Abstract

The short-lived thorium isotope ^{234}Th (half-life 24.1 days) has been used as a tracer for a variety of transport processes in aquatic systems. Its use as a tracer of oceanic export *via* sinking particles has stimulated a rapidly increasing number of studies that require analyses of ^{234}Th in both marine and freshwater systems. The original ^{234}Th method is labour intensive. Thus, there has been a quest for simpler techniques that require smaller sample volumes. Here, we review current methodologies in the collection and analysis of ^{234}Th from the water column, discuss their individual strengths and weaknesses, and provide an outlook on possible further improvements and future challenges. Also included in this review are recommendations on calibration procedures and the production of standard reference materials as well as a flow chart designed to help researchers find the most appropriate ^{234}Th analytical technique for a specific aquatic regime and known sampling constraints.