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NW African millennial-scale climate variability during the late Quaternary: validation and use of XRF core scanner measurements as proxies for terrigenous input and sediment-transport mechanisms.

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We present a detailed reconstruction of NW African millennial-scale climate variability during the late Quaternary (∼120 ka) inferred from sediment core GeoB7920-2 off Cape Blanc, NW Africa. High-resolution XRF measurements, the proportion lithogenic material, and grain-size distributions of the lithogenic fraction show an in-phase link between variations in high-latitude temperature and low-latitude climate changes.

High-resolution XRF measurements (∼200 yr) of the element Silicium (Si) match well with the lithogenic fraction as calculated by removing all organic material, calcium carbonate, and biogenic opal from bulk sediment. End-member modelling (Weltje 1997) of the grain-size distribution of the lithogenic fraction resulted in three sediment populations, which are interpreted as reworked shelf sediments, eolian dust, and river-derived mud, respectively. The Zirconium-Potassium ratios (Zr/K) calculated from XRF core-scanner measurements are in good agreement with the coarsest grained lithogenic end member. Variations of the coarsest lithogenic end member co-exist with sea-level lowstands and are probably related to exposure of the continental shelf rather than enhanced atmospheric circulation. Furthermore, strong and abrupt increases of lithogenic material appear to co-occur with a stong decrease of the finest lithogenic end member. These abrupt terrigenous input increases are in-phase with stadials as observed in the NGRIP ice core (Johnson et al 1992; NGRIP 2004). Additionally, wind-blown material is the largest contributor of lithogenic material off Cape Blanc and the availability of aeolian material strongly depends on vegetation

coverage. Therefore, we interpret the strong increase of lithogenic material and the decrease of the fine-grained end member during stadial periods as a decrease of the vegetation cover and fluvial activity on the continent. These data support the hypothesis that millennial-scale northern hemisphere temperature variations are supper imposed on the African monsoonal climate variability and are related with changes in the hydrographical conditions off NW Africa during the late Quaternary as suggested by deMenocal (2000).