Research Interests:

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

The research during 2017 of myself and my students and post-docs was primarily focused on the study of the ancient geomagnetic field, focussing on the strength. Most of this work was done on the last 10,000 years using either archaeological (metallurgical slag, ceramics) or geological materials (lava flows). Three former post-docs in the Scripps Paleomagnetic Laboratory produced new constraints on the geomagnetic field variations of the Levant (Ben-Yosef et al., 2017), Georgia (Shaar et al., 2017) and China (Cai et al., 2017a,b). The bottom line is that we have confirmed the existence of a regional high (spike) observed in the Levant and Georgia. The evidence for a spike as far East as China is weak, however.

On another related front, we made some progress toward the goal of better understanding the paleointensity method in general. Cai et al. (2017c) resampled the Hawai’i Scientific Drilling Project (HSDP) drill core previously studied using traditional methods by Laj et al. (2011; doi:10.1016/j.pepi.2011.05.007). Cai et al. analyzed the quickly cooled parts of the same lava flows using the approach outlined previously by Cromwell et al. (2015; doi:10.1016/j.pepi.2014.12.007). They found a systematic difference between the two approaches. Based on the successful results of the Cromwell paper, in which they recovered the field strength known from the International Geomagnetic Reference Field for Hawaiian lava flows by sampling glassy flow tops and applying strict selection criteria (CCRIT), it is
likely that the ‘traditional’ approach which targets flow interiors and a much looser set of criteria (PICRIT03) yields biased results.

Figure 2: Paleointensities from Laj et al. (2011; doi:10.1016/j.pepi.2011.05.007) (black solid/open dots), SIO_CCRIT (red dots), and SIO_PICRIT03 (cyan dots) versus HSDP2 lava flows and ages. The open dots represent Laj data without paleointensity sigma uncertainty alues. The cyan arrows show two SIO_PICRIT03 results with intensities greater than 100 μT. [Figure from Cai et al. (2017c).]

Publications from 2017 Archaeomagnetism:


Paleointensity:


Techniques: