of floodwater rushed downstream, where its effect on the overlying ice was captured in the velocity record. The timing of the onset of speed-up matched that of the lake drainage and the slow-down coincided with the flood cessation. During the event, the ice velocity increased by 10% compared with the glacier's average speed during previous decades, and the high flow speed lasted for an incredible 14 months. The link between floods and ice flow has serious implications for Antarctica's ice-sheet mass balance: floods can modify the rate of delivery of mass (of solid ice) to the Southern Ocean. During the 2005 event, Byrd Glacier discharged around 8% more mass than normal, which will affect estimates of mass loss using flux methods[9].

Predicting the future behaviour of the Antarctic ice sheet, and its contribution to sea-level rise requires an improved treatment of its subglacial system in ice-sheet models. Unfortunately, the ICESat record is short (2003–2008) and we therefore do not know how frequently floods and related speed-up events occur. In addition, the temporal resolution of Stearns and colleagues' velocity time series is not sufficient to determine whether a speed-up had occurred before their reported 2005 event. More observations are needed to quantify the frequency of such events. ICESat-II, scheduled to launch around 2015 into a similar type of orbit as ICESat, will extend the length of the laser altimeter time series over the lakes. These observations, combined with coincident velocity measurements from other satellite missions (such as InSAR), should provide much needed information in understanding the subglacial system and the ice sheet's response.

ICESat has provided glaciologists with a new tool for surveying and monitoring the nature of the subglacial system; coincident observations of ice velocity allow us to link these observations to the motion of the ice sheet. Leigh Stearns and Ben Smith, who discovered the exciting link between their separate data sets of ice velocity and the 2005 lake drainage event in a coffee break at the 2007 Fall Meeting of the American Geophysical Union, have made excellent use of the available data. Their pivotal paper provides the piece in the water–iceflow puzzle that had been missing so far: direct evidence for glacier acceleration as a result of subglacial floods.

Published online: 16 November 2008.

References

1. Robin, G de Q. *Int. Ass. Sci. Hydrolog.* 86–97 (1970).
2. Gray. L. *et al. Geophys. Res. Lett.* **32,** doi: 10.1029/2004GL021387 (2005).
3. Wingham, D., Siegert, M., Shepherd, A. & Muir, A. *Nature* **440,** 1033–1036 (2006).
4. Fricker, H. A., Scambos, T., Bindschadler, R. & Padman, L. *Science* **315,** 1544–1548 (2007).
5. Stearns, L., Smith, B. & Hamilton, G. *Nature Geosci.* **1,** 827–831 (2008).
6. Bell, R. E., Studinger, M., Shuman, C. A., Fahnestock, M. A. & Joughin, I. *Nature* **445,** 904–907 (2007).
7. Zwally, H. J. *et al. Science* **297,** 5579 (2002).
8. Joughin, I. *et al. Science* **320,** 5877 (2008).
9. Rignot, E. *et al. Nature Geosci.* **1,** 106–110 (2008).

CARBON CYCLE

A return to Soviet soils

© DZIANIS MIRANIUK / 123RF

The collapse of the Soviet Union in the early 1990s heralded an era of environmental recovery from intensive military and industrial expansion. Since then, greenhouse gas emissions and pollution have rapidly declined. Now, almost 20 years after the dissolution of the USSR, another benefit is beginning to emerge.

In its heyday, the former USSR was home to a large number of highly mechanized, collective farms: the very antithesis of the individual, family-run farms typical of the west. When the Soviet Union collapsed, many of those farms were abandoned, leaving large areas of land (estimated at around 20 million hectares) to be colonized by grassy vegetation. Nicolas Vuichard of the University of Tuscia, Italy, and colleagues, suggest that this agricultural abandonment has significantly increased the size of the region's carbon sink (*Glob. Biogeochem. Cycles*, doi:10.1029/2008GB003212; 2008).

In an effort to determine how much additional carbon these deserted croplands have taken up, the team used a vegetation model to assess cumulative carbon uptake between 1991 and 2000 in abandoned versus undisturbed agricultural land. The researchers found that following abandonment, the croplands switched from being a small source of atmospheric CO_2, releasing approximately 10 g carbon m^{-2} yr^{-1}, to a significant sink of atmospheric CO_2, taking up an average of 47 g carbon m^{-2} yr^{-1}. The cumulative increase in carbon uptake over this period was 373 g carbon m^{-2}.

The carbon gain during the 1990s resulted from an increase in vegetative returns to the soils, which lost a large amount of carbon in the Soviet era through the intensive harvesting of grain and straw. For this reason, current and future carbon benefits will depend on the management practices employed in the Soviet era — the less carbon farmers returned to the land back then, the greater the benefit we derive today.

Vuichard and colleagues estimate that it will take more than 50 years for the land to reach its pre-USSR carbon levels. In the meantime, the colossal collapse of Soviet agriculture in the early 1990s will be responsible for a net sequestration of 70 Tg carbon over the coming decades. Thus it seems that the Soviet era has inadvertently helped the capitalist world of the twenty-first century to a sizeable carbon sink.

Anna Armstrong