

## Neoproterozoic peritidal phosphorite, Sete Lagoas Formation, Brazil: Implications for the Precambrian phosphorus cycle\*

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The Sete Lagoas Formation is a ca. 150-m-thick basal unit of the Neoproterozoic Bambuí Group located in the São Francisco Basin of central Brazil. Lithofacies stacking patterns indicate deposition of this siltstone-carbonate-phosphorite succession occurred during an overall marine transgression that flooded the São Francisco Craton ca. 610 Ma. The phosphatic sequence is punctuated by higher order fluctuations in relative sea level that produced three parasequences. Parasequences are 40 to 50-metre-thick, defined by a basal flooding surface that is generally overlain by interbedded carbonate mudstone and wavy laminated siltstone that grades into flaser bedded silty sandstone and intertidal phosphatic microbial laminites. Each cycle is interpreted to record progradation of phosphatic intertidal flats over subtidal deposits as accommodation filled. The presence of beach facies, mudcracks, absence of coarse terrigenous clastics, and the abundance of silt with fine, abraded quartz grains indicate deposition along an arid coastline dominated by aeolian input. The shallow nature of phosphorite in the Sete Lagoas Formation suggests that redox-controlled phosphogenic mechanisms were restricted to nearshore environments. This is unlike younger, larger late Neoproterozoic-Phanerozoic phosphorites. These giant phosphorites generally formed in distal shelf environments in association with coastal upwelling. The increasing size of phosphatic deposits through the Neoproterozoic is interpreted to reflect the expansion of oxygenated environments across shelves that were favourably positioned for upwelling. This codependence of seafloor oxygenation and phosphogenesis highlights the importance of ocean redox state on the Precambrian phosphorus cycle.

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