Bodoque J M, J Geol Geophys 2017, 6:6(Suppl)
DOI: 10.4172/2381-8719-C1-013

Annual Congress on

SOIL SCIENCES

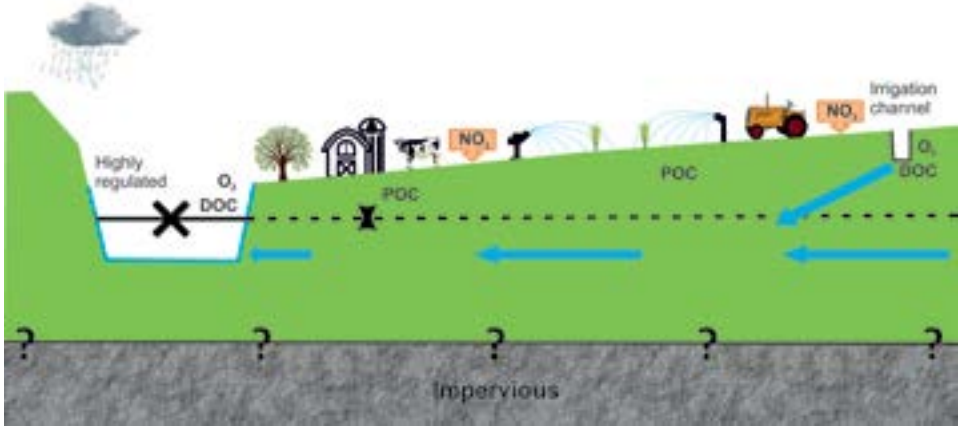
December 04-05, 2017 | Madrid, Spain

Bodoque J M

University of Castilla-La Mancha, Spain

Restoring hydromorphological functionality to improve natural purification capacity of a heavily modified water body

We determined the natural purification ability of a floodplain where irrigated agriculture is a dominant and hydraulic connection with the associated river is limited. Denitrification activity was characterized by using different methodological approaches based on i) End-Members Mixing Analysis; ii) characterization of macroinvertebrates of the hyporheic zone; iii) analysis of the denitrification potential; iv) analysis of the bacterial community structure; and v) hydrologic modeling. All the approaches, except EMMA analysis, lead to the same conclusion. Denitrification is almost non-existent because the study site does not have the hydric soil and oxygen-limited conditions needed to enable denitrification. Invertebrates did not show statistically significant differences (P-value higher than 0.05) between the diversity indices corresponding to each of the sampling campaigns. However, significant differences (P-value less than 0.01) were found between the piezometers closest to the river banks and the rest; this may be interpreted because of low hydraulic connectivity. Denitrification potential did not show significant statistical differences (P-value less than 0.01) between the sampling campaigns conducted. This shows that besides the absence of connectivity, irrigation is not able to significantly activate denitrification. Additionally, results from the characterization of the bacterial community structure are consistent with floodplains where denitrification is not effective since most bacterial communities are not linked with NO3. Hydrologic modeling showed that decay change is very low, on the order of 0.01 mgN/L.day, although it would improve around 10% if ordinary floods occur. During the summer months theoretical concentrations of nitrates were lower than expected (e.g. ΔNO3 = - 41 in August 2013), according to the EMMA analysis, which might be due to the intensity of irrigation is spatiotemporally variable in the study site. Our results show that floodplain denitrification has been drastically reduced due to the suppression of flood-pulses. In this context, the creation of riverine wetlands where the hydrological regime is restored would lead to a decay of nitrates whose dynamic evolution increases with flooding, as scenarios tested by hydrological modeling have demonstrated.



Recent Publications

1. Bodoque J M, Ladera J, Yela J L, Alonso-Azcarate J, Brito D, Antiguedad I, Duran R, Attard E, Lauga B and Sanchez-Perez J M (2017) Recovering hydromorphological functionality to improve natural purification capacity of a highly human-modified wetland. Ecological Engineering 103:332-343.
2. Havrylenko S B, Bodoque J M, Srinivasan R, Zucarelli G V and Mercuri P (2016) Assessment of the soil water content in the Pampas region using SWAT. Catena 137:298–309.
3. Bodoque J M, Ballesteros-Cánovas J A, Lucia A, Díez-Herrero A and Martín-Duque J F (2015) Source of error and uncertainty in sheet erosion rates from dendrogeomorphology. Earth Surface Processes and Landforms 40(9):1146–1157.
4. Bodoque J M, Lucia A, Ballesteros J A, Martin-Duque J F, Rubiales J M and Genova M (2011) Measuring medium-term sheet erosion in gullies from trees: a case study using dendrogeomorphological analysis of exposed pine roots in central Iberia. Geomorphology 134(3–4):417–425.
5. Martín-Duque J F, Sanz M A, Bodoque J M, Lucía A and Martín-Moreno C (2010) Restoring earth surface processes through landform design. A 13-year monitoring of a geomorphic reclamation model for quarries on slopes. Earth Surface Processes and Landforms 35:531–548.

Biography

Bodoque J M obtained his PhD in Geology from Complutense University of Madrid, Spain. He undertook his Postdoctoral studies at the Department of Civil Engineering, Texas A&M University, USA. Currently, he is a Professor of the Faculty of Environmental Sciences and Biochemistry at the University of Castilla-La Mancha His main research is focused on Hydrology and Geomorphology, which has resulted in more than 40 papers in international peer reviewed journals related to fluvial geomorphology, flood risk assessment and management, soil erosion, water quality and ecological restoration.

josemaria.bodoque@uclm.es