Fluvial bar dynamics in large meandering rivers with different sediment supply in the Amazon River basin

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Sediments in the large meandering rivers of the Amazon basin are known to be supplied by sources providing highly different magnitudes of sediment input and storage, ranging from the sediment-rich Andean region to the sediment-poor Central Trough.

Recent observations have highlighted how such differences in sediment supply have an important, net effect on the rates of planform activity of meandering rivers in the basin, in terms of meander migration and frequency of cutoffs.

In this work we quantify and discuss the effect of sediment supply on the organization of macroscale sediment bedforms on several large meandering rivers in the Amazon basin, and we link our findings with those regarding the rates of planform activity.

Our analysis is conducted through the newly developed software PyRIS, which enables us to perform extensive multitemporal analysis of river morphodynamics from multispectral remotely sensed Landsat imagery in a fully automated fashion.

We show that large rivers with low sediment supply tend to develop alternate bars that consistently migrate through long reaches, characterized at the same time by limited planform development. On the contrary, high sediment supply is associated with the development of point bars that are well-attached to the evolving meander bends and that follow temporal oscillations around the bend apexes, which in turn show rapid evlution towards complex meander shapes. Finally, rivers with intermediate rates of sediment supply develop rather steady point bars associated with slowly migrating, regular meanders.

We finally discuss the results of the image analysis in the light of the properties of river planform metrics (like channel curvature and width) for the examined classes of river reaches with different sediment supply rates.