האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

סמינר המכון למדעי כדור הארץ
The Institute of Earth Sciences seminar

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Chemical weathering kinetics – what we knew, what we know and what we hope to know

קינטיקה של ריאקציות בלייה כימית – מה ידענו, מה אנו יודעים ומה אנו מקווים לדעת

Wednesday 15.3.2017, Room 102, 10:00

הסמינרים מתקיימים בימי רביעי בשעה 10.00 באולם 102
בבניין המכון למדעי כדור הארץ,
קמפוס אדמונד י.ספרא, גבעת רם.

קפה יוגש לפני הסמינר בשעה 09.45

הזמנה זה משמשת אישור כניסה לקמפוס אדמונד י. ספרא, גבעת רם החל מהשעה 8.00

מרכזי הסמינר: עמוס פרומקין (054-8820489) וחגית אפק (02-6584654)

Abstract

Understanding weathering of minerals is essential for many environmental problems such as susceptibility of landscapes to acid deposition, CO_2 sequestration, weathering and climate change, radioactive waste disposal, mines drainage, release of both nutrient and toxic elements to soils and to the hydrologic cycle, and the distribution of porosity and permeability in hydrocarbon reservoir rocks. Nevertheless, weathering rates of silicates observed in the laboratory, under non-natural conditions, are in general up to five orders of magnitude higher than those inferred from field studies. Although many explanations were proposed during the last two decades, the gap was never fully resolved. Therefore, it is environmentally important to confirm the extrapolated geochemical models, under close-to-natural conditions.

The two major problems in measuring dissolution rates under close-to-natural conditions in laboratory experiments are: (1) our inability to measure small differences in concentration between solutions with relatively high concentrations and (2) the inherent problem that the change in solution concentration is affected by both the dissolution of the primary mineral and the precipitation of secondary minerals.

In the present study, a novel method that uses silicon isotopes is developed and used to measure weathering rates of feldspar under close-to-natural conditions. This new method overcomes the analytical difficulties by lowering the absolute uncertainty on dissolution rates. Moreover, with this method one can eliminate the effect of secondary phase precipitation on the determination of dissolution rate of a primary mineral and it is possible to approximate the precipitation rate of the secondary phase minerals.

The new results fully resolve the gap between laboratory data and field measurements. Moreover, the effects of environmental variables (e.g. degree of under saturation, pH, temperature, catalysts, inhibitors and salinity) on feldspar dissolution rate were re-examined.