Tide-induced pulsing of nutrient discharge from an unconfined aquifer into an *Anaulus australis*-dominated surf-zone

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Abstract

Groundwater levels in the slacks of the Alexandria dune field were monitored over a 14 d spring-to-neap tidal cycle. During this period water level at the seaward end of the slacks rose and fell in relation to the spring-to-neap tidal heights. The levels at the back of the slack fluctuated much less than in the front. This resulted in a change in the slope of the water table between spring and neap tides. During neap tide, the difference in water table height was 133 mm between the seaward and landward ends of the slack (a distance of 110 m), while just after spring tide the difference was only 54 mm. This means that groundwater is discharged in a pulsing fashion from the aquifer into the surf-zone, releasing nutrient-rich water at a rate of 0.157 $m^3 \cdot d^{-1} \cdot m^{-1}$ (spring tide) and 0.328 $m^3 \cdot d^{-1} \cdot m^{-1}$ (neap tide). The daily tidal cycle influences the groundwater mainly around spring tide and mostly at the seaward side of the slack. The influence extends for a distance of 325 m from the mean shoreline. A 20% change in flow was calculated between low and high spring tides and only a 6% change between low and high neap tides. Groundwater provides 2.6 g $N \cdot d^{-1}$ at spring tide and 5.6 g $N \cdot d^{-1}$ at neap tide for every running metre of beach on average. This gives rise to a pulsing of nitrogen availability with twice as much nitrogen entering the surf-zone at neap tide compared to that at spring tide. This nitrogen is an important source of this element to the surf diatom *Anaulus australis* Drebes *et* Schulz.