A new furnace for improving thermal demagnetization in paleomagnetism

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Thermal demagnetization furnaces are routine facilities for paleomagnetic studies. The ideal thermal demagnetizer should maintain “zero” magnetic field during thermal treatments. However, magnetic field noises, including residual magnetic fields of material and induced fields caused by the heating current in the furnace are always present. The key to making high-performance demagnetization furnace is to reduce the magnetic field noises. By combining efficient demagnetization of shielding and a new structure of heating wire, we have developed a new demagnetization furnace with low magnetic field noises. Repeated progressive thermal demagnetization experiments using specimens that were previously completely thermal demagnetized above their Curie temperature were carry out to explore the effects of field within various types of furnace during demagnetization. These experiment confirm that magnetic field noises in the furnace can have an observable and detrimental impact on demagnetization behavior. Comparison between commercial furnaces and our new design show a notable reduction in the impacts of on thermal demagnetization behavior. The new heating element design and procedure for reducing magnetic field noises represent a significant improvement in the design of thermal demagnetizers and allows for extremely weak specimens to be successfully measured.