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Research Interests: Behavior of the ancient geomagnetic field. Statistical analysis of paleomagnetic data. Applications of paleomagnetic data to geological problems.

My research over the past year has focused on a few major themes including: 1) variations in the strength of the geomagnetic field over the past seven millennia as recorded in Israeli and Jordanian copper mining slag heaps, and 2) paleomagnetic and rock magnetic studies of sediments recovered during IODP Expedition 318 on the Wilkes Land margin and the Adelie Basin, Antarctica.

Topic #1: Last year we reported on data obtained from an excavation led by Prof. T.E. Levy (Dept. of Anthropology, UCSD) of a thick pile of copper mining slag in Jordan. Our results, published by Ben-Yosef et al. (2009) demonstrated rapid changes in field intensity in a period of overall high field values. This year, we excavated a second section in a nearby Israeli site thought to be the same age (Figure 1). Our results from this second excavation replicated the first and documented two episodes of extremely high magnetic fields and extremely rapid rate of change (Shaar et al., submitted). Furthermore, Shaar et al. (2010) published results examining the behavior of copper mining slag and established its reliability for archaeointensity research. Finally, in a pair of papers, Ben-Yosef et al. (2010a,b) extended our research to older material.



Figure 1: Excavation in Timna Valley, Israel. To the right is a small slag mound which is co-eval with the mound described by Ben-Yosef et al. (2009).

Topic #2: The Antarctic cryosphere plays a key role in the global climate system and its history therefore plays a role in the current climate change debate. Drilling on the Antarctic Wilkes Land margin (IODP Expedition 318, January – March, 2010) was designed to recover sedimentary archives documenting the onset of glaciation at ~34 Ma and its entire history up to

and including the Holocene. A critical aspect of the goals of the expedition is documenting the age of the sediments and sedimentary hiatuses. Extensive paleomagnetic analyses were carried out during the expedition. The magnetic stratigraphy provides crucial constraints on the position and duration of hiatuses as well as calibration for the biostratigraphies in the southern ocean, where direct calibration is notably scarce. Furthermore, magnetic fabrics, mineralogy and grain size provide intriguing clues to environmental changes recorded in this unique sedimentary sequence.

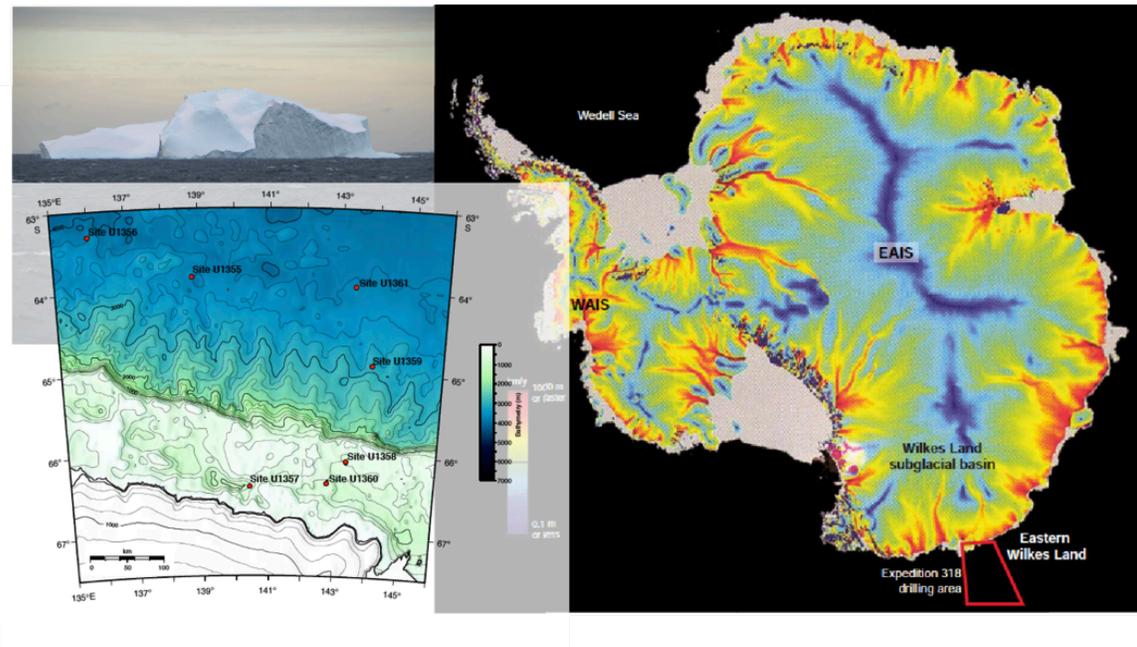


Figure 2: Location of IODP Expedition 318 drill sites on the Wilkes Land Margin.

Relevant Publications

Ben-Yosef, E., Tauxe, L., Levy, T.E., Shaar, R., Ron, H., and Najjar, M., Archaeomagnetic intensity spike recorded in high resolution slag deposit from historical biblical archaeology site in Southern Jordan, *Earth Planet. Sci. Lett.*, doi:10.1016/j.epsl.2009.09.001, 2009

Ben-Yosef, E., Levy, T.E., Smith, N.G., Higham, T., Najjar, M. and Tauxe, L., The beginning of Iron Age copper production in the southern Levant: new evidence from Khirbat al-Jariya, Faynan, Jordan, *Antiquity*, 84, 724-746, 2010a.

Ben-Yosef, E., Tauxe, L., Levy, T.E., Archaeomagnetic dating of copper smelting site F2 in the Timna Valley (Israel) and its implications for the modelling of ancient technological developments, *Archaeometry*, doi: 10.1111/j.1475-4754.2010.00528, 2010b.

Shaar, R., Ron, H., Tauxe, L., Kessel, R., Agnon, A., E. Ben-Yosef, J.M. Feinberg, Testing the accuracy of absolute intensity estimates of the ancient geomagnetic field using copper slag material, *Earth Planet. Sci. Lett.*, 290,201-213, 2010.