Biogeochemical dynamics in salt marsh environments: The role of intertidal hotspots

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Intertidal salt marshes are highly productive, dynamic ecosystems that act as a filter between the land and the ocean. They may play a significant role in reducing increased nutrient input caused by anthropogenic activity [1]. Since nitrogen (N) tends to limit primary production in most coastal systems [2], N bioavailability is a controlling factor in eutrophication. The rate of denitrification, the main process affecting nitrogen bioavailability, is largely controlled by nitrate levels, which in turn depend on *in situ* production (coupled denitrification) and external sources. In coastal systems, both factors are linked to the dynamic, tidally-driven fluid exchange and the associated changes in subsurface redox conditions.

Here, we present a model assessment of the spatio-temporal dynamics in salt marshes as they relate to nitrogen transformations. We developed a hydrological model that accounts for variably saturated conditions in both the fluid flow and solute transport, the effect of density variations, tidal dynamics and an upland-to-creek head difference which results in an oceanward net groundwater flow. The effect of changing total stress due to the tidal forcing of the loading applied by inflowing creek water is also taken into account [3]. The spatial distribution of water residence times is determined before a biogeochemical reaction network, including carbon respiration and the main processes in N cycling (ammonification, denitrification and nitrification), is added.

The analysis will be used to indicate whether there are hotspots at which biogeochemical transformations proceed at high rates, and to assess to what extent a simple estimate of mean residence times can be used as an indicator for system-scale reaction rates as proposed for estuaries [4].

[1] Vitousek *et al*. (1997) *Ecol Appl* **7**, 737-750. [2] Howarth (1988) *Annu Rev Ecol Syst* **19**, 89-110. [3] Reeves *et al*. (2000) *Ground Water* **38**, 89-98. [4] Nixon *et al*. (1996) *Biogeochemistry* **35**, 141-180.

Several methods and steps in tectono-geochemistry research

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(1) *Analyzing macroscopic geological features*. Studies of geotectonic setting, regional strata and structure features, magmatic activities, etc. (2) *Carrying out tectono-geochemical mapping*. For structurally-controlled ore-deposits, it is important to study mechanical properties of faults, macro or micro features of tectonites, in order to develop geochemical mapping of faults under operating norms. To judge mechanical properties of faults, records and studies must include occurrences, moving directions of upper-lower plates, fracture surface shapes, belt widths, tectonite types, associated structure features and mineralizing characteristics. (3) *Collecting and processing of samples*. Samples must be representative and may be collected from fault belts, upper-lower walls, or from dill cores. Tectonites (1~2 kg) should be collected from faults of various trends and properties. (4) *Testing of samples*. Some samples can be rock flakes for micro-structural study, whereas other samples can be tested to obtain major and trace elements by methods such as ICP-MS, ICP, x-ray or chemical analysis, etc. (5) *Redefining of tectonic systems*. It is based on a division of tectonic period according to mechanical property study of multi-stage compound and transformation of complex structural faces and their intersect relationship. (6) *Processing of tectono-geochemical data with multiple methods*. Common methods include frequency distribution histograms, factor and cluster analysis, correlation and trend-surface analysis, anomaly sections. A series of loading matrices, factor scores and diagrams will be gained. It can be fairly efficient to use fuzzy mathematical methods [1]. (7) *Explaining geological problems with tectono-geochemical results*. Combined with geological conditions, the results (especially anomalies and element associations) aid in studying material sources, ore-forming stages, features of provenance areas, etc., which are important for prognosis of concealed ores.

[1] Haijun *et al*. (2006) *Geochimica et Cosmochimica Acta* (http://dx.doi.org/10.1016/j.gca.2006.06.449).