



Infradecadal changes of coccolith calcification during the last 1000 years obtained with a new method of thickness measurements

Luc Beaufort, Thibault de Garidel-Thoron, Yves Gally, and Nicolas Barbarin

CNRS, CEREGE-UMR 6635, Aix-en-Provence, France (beaufort@cerege.fr, +33-(0)442-9715)

Coccolithophores are the main pelagic calcifiers. Because of their minute size, it is very difficult to assess the amount of calcite they secrete. We present here a new method which permits to measure the thickness, and hence estimate their mass. It is based on the birefringence properties of the calcite. Rotating polarizer and analyzer permit to grab numerical images in 3 different polarizing planes. The combination of these images allows to eliminate the typical «black-cross» that appear on coccolith observed in crossed nichols. The measurement of the light is converted into thickness using the measured retardation and the known birefringence of the calcite. The multiplication of thickness, surface, and calcite density equals the mass of the coccoliths.

We use this method on sediments retrieved north of Papua in 2005. ¹⁴C chronology of Core MD05-2917 indicates regular sedimentation rate in the order of 6mm/1000years. We sampled the top 6m of the core every centimeters. We prepared a smear slide for each sample on which a 2mm continuous transect was scanned by at 1000X resolution with an automated Leica DMR6000N microscope and a DiaFlex digital camera. Coccolith photographs of *Emiliania huxleyi* and of 2 species of *Gephyrocapsa* were selected by an artificial neural network using the combined «3 angles polarized» digital images of the field of views. The high sedimentation rates in this core implies important dilution of coccoliths in the sediments: only 30-40 coccoliths were grabbed per sample. We combined 5 samples together to reach a number of coccolith analyzed sufficient to determine the mean coccolith mass with enough accuracy. We produced a high resolution (< 10years) record of coccolith mass for the last 1000 years (≈1998-≈980 year AC). This record permits to describe the history of the coccolithophore calcification states during the last millennium.