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Past variations of the deep circulation in the South China Sea reconstructed using magnetic properties of sediments.

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Pacific deep waters enter into the South China Sea (SCS), passing the Luzon strait at about 2400 meters depth. These deep waters invade the SCS through a basin-scale cyclonic circulation. After upwelling in the southwestern part of the SCS, they return into the Pacific, again through the Luzon strait, as an intermediate water mass. Variations of the intensity, depth and path of this deep water mass in the past are still poorly known at the scale of the entire SCS. These past variations can be traced using the terrigenous fraction of the marine sediment. Indeed, oceanic water masses transport and re-distribute within the SCS more than 700 million tons of fluvial sediments which are yearly delivered by the surrounding continental regions into the SCS.
In particular previous studies have shown that the composition of the magnetic fraction of the river sediments drained into the SCS is significantly variable from north to south. On the basis of this knowledge, we examine the magnetic properties of a number of cores distributed along the Asian continental margin in a roughly N-S transect from off the Pearl River canyon to off the Mekong river delta. The cores, distributed in depth between 1400 and 3200 m, cover at least the last climatic cycle with sedimentation rates of the order of 10-20 cm/ka.
Low field susceptibility, anhysteretic (ARM) and isothermal (IRM) remanent magnetizations, S-ratio, HIRM have been measured with a resolution of 4 cm giving access to the magnetic coercivity and concentration. Thermal demagnetization of three axes IRM allow to identify the magnetic minerals associated to each coercivity family determined by hysteresis parameters, FORC diagrams and log Gaussian decomposition of IRM acquisition curves. Time and space changes are observed in the relative proportion of magnetite which is a signature of the northern rivers with respect to hematite which characterizes the southernmost regions. The clearest changes are at the glacial/interglacial scale with more hematite present during glacial stages than during interglacials. The glacial/interglacial contrast is very minor in the north and increases southward. It suggests that the deep water mass was active during interglacials bringing magnetite type sediments from the north to the south where it mixes with hematite rich sediments while during glacials, the deep circulation was very significantly reduced emphasizing the "physical" separation of the two main sedimentary end-members. Comparison with other data and reconstructions will be discussed.