

## **Changing sediment discharge in Amazon River**

Safaa Naffaa, L.P.H. (Rens) van Beek, Frances E. Dunn, Jannis M. Hoch, Steven M. de Jong

Faculty of Geosciences, Utrecht University, Utrecht, The Netherlands

- The Amazon river is one of the largest rivers of the world (6.8 million km<sup>2</sup>), transporting a large amount of suspended sediment
- The exchange of sediment between the land and the ocean influences the global carbon cycle and nutrient balance
- The sediment supply to the river changes as a results of deforestation and sediment trapped in the reservoirs and because of climate change
- Understanding sediment transport issues is important for river management policy decision making and for making scientific predictions about the future
- We developed a spatial-temporal process-based model "River discharge and sediment model" (RDSM) (https://www.linkedin.com/posts/safaa-naffaa\_researchugcPost-6859470230196948992-hXPy)

River Discharge & Sediment Model

**River Sediment Production Model RSPM** 

River Sediment Transportation Model RSTM



RDSM flowchart (modified from the source: https://www.alevelgeography.com/drainage-basin-hydrological-system/) showing the process of sediment production, sediment delivery and sediment transport by the river



Map of the Amazon basin, including major rivers and monitoring stations used by this research

**Observations from seven stations along the Amazon river for the historical** period (1980-2009) are used to validate our model.

RMSE		
Stations	Discharge	Sediment transport
Tabatinga	0.255	0.98
Manacapuru	0.151	0.62
Obidos	0.101	0.40
Portovelho	0.102	0.17
Fazenda vista Alegre	0.117	0.22
Serrinha	0.259	0.32
Caracari	0.093	0.17

The model performance, comparison between the monthly observed and simulated discharge and sediment transport using Root Mean Square Error (RMSE), which shows how far predictions deviate from measured values



- We develop a serious game to increase awareness and inform decision makers about the long-term effects of policy actions on discharge and sediment in the Amazon river
- The scientific basis of the game is a set of future scenarios based on combinations of the Shared Socioeconomic Pathways (SSP) the and **Representative Concentration Pathways (RCP)**

Precipitation changes in the Amazon basin between 2011-2098 combined with SSP (ex. SSP 2 with RCP 6.0)