, which increases carbon inputs to the soil. However, the current evidence is that these soil carbon increases aren't enough to counter the potentially huge carbon releases into the atmosphere that result when permafrost thaws and peatlands dry out. To be sure, our understanding of what makes soil carbon change is incomplete, but we know enough to be worried that huge stocks of soil carbon in the arctic are at risk of being lost as the earth warms, thus making the warming worse.

Accelerated warming is not inevitable, however. We could slow or reverse the process by making more efficient use of coal, oil, and gas and by increasing renewable sources of energy, such as wind power, solar energy, and biofuels. Just as kids can be trained to wipe their feet to keep dirt off of the carpet (at least most of the time), we could also train ourselves to curb our voracious appetite for burning fossil fuel. Mom's wrath may suffice to keep dirt off the carpet, but we adults will most likely need strong economic incentives to learn to conserve energy in our cars, homes, offices, and



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industries. What a great lesson it would be for our kids, and one that they would thank us for the rest of their lives, if we kept global warming under control and kept the dirt and soil carbon where it belongs.