Pollution of the Faleme River (Senegal catchment): Impacts of hydromorphological dynamics and gold mining techniques on mercury mobilization (Mali – Senegal)

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ABSTRACT

Artisanal gold mining, largely based on the use of mercury for amalgamation of minerals, causes significant mercury pollution in rivers, particularly those receiving mining waste. The Faleme River, the major left-bank tributary of the Senegal River flowing through Mali and Senegal, is particularly affected by this pollution due to the intensification of gold mining activities since the 2000s (Top, 2024). With its contrasting hydrological regime and dual sediment load (fine bed load and suspended load), it is a relevant subject for study in relation to mercury contamination. This paper has two objectives: *(i)* to assess the level of mercury contamination in the water, and *(ii)* to analyse how hydro-morphological dynamics and artisanal gold mining practices influence the transfer of mercury downstream in the catchment. Two mercury measurement campaigns were carried out in April 2023 (low water) and December 2025 (post-high water) at 13 sites along the Faleme River and one site in the Senegal River. The methodology, adapted to logistical constraints, included the use of test strips to detect mercury in surface water and sediments, as well as the calculation of CMDs to study hydrological behaviour, combined with an analysis of mining practices. The results reveal diffuse contamination throughout the catchment, with varying levels. During low water stages, mercury remains confined to mining areas. Transverse obstructions created by gold miners limit sediment transport, reinforcing the confinement of mercury. During high water stages, intense flows facilitate the dispersion of mercury downstream, especially since the anthropogenic lateral obstructions no longer play their role of trapping sedimentary loads, as the structures are submerged. Our results indicate that mercury pollution can shift from localized contamination to a catchment-wide risk. This is of particular concern for the downstream part of the catchment, which is agro-pastoral, and for the Senegal River, which supplies drinking water to several large Senegalese cities.

Keywords: Mercury; Pollution; Gold mining; Hydromorphology; Sediment transport; Faleme River.