**Sampling and analytical techniques**

Twenty four samples of stream sediments and five rock samples were collected (Fig. 1). A field prospection of alluvium was carried out along the Lobo River and its tributaries in the Lobo watershed during the long dry season (November-March) when the river level is low. The watershed has been subdivided into upstream, central and downstream zones in order to highlight the variation of different parameters from an area to another. The applied field exploration techniques were similar to those described by Chaussier and Morer (1981) and Selley (1982). Sedimentary traps in rivers (e.g., meanders, potholes) were surveyed. The sediments have been collected manually at the bottom of the riverbed in proximity of meanders and potholes. Data on rivers flow directions were recorded with a compass and their geographic coordinates recorded and plotted on the map in Figure 2. Sand-size materials separated from the coarse-grained samples occurring at the bottom of potholes were washed and heavy mineral concentrates were collected by density difference. The sediments are placed in a pan and shaken sideways in circular motion while being held just under water; heavy minerals sink to the pan bottom and light minerals rise and spill out over the top. The analytical procedures were described by McClenaghan et al. (2011). Very fine-grained clasts (<0.05 mm) were separated from sediment samples by constant washing of the clastic mixtures. For each sampling point, about 2 kg of wet sediments were collected for laboratory analyses.

Sample separation and heavy minerals extraction were carried out at the Department of Earth Sciences, University of Yaoundé I (Cameroon). The different grain-size of sediments were mechanically separated in columns of six sifters with mesh hole ranging from 0.5 to 3.15 mm mounted on an electromagnetic machine. Each sieved contents were packaged. The fine fraction retained for further analyses (mineralogy and geochemistry) because of their high rutile proportion ranges from 0.5 to 0.8 mm in size. The heavy minerals (d > 2.89) were extracted with the help of bromoform which is a heavy liquid (d = 2.89). The selected fraction was poured in a test tube containing bromoform (0.5 l). After 5 minutes of agitation, the heavy minerals settled at the bottom of the tube while the lighter minerals remained in suspension. The collected heavy minerals were washed in 95% CH3COOH to eliminate bromoform, and in boiled 10% HCl acid (for 20 minutes) to eliminate oxide and hydroxide stains. The thin slides were mounted and the heavy minerals were morphologically examined and identified by a binocular magnifying glass. Morphological aspects of some heavy minerals are shown in figure 2.

Twenty four samples were analyzed in order to determine their mineralogical and geochemical compositions at the Geoscience Laboratories (Sudbury, Canada). The preparation of samples was carried out at the Department of Earth Sciences of the University of Yaoundé I. The mineral assemblage was identified by X-ray Diffraction (XRD). The analytical instrument is PAN Analytical X'PERT PRO diffractometer equipped with a monochromator using a Co Kα radiation of 1.7854Å over a range of 2.5° to 35° 2θ and a step size of 0.05° 2θ/min at 40 kV and 45 mA. The major element concentrations were determined by X-ray Fluorescence (XRF) after two-step of loss on ignition (LOI) at 105 °C under nitrogen and 1000 °C under oxygen. The powder samples were first ignited then melted with a lithium tetraborate flux before analyzing with a Rigaku RIX-3000 wavelength-dispersive X-ray fluorescence spectrometer. Samples were prepared by acid dilution for ICP-MS (Inductively Coupled Plasmas-Mass Spectrometry) analyses to evaluate lithophile trace element concentrations by acid digestion in closed beakers. They were melted with two acids (HCl and HClO4) at 120 °C in sealed teflon containers during one week; then in dilute nitric acid (HNO3) and dried. The residue was then redissolved in an acid mixture (HCl and HClO4) and dried for a second time before being dissolved in three acids (HNO3, HCl and HF) at 100°C. In the package, the trace elements are again calibrated and solutions made up from single or multi-elemental solution standards. The international standards as well as the internal standards of the laboratory were used. The instrumental precision of almost all elements was around 5% (2σ) and the detection limits were low for both major and trace elements.

Five rock samples were utilized to determine their petrography features and major element compositions. Thin sections were made at the Institute for Mining and Geological Research (Cameroon). The observations were done on a polarizing microscope in the Department of Earth Sciences, University of Yaoundé 1. X-ray Fluorescence was used to determine the major element concentrations after sample ignition as described previously in University of Lausanne, Switzerland.