Inverse magnetic fabric of anisotropy of magnetic susceptibility in tsunami deposits

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Preferred orientation of minerals (e.g., mineral fabric) preserve information about depositional processes that can be used to reconstruct flow orientation of sediments and magma. Anisotropy of magnetic susceptibility (AMS) is a proxy for determining the preferred orientation of magnetic minerals. Given that magnetic minerals, such as magnetite, mimic the alignment of rock-forming minerals, this technique is the easiest and quickest technique used to measure paleo-flow directions. Since the 2004 Indian Ocean Tsunami, this technique has been used on recent- and paleo-tsunami deposits to try to extract tsunami's information. However, it is unclear if the alignment of magnetic minerals measured by AMS are an accurate proxy for the tsunami's flow direction. Although some studies clarified that AMS can mimic magma flow directions by distribution anisotropy, it has not been interpreted the mechanism for unconsolidated sediments yet. It needs a verification to compare the results between AMS and the other magnetic anisotropy technique. Kon et al. (2017) used anisotropy of anhysteretic remanence magnetization (AARM) that can trace the alignments of remanence-carrying single-domain magnetic mineral. The AARM results indicate that lower susceptibility samples of tsunami deposits showed 'inverse magnetic fabric' where magnetic axes are interchanged. In this case, AMS cannot be used to determine paleo-flow direction. Based on this result, AMS methods alone may not be enough to measure paleo-flow directions from tsunami deposits. In this presentation, we explain such discrepancy by fabric tensor and also stereology. This understanding will help to estimate paleo-flow directions of unconsolidated sediments and also igneous rocks.