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# Volatile emissions from sedimentary host rocks during continental flood basalt emplacement

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**RESUMO:** The coevality of continental flood basalts and global environmental changes might imply that volatile emissions during these magmatic events can significantly impact atmospheric composition, causing disturbances on climate and ecosystems. It is widely believed that volatile emissions resulting from magma-sediment interactions in the shallow crust play a pivotal role in the overall volatile budget, releasing significant amounts of $CO_2$, $SO_2$, CO, and $CH_4$. In light of this, this work aims to investigate the nature of volatile release through thermal metamorphism, using heating experiments to simulate metamorphic conditions on sediment samples from Paraná-Etendeka and Central Atlantic Magmatic Province, facilitating a comparative analysis between these two CFB. Eleven experiments were conducted in Externally Heated Pressure Vessels (EHPV) with a cold-seal design at 600-650ºC and 100 MPa, using Ar-$CH_4$ mixtures as pressure medium and to constrain oxygen fugacity (ca. NNO-1). Ground shales, carbonates, and evaporites were loaded in Au-capsules along with cylindrical cores of unfractured inclusion-free quartz. Fluids outgassed from starting materials were trapped in-situ by thermal shock of the quartz cylinders. Starting materials and run products (post degassing) were characterized by XRF, EPMA, LA-ICP-MS, XRD, and SEM analyses to constrain the impact of volatile release on sedimentary lithologies. The synthetic fluid inclusions were evaluated by size, quantity, and chemical composition. The geochemistry of the heated residues did not exhibit any systematic changes in terms of major and minor elements. All shales decreased in organic content after heating, indicating the potential of C-bearing volatiles release during both CFB emplacement. The evaporite experienced a reduction of nearly 50% in its sulfur content suggesting an important potential for the release of volatile S upon sedimentary heating. The pre- and post- experiments performed at 600ºC on carbonates samples suggest the high potential for $CO_2$ release, which may be further intensified at higher temperatures, since LOI remained high. The mineralogical characterization revealed that shales undergo dehydration of clay minerals and pyrolysis, leading to the release of H2O and $CO_2$. Carbonates, on the other hand, exhibited dedolomitization as the main reaction, which resulted in significant $CO_2$ emissions. Our preliminary results indicate that similar volatile species were released during the emplacement of Paraná and CAMP provinces, with aqueous and carbonic inclusions. Regarding the upscale of volatile emissions, the sediments from Irati Fm. (Paraná-Etendeka Province) have the potential to release ~554 Gt of thermogenic C, assuming a degassing efficiency of 1.1%.

**PALAVRAS-CHAVE:** CONTINENTAL FLOOD BASALTS**,** HEATING EXPERIMENTS, VOLATILE EMISSIONS**,** THERMAL METAMORPHISM**.**