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Magnetic anisotropies for tsunami deposits: Application to the 3.11

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Tsunami deposits consist of well-sorted fine sand intercalating with non-marine black organic mud. It is difficult to reveal a transport direction of the deposit if the deposit showed no sedimentary fabrics,such as ripples. The proxy of anisotropy of magnetic susceptibility (AMS) appears to be a promising tool for the study of flow fabrics in recent-tsunami deposits such as Sumatra tsunami (Wassmer et al. 2010). The AMS fabric might allow us to reconstruct transport directions of unconsolidated tsunami sediments during emplacement because AMS provides a cryptic alignment of ferromagnetic and paramagnetic minerals. Such cryptic minerals, such as magnetite or phyllosilicate minerals, would behave as a different emplacement mode in a different hydrodynamic condition. In the AMS fabrics of volcanic rocks, there are large discrepancies between the magnetic lineation and the framework-forming silicate linear fabric. This suggests that the uncorroborated use of bulk AMS to detect flow fabric in tsunami deposits has risks. In this article, we show that the anisotropy of anhysteretic remanent magnetization (AARM) may resolve the difficulties. The combination of inundation eye-witness, SEM, AMS, and AARM confirms the flow pattern of recent- and paleo-tsunami deposits from the geoslicer sampleing at Rikuzen-Takata city, Japan during 2011, 11th March Tohoku tsunami. We determined if the sandy deposits are of tsunami from these magnetic anisotropies.

Keywords: tsunami deposits, paleomagnetism, anisotropy of magnetic susceptibility, anisotropy of anhysteretic remanent magnetization