

# A Rich Tephra Record in the WAIS Divide (WDC06A) Ice Core

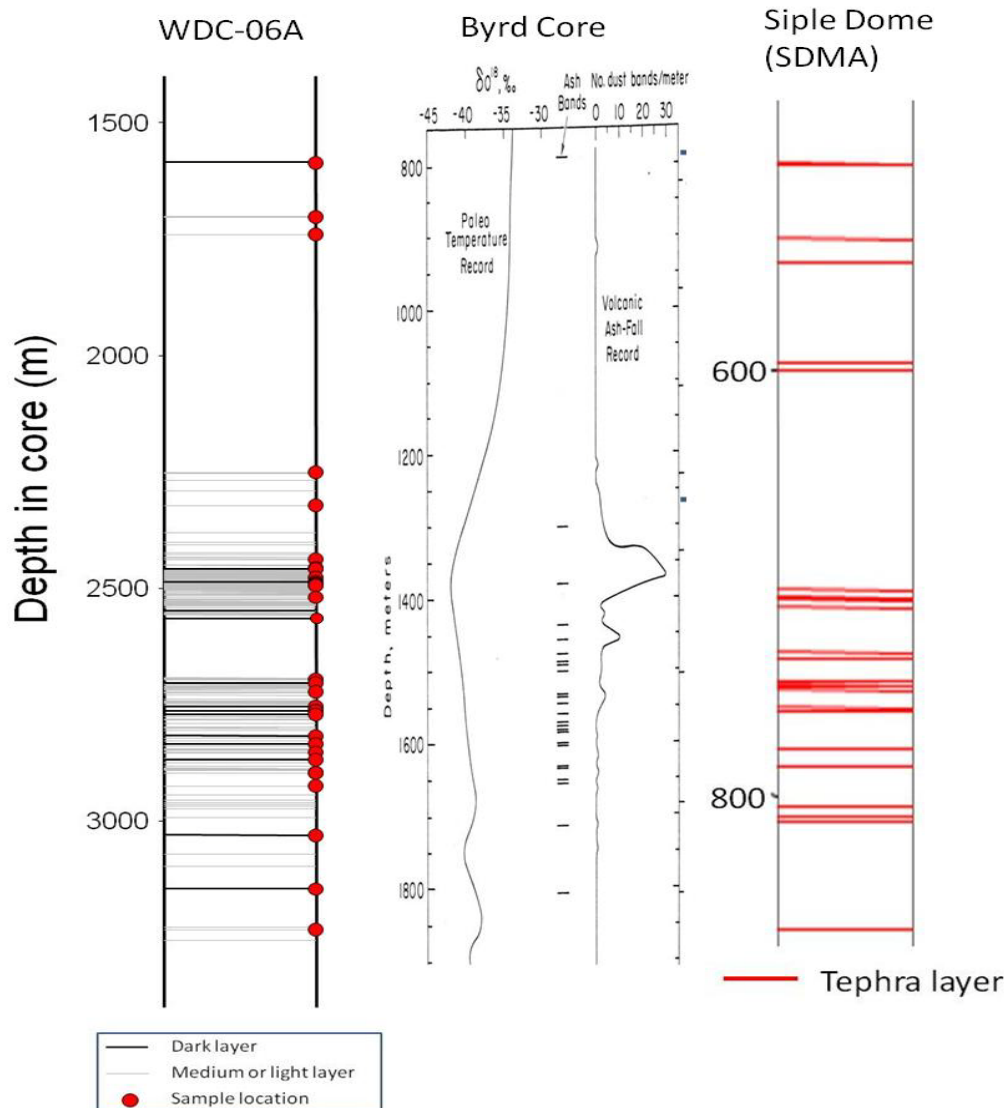
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Visible tephra layers have been a recognized as a common feature of Antarctic ice cores since one of the first deep cores, the Byrd Station ice core was drilled in Antarctica. Since then, visible tephra have been found in Vostok, EPICA Dome C, Dome Fuji, Central Dronning Maud Land, Collins Ice Cap, James Ross Island, Siple Dome, Taylor Dome, and the Talos Dome ice cores. However, the WAIS Divide ice core WDC06A may offer one of richest tephra records ever recognized in an ice core, rivaling the Byrd ice cores, which was estimated by Gow and Williamson (1971) to contain around 2000 individual tephra falls. To date, several hundred “dust bands” have been visually recognized in WDC06A (Fig. 1) through careful observation by on-site core handlers and subsequent core processing at NICL. The record of the depths of the layers in Fig. 1 was provided by A. Orsi, based on compilations from a large group of core handlers and processors. These “dust bands” are very likely to all be tephra layers based on comparison with the record in the Byrd ice cores in which many layers originally thought to be silicate dust were later determined, upon closer investigation, to be volcanic ash. More dust bands, particularly cryptotephra layers (sparse, fine-grained tephra layers with shard sizes <10 microns) may be found following downhole optical logging as was done for the Siple Dome ice core (Bay et al., 2001).

Qualitative comparison of the dust band (many of which are likely to be tephra) distribution in the WDC06A ice core with the Byrd and Siple Dome (SDMA) ice cores shows some similarities, but also some differences. The most notable similarity between the WDC06A and Byrd ice cores is the presence of a dramatic pulse of dust in the cores at a depth of around 1350 m. and the Byrd core and around 2500 m in the WDC06A core. This dust pulse, which in the Byrd core is recognized as tephra (Gow and Williamson, 1971), is interpreted to be derived from to activity of Mt. Berlin (Wilch et al., 1999). An older pulse of activity (between around 2700 and 2800 m. depth in the WDC06A ice core) appears to be better developed (or more fully observed) in the WDC06A core than in the Byrd ice core, although a number of distinct silicate layers are present in both cores. This volcanic activity is also apparent in the SDMA ice core, and many of the eruptions are geochemically linked to Mt. Berlin (Dunbar and Kurbatov, 2011).

Samples of 33 dust bands were collected from the WDC06A ice core in August 2011. The sample preparation of these layers is underway, and by the time of this meeting, we hope to be able to present some quantitative correlations between the WDC06A, SDMA and Byrd cores. Among possible correlations would be a distinct “visible brown layer” at a depth of 1586.363 m. in WDC06A (8.279 Ky BP preliminary age), which is very likely to be from a major eruption of the West Antarctic volcano Mt. Takahe. This eruption is dated at  $8.2 \pm 5.4$  using  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology (Wilch et al., 1999) and is observed at a depth of between 503.58 and 503.87 m in the Siple Dome A core (SMDA) corresponding to ages between 8.167 and 8.181 Ky before 1950 (Dunbar and Kurbatov, 2011). A layer almost certainly corresponding to this one was identified and analyzed in the Byrd ice core at a depth of 788 m (Palais et al., 1988).



**Figure 1. Qualitative comparison of the dust band record in the WDC06A with the tephra records in the Byrd and Siple (SDMA) ice cores. Chronologies of the Byrd and SDMA cores from Blunier and Brook (2001), Taylor et al., 2004 and Brook et al., 2005.**

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