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Past variability of the Indonesian Troughflow Using Magnetic Anisotropy and Sedimentary Grain Size in a Core from the Halmahera Sea

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The Halmahera Sea in the eastern part of Indonesia is on the path of the eastern branch of the Indonesian Throughflow (ITF), a key current for the global oceanic circulation, which transfers the Pacific waters to the Indian Ocean. Time variability of this current may have a great impact on the global circulation but it is still poorly known. In 2010, during the MONOCIR cruise on board the R. V. *Marion Dufresne*, a core (MD10-3339) was collected from the central part of the Halmahera Sea at a water depth of 1919 m. The age model of this 39 m long core was established using the oxygen isotope record and 20 radiocarbon ages. It shows that the core covers the last 70 ka with a rather regular sedimentation rate of about 60 m/ka. A detailed study of the magnetic properties, and in particular of the anisotropy of the magnetic susceptibility (AMS), coupled with sortable silt analyses, has been conducted on this core.

The magnetic susceptibility (κ) and the anhysteretic (ARM) and isothermal (IRM) remanent magnetizations with values reaching 2 x 10^{-4} SI, 1 A/m and 8 A/m, respectively, at the top of the core decrease abruptly at about 1.8 m ($\sim$2 ka). Below, the values are low and rather constant. ($\sim$60 x 10^{-6} SI; 0.03 and 0.5 A/m, respectively). This illustrates a diagenetic dissolution of the magnetic grains. As a consequence, the fine magnetic grains are partly dissolved as also shown by a drop in the ARM/$g\kappa$ ratio. Consequently, the record of the earth magnetic field direction is noisy but the inclination is on the average statistically consistent with the expected one at this latitude (-12° $\pm$ 18°). The mean declination was therefore used to orient the core in the horizontal plane.

The degree of anisotropy (Pj) varies between 1 and 2% and the magnetic fabric is mainly triaxial with a slight tendency toward oblateness. A magnetic lineation is present in the stratigraphic plane and its orientation is not random. A rather clear SSW – NNE preferential alignment of the maximum axes is present all along the sequence. This orientation is consistent with the ITF path through the basin. No change in the shape of the magnetic fabric is observed but an increase in the mean size of the sortable silt is observed between the top and 8 m (about 15 ka) and the SS remains relatively coarser and constant (around 20μm) in the rest of the core. This suggests a relatively stronger bottom current related to ITF during the glacial time which would indicate and intensification of the Southern Pacific Ocean influence in the Halmahera Sea, associated to the ENSO intensification.

Keywords: Magnetic anisotropy, sortable silt, Bottom current, Indonesian Throughflow, Halmahera Sea