W
hoops! Science now brings news of the difficulty of predicting when ice will melt as air temperature increases. The messengers are Horst Machguth and colleagues in their recent *Nature Climate Change* paper on Greenland ice cap melting, and Luke Trusel and colleagues’ recent *Nature Geoscience* paper on Antarctic ice shelf melting.

The important lesson here is not that touted by the media: “What scientists just discovered in Greenland” or “Antarctic sea ice melting fast.” This wrongheaded focus on what science discovered, and on scientific knowledge, misses a much more serious message.

But first, why is the science of melting polar ice so intractable? Pull an ice cube from your freezer, and put it on your countertop. It will quickly melt into a pool of liquid water. Seems simple enough. So how is melting polar ice different?

Ice in Greenland and Antarctica does not just melt. It melts, then refreezes, then melts again, and refreezes again, and on and on, as the temperature fluctuates from just above to just below freezing. It is a little like the process that forms treacherous black ice on Vermont roads.

Moreover, when snow falls it is relatively granular. Gradually over time this porous snow gets compacted into ice. Thus, the surfaces of the Greenland ice cap and Antarctic ice shelves are not solid blocks of ice, surrounded by much warmer air. Rather these surfaces consist of a complicated mixture of granular snow (known technically as firn), ponds, flowing rivers and streams of meltwater, and ice.

Liquid meltwater can run across the ice surface, run down into cracks in the ice, or infiltrate into the firn, and some meltwater refreezes into sheets of ice. And whereas most all sunlight gets reflected off white snow, liquid water absorbs considerably more sunlight, thereby increasing surface temperatures. Moreover, the Antarctic ice shelves act a bit like corks, holding back massive inland glaciers that would otherwise flow and melt into the sea.

The complexities just go on and on. None of this is static. It all changes dynamically, across the surface of the ice, at different depths, and as time progresses.

The solution to this complexity, and the uncertainty it spawns, is not more scientific research. (Though I am in favor of that, and oodles more money for earth scientists, too.) Rather, climate change law and policy needs to be grounded in, and to act on, not what science knows, but on what science does not know. That is the critical and real message of these two articles.

Law, policy, and media mostly focus on scientific knowledge. Yet the focus of science is not on knowledge, but on the complement to knowledge — that is, on what we do not know. I guarantee that more nasty surprises like those uncovered by Machguth and Trusel lurk. I don’t know their probability or details. I do know that there is a significant chance that melting polar ice will cause catastrophic sea-level rise — over 1 billion people live within 100 kilometers of the ocean and less than 100 meters above sea level, and coastal areas contain a disproportionate amount of human wealth, capital, and infrastructure.

If ever a circumstance cried for a policy of precaution, this is it. Yet current climate policy debates whatever 1.5º or 2º Celsius is the better target, and the climate deniers remain quite viable politically in the United States. Yet the immediate problem is not half a degree, or the truth of climate change, but rather the unknown, and likely unknowable, the probability of catastrophic climate failure.

It is a fundamental principle of control engineering that, before you do anything else, you keep your rocket in the region of parameter space where you can control it. Thus, the rocket scientist first makes damn sure that his rocket will not start to tumble end over end, uncontrollably. Then, and only then, does he shift the focus to ensuring a nice smooth landing. Yet current climate policy deeply discounts the probability that the Earth’s climate will start to tumble end over end, and fails to act to prevent it.

A cynic might contrast the cold water running off the Greenland ice cap and the Antarctica ice shelves, to the hot air emanating from COP 21. We have now had 21 Conferences of the Parties, and yet atmospheric carbon dioxide levels measured at Mauna Loa continue to rise, unabated. After 21 replicates of this particular failed experiment, on what basis could anyone seriously think that the 22nd, 23rd . . . Nth replicates will produce a different result? I don’t.

Climate science is, and will remain, uncertain. Climate policy is failing. Of that, I am certain.