**Methods:**

A total of 493 samples at ~2.5 m spacing from the Early Miocene to Holocene interval were utilized to conduct X-ray diffraction (XRD) analysis in order to determine the mineral compositions. The powdered samples were analyzed using PANalyticalX’Pert Pro X-ray power diffractometer with Ni-filtered Cu K-α radiation (λ=0.15418 nm) at 40 kV and 40 mA at the State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences (CUG). All 2θ scans were run from 3°to~65° at a speed of 0.417782°/s. Mineral types and their weight percentages were identified and calculated using X’pertHighScore by comparing measured diffraction peaks and intensities with standard reference patterns from the International Center for Diffraction Data (ICDD).

**Results:**

XRD analysis results show that the core mainly consists of carbonate minerals, together with very few terrigenous compositions (Fig. 1) (Zhai *et al*. 2015). The content of aragonite ranges from 0 to 64%, high-magnesium calcite from 0 to 29%, low-magnesium calcite from 0 to 100%, and dolomite from 0 to 100%, with an average value of 1.8%, 0.6 %, 52% and 44%, respectively. Low-magnesium calcite and dolomite are two major carbonate phases throughout the whole core. Aragonite and high-magnesium calcite mostly occur within top 33 m. Terrigenous minerals are composed of feldspar, quartz, chlorite, illite, pyrite, and kaolinite. They occur mainly within the intervals of 1257-1250 m and 1220-1210 m, and 1037-1036 m. The total abundance of various terrigenous minerals in these three intervals ranges from 3% to 99%, with an average value of 60%. Terrigenous minerals occur sporadically at other depths, except for these three intervals.

E:\controlling factors analysis\for xie\results 和 discussion 分开\Fig.6 Mineralogical composition of whole core.tif

Figure 1. Mineralogical composition of core XK-1 (contents in weight percent, wt %), showing this core is mostly composed of carbonate phases.

**Reference:**

Zhai, S., Mi, L., Shen, X., Liu, X., Xiu, C., Sun, Z. & Cao, J. 2015. Mineral compositions and their environmental implications in reef of Shidao Island, Xisha. *Earth Science-Journal of China University of Geosciences*, **40**, 597-605 [in Chinese with English abstract], doi: 10.3799/dqkx.2015.047