# FEATURE PROPOSAL: Douglas Fox

On November 28, 2007, a small ski-mounted propeller plane dropped me and 3 glaciologists in a remote spot in the middle of million square miles of empty ice—the West Antarctic Ice Sheet (WAIS). As the plane departed we found ourselves profoundly alone, with only a pile of boxes and bags, in a disorienting landscape—flat ice in every direction. For the next few weeks we lived in tents, riding snowmobiles up to 10 hours per day as we explored places where humans have never stepped before. Our objective: study the movement of the WAIS—at 700,000 cubic miles, the second largest hunk of ice on Earth—and one that glaciologists are increasingly concerned about in the face of climate change. The WAIS's structure makes it uniquely vulnerable to runaway melting. Some parts of it are thinning rapidly, and its melt water could raise sea levels by 15 feet.

"It is the banana belt of Antarctica," said Slawek Tulaczyk, our expedition leader, as he reassured me that life on the WAIS would be pleasant. But you have to weigh Slawek's soothing words against his own comfortless upbringing: he grew up in a small coal-mining town in Communist-ruled Poland, and briefly worked underground in the mines himself before finding his way to the U.S. and rising to become a prominent glaciologist at the University of California in Santa Cruz. In fact, Tulaczyk actually meant to say that I would need to sleep at night with my laptop computer in order to keep it warm enough to boot in the morning. And summer storms would choke the air with blowing snow, forcing us to plant flags on bamboo poles to mark the way between our tents—lest someone wander off-course into the whiteout (a very real danger) during the 20-yard trek between tents.

Exploring an Antarctic ice sheet, hundreds of miles from any other humans, is an exercise in self-reliance—with dire consequences for the smallest misstep. Tulaczyk studied satellite photographs in advance to plan our travel routes around crevasse fields. Rapidly moving parts of the ice—like the area we visited—are riddled with crevasses, often 10 feet across, hundreds of feet deep, and hidden beneath fragile crusts of snow. We traveled on snowmobiles roped-up like mountaineers, using ice-penetrating radar to detect crevasses in our path. Even so, the expedition nearly ended in tragedy, with a certain science journalist (myself) narrowly avoiding plunging—and wedging—deep in a crevasse.

We used radar to study the landscape below the ice, and planted GPS sensors that will track the ice's movement to the nearest centimeter, every 10 seconds, for 2 years. The goal is to understand how the landscape below the WAIS controls its movement—and ultimately, its stability. It's an important question.

The WAIS is the only ice sheet on Earth whose bed sits below sea level—making it sensitive to warming oceans. It straddles a vast rift valley like that in Africa, with geothermal heat and volcanoes gradually melting its bottom layer, producing melt water that lubricates its movement over the rocky continent and causes glaciers to flow more quickly toward the sea. In January 2008, researchers reported evidence that one volcanic eruption 12,000 years ago blasted a hole through 1,000 feet of ice. And a satellite study, reported in January 13, 2008, showed that the WAIS and the Antarctic Peninsula are loosing 210 cubic kilometers of ice per year—up 60% in the last decade.

**I will weave a first-hand account of our 6-week expedition together with an exploration of other rapidly evolving research on the WAIS.** Apart from deep-field expeditions, researchers rely heavily on satellites to monitor changes in the WAIS—but few satellites actually travel in orbits that allow them to see the Earth's poles.

When Bob Bindschadler (NASA Goddard) wanted to study how the WAIS has changed over the last few decades, he was forced to search through declassified spy satellite photos from the Cold War. He finally found two images, taken by the CIA's Corona satellites on October 29, 1963 (these satellites monitored the Soviet military; they captured photos on massive spools of film which were parachuted back to Earth and recovered mid-air by aircraft). Compared with modern images, those photos revealed surprisingly rapid changes in the very part of the WAIS that our expedition visited in November-December 2007.

At a time when monitoring the WAIS is more important than ever before, satellite observations are gradually succumbing to a black-out. Several satellites that currently monitor the WAIS are nearing the end of their lives. And in early February, 2008, NASA announced that only 2 out of 4 requested ice-monitoring satellites will be launched in the next 5 years. "It's a slap in the face that they're planning to put these very same satellites into orbit around Mars and the Moon, but not around Earth where they're desperately needed," says Eric Rignot, a glaciologist at NASA Jet Propulsion Laboratory.

Tulaczyk's initial data, analyzed since we returned home on December 23, document the WAIS's bizarre private life. The ice sheet sits still most of the time, but then twice per day it lurches 18 inches toward the ocean—triggered by the ocean tides, hundreds of miles away, lifting up the Ross Ice Shelf, a Spain-sized tongue of ice that extends out from the edge of the WAIS. Our GPS sensors caught these lurches, and our seismic sensors caught the magnitude-1 to -2 "ice quakes" that occurred along with them. Tulaczyk's instruments will continue to eavesdrop on the Ice Sheet's movements for the next 2 years.

I will also document another important study which I viewed first-hand during my time at McMurdo Station (the main U.S. research base in Antarctica). By drilling into the sea bed at the edge of the Ross Ice Shelf, researchers are documenting how the Ice Shelf and the WAIS have responded to past climate changes—an important insight for people who are trying to predict how the WAIS will respond to warming temperatures this century. So far, the project has revealed that ice has responded strongly to climate change—expanding and withdrawing 60 times over the past 10 million years. The project's latest findings will soon be announced at a major European geology meeting on April 12-16, 2008; I am privy to these results, and will include them in the story.