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Towards image based assessment and characterization of cyclic paleo-wind and flow fields

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Cylcostratigraphy is used to investigate quasi-cyclic patterns in sediments. It often provides insight about time and climate. While most studies utilize proxies related to precipitation and temperature, reconstruction of wind and flow directions is more challenging. Due to this, the dynamic change of atmospheric circulations from geophysical data is not well established on orbital timescales. One key method for this purpose is the assessment of the anisotropy of the magnetic susceptibility. Nevertheless, the so derived data are of volume-integrated nature, i.e. a result of the combined mineral composition and structure of the entire investigated sample material. Accordingly, it would be most favorable to link and assess the volume integrated data with spatial sample features. X-ray micro computed imaging enables extensive and non-destructive sample material characterization in three dimensions, with special regards to mineralogical, textural, geometrical and topological material features. By combining volume specific magnetic anisotropy data with state of the art X-ray micro CT imaging data sets, we can derive spatially resolved information about (e.g.) grain sizes, grain shapes, sorting, layering patterns, preferential grain / pore/ layer orientations, secondary precipitates, pore sizes, pore shapes and many other parameters. With this, we greatly increase our understanding about the ancient depositional environment, which is important for investigating and characterizing the dynamic and quasi-cyclic wind and flow fields.