

**UNIVERSITY OF SÃO PAULO
INSTITUTE OF GEOCIENCES**

**Luminescence signals sensitivity of quartz from the Putumayo foreland basin,
north-eastern Andes (Colombia): implications for sediment provenance and basin
evolution**

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Dissertation presented to the
Geochemistry and Geotectonics Program
to obtain the title of Master of Science.

Concentration area: Geochemistry of
Exogenous Processes

Supervisor: Prof. Dr. Fabiano do
Nascimento Pupim

SÃO PAULO

2023

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Barbosa Leite da Cruz, Carolina
Luminescence signals sensitivity of quartz from
Putumayo foreland basin, north-eastern Andes
(Colombia): implications for sediment provenance
and basin evolution / Carolina Barbosa Leite da
Cruz; orientador Fabiano do Nascimento Pupim. --
São Paulo, 2023.
79 p.

Dissertação (Mestrado - Programa de Pós-Graduação
em Geoquímica e Geotectônica) -- Instituto de
Geociências, Universidade de São Paulo, 2023.

1. sedimentary provenance. 2. luminescence
sensitivity. 3. low-contrasting signal. 4. Putumayo
basin. 5. Eastern Andes. I. do Nascimento Pupim,
Fabiano, orient. II. Título.

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Nº 921

COMISSÃO JULGADORA

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SÃO PAULO

2023

Abstract

CRUZ, C. B. L. Luminescence signals sensitivity of quartz from the Putumayo foreland basin, north-eastern Andes (Colombia): implications for sediment provenance and basin evolution. 2023. 79p. Master Dissertation - Geochemistry and Geotectoninc Graduate Program, Institute of Geosciences, University of São Paulo

Sediment provenance analysis is a widely used approach to reconstruct the set of source rocks of a rock/sedimentary deposit, allowing the study of the source-destination sediment transport system, sedimentary basin filling, depositional environments and contributing to the understanding of tectonic systems and magmatic processes and climatic conditions in the source areas. With this in mind, the scope of this work was to test the feasibility of using luminescence signals to distinguish sedimentary units and traces of sedimentary provenance in a low-contrast sedimentary basin, the Putumayo Foreland Basin (northeast of the Andes, Colombia). The Putumayo Sedimentary Basin is a key area for hydrocarbon exploration, providing a comprehensive and uninterrupted sedimentary record from the Cretaceous to the Cenozoic. Despite its considerable geological and economic importance, there is a lack of knowledge about the origin of the sediments that fill this basin. The results show that %BOSL_F and IRSL_[1.2s]/BOSL_[1s] signals from quartz and feldspar grains are the most appropriate luminescence proxies for distinguishing lithostratigraphic units and tracing their sedimentary provenance. In general, all lithostratigraphic units showed low %BOSL_F and high IRSL_[1.2s]/BOSL_[1s], indicating source areas with rocks with a low number of sedimentary cycles and high denudation rates, as expected for the Andean orogen. However, slight differences between lithostratigraphic units could be detected. The sediments of the Cretaceous rocks (Caballos and Villeta Fms) showed very low %BOSL_F and relatively high IRSL_[1.2s]/BOSL_[1s], indicating that their source areas are composed of metamorphic and igneous rocks, characterized by the first sensitization cycle luminescent and higher feldspar content, related to the Amazon Craton (east) and the Paleo-Central Cordillera (west). An abrupt increase in %BOSL_F and decrease in IRSL_[1.2s]/BOSL_[1s] occurs across the K-Pg boundary, suggesting that Cenozoic rocks (Rumiyaco, Neme and Pepino Fms and Orito Gr) received sediments reworked from Mesozoic and Proterozoic rocks due to the tectonic uplift of the Eastern Cordillera and the unroofing process during the Cenozoic. In conclusion, luminescence sensitivity has high potential as a sediment provenance tool for interpreting basin evolution, even in low-contrast source areas.

Keywords: sedimentary provenance; luminescence sensitivity; low-contrasting signal;
Putumayo Basin; Eastern Andes