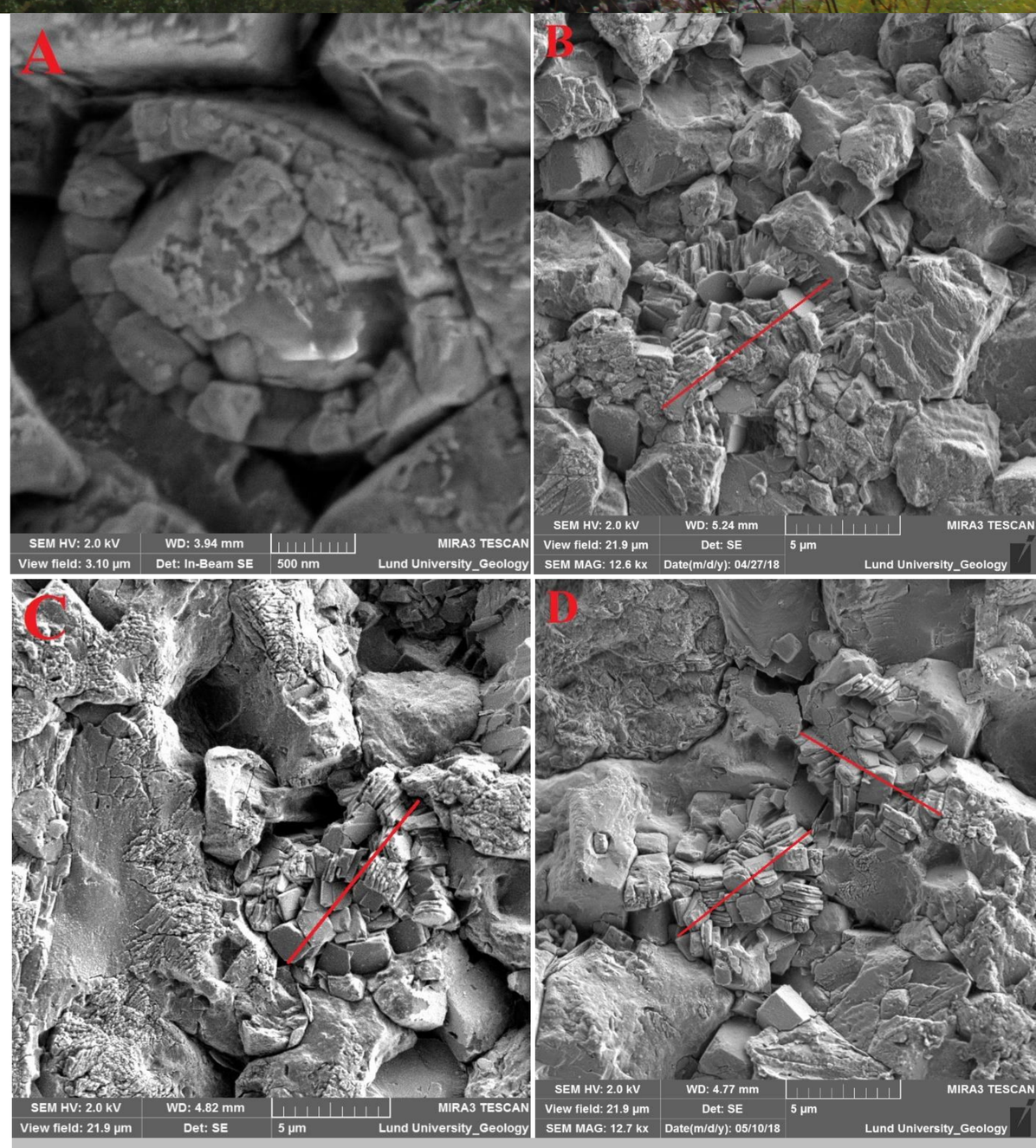
Calcareous nannofossils – Key to ancient marine ecosystems

In a time when dinosaurs were in an early evolutionary stage over 200 million years ago, a much smaller organism appeared in the fossil record. Coccolithophores are unicellular microorganisms that have contributed significantly to primary production at the bottom of the food chain. The scales of these tiny plankton, coccoliths, surrounds the coccolithophore in an exoskeleton known as a coccosphere. Coccoliths (A in the image below) make up a significant part of microscopic calcareous nannofossils, which usually are <30 µm in size. The chalk in the White Cliffs of Dover in England largely consists of coccoliths. By studying calcareous nannofossils and associated fossils, we can correlate these finds with past marine ecosystems through history.

Northern Calcareous Alps, central Austria

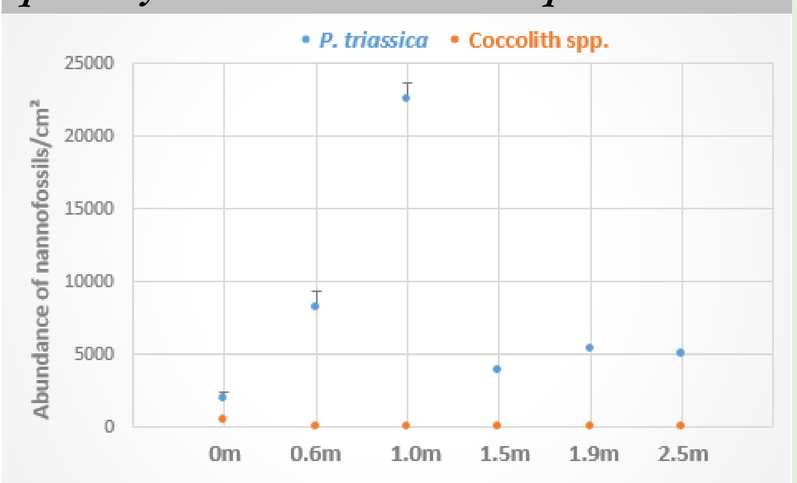
Introduction

Some of the earliest calcareous nannofossils can be found in various locations on Earth including the Alpine region, Timor, Canada and Australia. These microfossils originate from calcareous nannoplankton. The rapid increase of calcareous nannoplankton about 200 million years ago may have had a significant impact on seawater chemistry and carbonate production. Today, marine calcifying organisms are important for the biogeochemical cycles. Calcareous nannoplankton fixate carbon into organic matter through photosynthesis. The oceans store up to half of the CO_2 that is released into the atmosphere, which helps to reduce the greenhouse effect and subsequent global warming. However, if too much CO_2 is accumulated, ocean acidification may affect marine organisms. Studies show that fossil fuel CO_2 emissions already have decreased the pH of the oceans' surface water by ~0.1. Scientists are looking at past events in Earth's history to see how marine calcifying organisms previously responded to increased levels of CO_2. The aim is to find clues in the past to better be able to foresee the effect of increasing CO_2 on marine ecosystems.



Scanning electron microscope image of calcareous nannofossils. Their size ranged from ~2 to 10 µm.

Graph of calcareous nannofossil species quantity in six limestone samples



Results

Six limestone samples were analysed from near Hallstatt, Austria, in the Northern Calcareous Alps. The rock samples are approximately 210 million years old. The average quantity of calcareous nannofossils was 8 000 specimens per cm^2. *Prinsiosphaera triassica* was the most abundant species – B, C & D in image to the right.

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