

## **Nutrient and carbon fluxes along sandy beaches of the French Atlantic coast : recycling and groundwater discharge**

PIERRE ANSCHUTZ<sup>1</sup>, CÉLINE CHARBONNIER<sup>1</sup>, PASCAL LECROART<sup>1</sup>

<sup>1</sup>Université de Bordeaux, CNRS, UMR 5805 EPOC, Pessac, France, [pierre.anschutz@u-bordeaux.fr](mailto:pierre.anschutz@u-bordeaux.fr)

Pore waters that seep out on the lower parts of sandy tidal beaches have two origins: recirculating sea water due to tidal pumping and terrestrial SGD. Both supply nutrients and dissolved carbon to the coastal zone. The magnitude of fluxes depends on several parameters. Recirculating sea water becomes a source of nutrient when tidal sediments act as an efficient bioreactor, which is conditioned by the volume of the recirculation cell, the organic matter content of the sediment, and the biogeochemical processes. The contribution of nutrient from terrestrial SGD depends on the surface area of the beach catchement, land use, hydraulic gradient, and processes that occur in the subterranean estuary (STE).

Saline and brackish waters depleted in dissolved oxygen and enriched in nitrate are found all along the 240-km-long Aquitaine coast of the south-west France Atlantic coast, indicating that SGD and tidal pumping are ubiquitous. The beach aquifer consists of sandy dune sediments. The estuary located in intertidal beach sands is a mixing between saline pore waters and fresh waters from the dune watershed. After several years of field investigation, we have quantified fluxes of nitrogen, phosphorus, silica and carbon through the beach, and have determined the driving forces behind the fluxes. Our results are the fruit of a multidisciplinary approach that includes a geophysical and hydrological study of the beach aquifer, modeling of water fluxes, characterisation of the terrestrial groundwater and sea water end-members, monitoring of pore water composition (dissolved inorganic N, P, Si, C, Fe, Mn; DOC, d-13-DIC, methane), deployment of oxygen probes, solid fraction analysis, study of the beach macrofauna. Results show that recirculation provides the coastal zone with recycled nutrients more efficiently than terrestrial SGD does with new nutrients. Terrestrial SGD fluxes are limited by the surface of the beach watershed and redox processes that occur in the STE.