

Fertilizers rule REYs: agricultural catchments of Eastern Australia

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Lanthanides, generally named Rare Earth Elements (REE), are part of the internal transition metals forming a group of 15 elements with very similar chemical characteristics and physical properties. REEs and Yttrium (named REY) are widely used to understand geochemical processes. The increasing use of REYs in technology as well as their presence as a by-product in some fertilizers has opened new pathways for these metals to enter the water cycle, thus making REYs tracers of anthropogenic activity.

In this study we investigate the concentration and distribution of REYs in two predominately agricultural catchments of Eastern Australia: the Namoi River with a 43,000 km² catchment, which forms part of the headwaters of the Murray-Darling Basin; and the Nogoia River with a 27,600 km² catchment, which forms part of the Fitzroy River catchment, the largest in eastern Australia flowing into the Great Barrier Reef.

Bi-monthly sampling during 18 months was conducted at seven selected sites along both rivers. The [REY] in water samples were analyzed by automated chelation pre-concentration (SeaFast, ESI), followed by ICP-MS. Samples were automatically loaded onto a loop and injected to an iminodiacetate column that chelates REY allowing matrix Na⁺, Cl⁻, Ca²⁺, Mg²⁺ and, more importantly, Ba²⁺ ions to be rinsed out. The pre-concentration process allowed a ~20-fold increase in concentration. Results are compared to those obtained from commonly used fertilizers in the region. REY trends suggest a link to the fertilizers used in both catchments. No regional variations were apparent, possibly due to the prevailing dry conditions during the sampling period. Stream flow was controlled by dam releases in the upper ridges for both catchments.