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An alkenone-based method to quantify growth rate of coccolithophores

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The missing of accurate quantifications of coccolithophores' growth rate has hampered the paleo-pCO_2 estimation via alkenone carbon isotopes for thirty years. Though previous works have been found the potential link between C_{37}/C_{38} alkenones and growth phase, there is still no good calibration on the coccolithophore growth rates. Here we introduce a new machine learning based method, which was train by lab-culture data including growth rate and alkenone assemblage (both C_{37} and C_{38} alkenones). By using a random forest method, the correlation coefficient between predicted growth rates and measured ones can reach 0.95 and the rot man square error of estimated growth rate is reduced to 0.15 d^{-1}. This new machine learning method can improve the accuracy of CO_2 reconstruction significantly.