

## ABSTRACT

$^{234}\text{Th}$  is an extremely useful radiotracer of particle dynamics in aquatic systems. Its utility, however, has yet to be realized by many within the aquatic science community. The reasons for this may in part be due to a lack of knowledge of how this nuclide has been used in the past as well as how and where  $^{234}\text{Th}$  might be profitably applied in future research. The purpose of this paper, then, is to examine the variety of  $^{234}\text{Th}$  applications that have been used to understand natural aquatic processes in four major areas: vertical transport, particle cycling, horizontal transport, and sediment dynamics. We provide a general overview of the possible applications of  $^{234}\text{Th}$  in the hopes of provoking an increased interest in the inherent potential and future application of  $^{234}\text{Th}$  in these systems. We end this paper with a discussion of future research avenues in the context of three specific regimes: i) the upper 1000 m of the open ocean, ii) coastal sediment/water processes and iii) large freshwater lakes.