Geophysical Research Abstracts
Vol. 19, EGU2017-903, 2017
EGU General Assembly 2017

Provenance of sediments from Sumatra, Indonesia

Christof Liebermann, Robert Hall, and Amy Gough

SE Asia Research Group, Royal Holloway, University of London, Egham, United Kingdom
(Christof.Liebermann.2014@live.rhul.ac.uk)

The island of Sumatra is situated at the south-western margin of the Indonesian archipelago. Sumatra is affected by active continental margin volcanism along the Sunda Trench, west of Sumatra as a result of active northeast subduction of the Indian plate under the Eurasian plate. Exposures of the Palaeozoic meta-sedimentary basement are mainly limited in extent to the northeast-southwest trending Barisan Mountain chain. The younger Cenozoic rocks are widespread across Sumatra, but can be grouped into structurally subdivided 'fore-arc', 'intramontane', and 'back-arc' basins. However, the formation of the basins pre-dates the current magmatic arc, thus a classical arc-related generation model can not be applied.

The Cenozoic formations are well studied due to hydrocarbon enrichment, but little is known about their provenance history. A comprehensive sedimentary provenance study of the Cenozoic formations can aid in the wider understanding of Sumatran petroleum plays, can contribute to palaeographic reconstruction of western SE Asia, and might help to simplify the overall stratigraphy of Sumatra.

This work represents a multi-proxy provenance study of sedimentary rocks from the main Cenozoic basins of Sumatra, alongside sediment from present-day river systems. The project refines the provenance in two ways: first, by studying the heavy mineral assemblages of the targeted formations, and secondly, by U-Pb detrital zircon dating using LA-ICP-MS to identify the age-range of the potential sediment sources.

Preliminary U-Pb zircon age-data of >1500 concordant grains (10% discordant cut-off), heavy mineral compositions, and thin section analysis from two fieldwork seasons indicate a mixed provenance model, with a proximal igneous source, and mature basement rocks.

An increase of the proximal signature in Lower-Miocene strata indicated by the occurrence of unstable heavy mineral phases such as apatite, and clinopyroxene suggests a major change of the source at the Oligocene-Miocene boundary. This can be interpreted as a pulse in the uplift of the Barisan Mountains. The presence of volcanic quartz in thin section supports this hypothesis. On the contrary, older sedimentary strata are characterised by ultra-stable heavy minerals such as zircon, tourmaline, and rutile; the presence of garnet in both pre-, and post-uplift affected strata indicates a contribution from metamorphic basement rocks, either from the local Sumatran basement or the Malay-Peninsula.

Detrital zircon ages as old as Archean are present in all sedimentary formations; a prominent Triassic age group can be correlated with the Main Range Province granitoids reported from the Malay-Peninsula. It is noteworthy that zircon age spectra from Sumatra lack some diagnostic age groups commonly found in central- and western SE Asia, such as Cretaceous ages, correlated with igneous rock in the Schwaner Mountains, SW Borneo.

The analysis of modern river sands suggests that the current sedimentary fluvial systems are mainly sourced from the recent Barisan-related volcanic arc. Zircon age patterns of the modern river sands resemble the populations found in the sedimentary strata, whereas, the heavy mineral composition is highly diluted by the recent igneous sources.