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Interactive comment on "An empirical method for absolute calibration of coccolith thickness" *by* Saúl González-Lemos et al.

Anonymous Referee #1

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This is a very well written paper that clearly sets out all the steps in obtaining an accurate calibration of thickness for coccoliths using polarization techniques in an imaging microscope. I found the paper easy to follow even for someone coming more from the optical physics side of the house. Every step is clearly described, all the sources of error are properly addressed and the procedures required to adapt other equipment and duplicate the fabrication of the wedge standard are clearly outlined ensuring that this paper will significant and of use to many other researchers in the field. I therefore recommend its publication. I only found one minor typo which is a testimony to the very good quality of the authors writing : Page 6 Line19 :"that they rods are cylindrical" should read "that they are cylindrical rods" The following comments are queries which come from my perspective as an optical physicist and should not in any way be

interpreted as a criticism of the paper. They may mostly be based on my ignorance of the customs and literature in the field. It seems to me that first glance that a relatively simple model for the polarization interference pattern as a function of illumination wavelength (even in the color range) of a given thickness of calcite could be derived as the retardation dispersion has been well measured.[G. Ghosh. Dispersion-equation coefficients for the refractive index and birefringence of calcite and quartz crystals, Opt. Commun. 163, 95-102 (1999)]. In and of itself, this may not be precise enough for a calibration but it would be precious to have as a guide to the proper functional form of a calibration curve. As anyone considered using a well-chosen set of narrow band color filters in front of the illumination source of the microscope? The intensity of each wavelength for a given pixel could be recorded and the ratios calibrated against a blank slide response computed. These would give information on the differential retardation and therefore the thickness given the known indices of refraction of calcite. If a black and white camera where used this would be completely straightforward. If a color camera where used the camera color channel response matrix could be used for the same purpose. Finally, it seems to me that comparing the retardation map with an electron microscope size map could in principle be used to estimate the distribution of the c-axis crystal orientation in the lith structure. Has this been done by anyone?

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