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Interactive comment on "Thin terrestrial sediment deposits on intertidal sandflats: effects on pore water solutes and juvenile bivalve burial behaviour" *by* A. Hohaia et al.

Anonymous Referee #2

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The main goal of this paper, the assessment of the effect of terrestrial sediment deposits on pore water solute composition and juvenile bivalve burial, is addressed with a set of flume experiments where juvenile bivalves were placed on intertidal sediments (bioturbated or organic matter depleted) covered by a thin layer of terrestrial sediment. The terrestrial sediment increased bivalve burial, irrespectively of sediment type, but bivalves preferred initially well-oxygenated bioturbated sediment.

The topic of this research is timely and relevant as many nearshore zones are exposed to increased sedimentation caused by coastal development and enhanced sediment loads in river waters. This enhanced fine sediment deposition has the potential to affect seabed biogeochemical processes through organic matter input and activities of

phototrophs.

The authors found the increase of bivalve burial in sediments covered by terrestrial material unexpected and suggest that this may be attributed to the activity of resident macroinfauna or the absence of organic matter. I found it surprising that this result came unexpected for the authors. For a juvenile bivalve, a primary prey for a large spectrum of bottom feeders including shore birds, demersal fish, shrimp, crabs, polychaetes, nemertines and many other predators, staying at the sediment surface is extremely dangerous, and the immediate reaction of such juveniles is to bury into the sediment if at all possible. Burying into sandy sediment covered by a thin unconsolidated layer of sediment allows faster burial, and the origin and quality of this sediment may be of lesser influence as burial means survival.

Macoma liliana inhabits sand and mud flats with low oxygen penetration into the sediment, and can accesses oxygenated water through a siphon that can be extended through the diffusive boundary layer. Sediment composition therefore should have a lesser influence on burial as long as the boundary layer does not become oxygen depleted. Oxygen could penetrate to some depth in all experimental treatments, revealing that oxygen was not a limiting factor nor toxic sulfide that could develop under anoxic conditions. As long as the sedimentary conditions are suitable, the bivalves will unlikely move out of the sediment unless they get infected by parasites.

The bivalves tested here were at the post-settlement stage, the stage after the pelagic larval stage that selects the sediment for settlement. This pelagic stage would have been a better candidate for testing the effect of the terrestrial sediment deposition as these larvae likely test the sediment before settling and relocate if they find it unsuitable.

Settling larvae of benthic invertebrates have been shown to select the best sediment by taste/odor, color, cohesiveness, grain size, angularity, organic coating, microbial film, compaction etc. and thus may have shown distinct reactions to the terrestrial sediment deposition. As the post-settlement larvae cannot effectively relocate, they would not

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have any benefits from not burying into a sediment unless the boundary layer above this sediment is oxygen depleted and sulfidic.

If the experiment would be repeated with pre-settlement larvae, it would be critical to use realistic settings for the terrestrial sediment cover. In the natural environments, such settling sediments have been exposed for some time to estuarine waters which rapidly and fundamentally changes the surface characteristics of the mineral grains due organic coatings and the attachment of bacteria. These coatings contain key clues used by settling larvae, thus, an aging of the terrestrial sediment in estuarine water and subsequent detailed characterization of the sediment including organic carbon and nutrient analyses would be required to allow a reliable interpretation of larval settlement behavior.

The results of this study show that the burial of post-settlement larvae is relatively insensitive to terrestrial sediment deposition, and I don't agree with the authors that these results are unexpected. The authors may consider this and rephrasing the interpretation of the results. A follow-up study using pre-settlement larvae likely would show different results provided that the terrestrial sediments are aged in estuarine water before application.

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