**Title: Cosmogenic 32Si as a potential tracer for the global marine silicon cycle processes: A review**

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**Abstract:** Silicon is the second most abundant element (27.7%) after oxygen in the Earth's crust. It plays an important role in regulating primary productivity and carbon cycling in the oceans. Cosmogenic 32Si (a half-life of approximately 150 years) is the only long-lived radioisotope, which can be produced by cosmic rays impinging on atmospheric 40Ar and falling as precipitation on lands (partly into oceans through runoff) and oceans. 32Si is taken up by siliceous organisms (e.g., diatoms), partly recycled, and partly eventually transported to the seafloor as biogenic silica (BSi). This paper summarizes 32Si and silicon cycling studies in nearshore (including estuaries), continental shelf waters, and the open ocean. Recent studies have demonstrated that 32Si can independently constrain diagenetic processes controlling Si storage in marine sediments. Biogenic silica (BSiopal) is rapidly altered toauthigenic clay phases (BSiclay) to variable extents depending on depositional environment. In tropical sediments, 32Si is in mineral rather than biogenic (reactive) silica pools used to constrain the silica cycle. Coastal reactive Si burial rates are likely 20-30% higher globally than previously estimated. Tropical and subtropical deltas store 3.5–3.9 Tmol/yr of Si as authigenic clay(BSiclay), and temperate proximal coastal zones store ~1 Tmol/yr. Global sedimentary Si sink via reverse weathering reactions is 2 to 3 times the current estimates and exceeds the Southern Ocean siliceous ooze.

**Keyword:** silicon-32; a cosmic-ray-produced radioactive nuclide; global marine silicon cycle; oceanography

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**标题： 宇生32Si用于示踪全球海洋生源硅循过程的研究进展**

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**摘要** 硅是地壳中仅次于氧的元素（约占27.7％），是海洋中初级生产力和碳循环的重要控制因素。32Si（半衰期约150年）是硅的唯一长寿命放射性同位素，可以通过宇宙射线撞击大气中的40Ar产生，并随降水落到陆地（部分通过径流进入海洋）或海洋表面。海洋中32Si被硅质生物（如硅藻）摄取，部分被循环利用，部分最终被输送到海底作为生物成因的硅质（BSi）。本文总结近岸（包括河口）、大陆架海域、开阔大洋中32Si与硅循环研究示踪研究现状。最新研究发现，32Si 可以独立地制约控制海洋沉积物中硅储存的成岩过程；在热带沉积物中，32Si 存在于矿物硅库中，而不是生物硅库（活性硅库）中，用于制约硅循环；生物硅（BSiopal）会迅速转变为自生粘土相（BSiclay），其程度因沉积环境而异；热带和亚热带三角洲以自生粘土（BSiclay）的形式储存了 3.5-3.9 Tmol/yr的硅，温带近海岸带储存了 ~1 Tmol/yr的硅；通过逆风化反应形成的全球沉积硅汇是目前估计值的 2 到 3 倍，超过了南大洋硅质软泥的储存量。

**关键词：**硅-32；宇生放射性核素；全球海洋生源硅循; 海洋学研究

**1 引言**

**2 硅-32**

**3 全球硅循环**

**4 存在问题**