

Bed topography of the Byrd Glacier trunk from airborne radar soundings of the ICECAP Project

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Byrd Glacier has one of the largest catchments in Antarctica and delivers more ice to the Ross Ice Shelf than any other ice stream. The geometry of its trunk has implications for subglacial water activity, glacier flow history and ice sheet response to climate change. Byrd Glacier's massive ice flux is channeled through a fiord of only ~20 km width, resulting in severe convergence and crevassing that has posed a challenge to radar sounders. Combined with logistical issues and a lack of directed airborne campaigns over Byrd until recently, this has resulted in subglacial topography and ice thickness being constrained by a single profile acquired by the NSF/SPRI/TUD surveys of the 1970's; furthermore, the radar data for that profile were apparently lost. The ICECAP project has successfully acquired new radar sounding data over the main trunk of Byrd Glacier during the course of four field seasons, resulting in multiple definitive profiles of bed topography. The data show a basin within the trunk approx. 2.5 km below sea level, located ~75 km upstream of the grounding zone. This depth is largely consistent with the deepest detected echoes in the NSF/SPRI/TUD soundings; however, those data contained only sporadic returns in the deep zone and it is likely that some cross-track echoes were misinterpreted as bed returns for a portion of that single profile. Also, significant variations in bed topography, both across and along the trunk, are now evident with multiple profiles. These new radar soundings were accomplished using the University of Texas Institute for Geophysics (UTIG) High Capability Radar Sounder (HiCARS) operating at 60 MHz with a 15 MHz bandwidth.