Lake Ellsworth: a candidate for Antarctic subglacial lake exploration

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Evidence is presented, from a variety of geophysical sources, on the physiography of a small subglacial lake in West Antarctica. Airborne radio-echo sounding defines the position of the lake, its length and tectonic setting. The lake is located at 79°S, 90°W, beneath about 3.5 km of ice, 20 km from an ice divide near the Ellsworth Mountains that separates the ice sheet from the Filchner-Ronne Ice Shelf. Interferometric Synthetic Aperture Radar from the lake's locale, and ice sheet balance velocities, show that ice flow across the lake is likely to be of the order of a few metres per year. The lake appears to be located within a distinct topographic hollow, which is over 1.5 km lower than the surrounding bed. The slope of the lake's ice-water interface is over 10 times greater than that found at Lake Vostok. As the slope of the ice-water interface is thought to control the circulation of water within subglacial lakes, this particular lake may be significantly more dynamic than most others (with less steep surfaces). Judging by the bed slopes flanking the lake, the water depth is highly likely to be several 10s (and possibly 100s) of metres. Numerical modelling of ice flow across the lake reveals the relative rates of ice accumulation and basal melting responsible for the lake formation. Although the lake is unlikely to be as old as Lake Vostok (or other East Antarctic subglacial lakes), its environment will be similar to any subglacial lake, i.e. cold, dark and under pressure of the overlying ice sheet. Consequently, adapted lifeforms may be expected as much in this lake as in any other. A proposal has been made to undertake a comprehensive geophysical survey of the lake. It is hoped that the full extent of the subglacial lake, and its bathymetry, will be evaluated within 5 years. This lake appears ideal for *in situ* observations, judging from the criteria for identifying appropriate candidates for exploration established by the SCAR Group of Specialists on Subglacial Antarctic Lake Exploration (SALE).