A COMPARISON OF THE RARE EARTH ELEMENT CONTENT OF THE MOON AND EARTH.

Michel LOUBET, Raymond MONTIGNY, Claude J. ALLEGRE

Laboratoire de Géochimie et Cosmochimie
Institut de Physique du Globe
et Département des Sciences de la Terre
Université de Paris 6 et 7
4, Place Jussieu Paris 5

I - INTRODUCTION

After the Apollo 11 mission, several workers have asserted that the Moon's mantle or the whole moon, differs significantly from the Earth's mantle in REE content. This assumption was based on a comparison of approximately 3.6 BY old lunar basalts with terrestrial basalts of about 0. B.Y. The Apollo 12 results showed that the REE difference between the Earth and the Moon was less important than was suggested by the Apollo 11 results.

Since then many new data with a bearing on this question have become availaible. Evaluation of these data and an increased knowledge of the Moon as a whole have lead us to the conclusion that as far as the REE are concerned, the Moon and the Earth have chondritic abundances.

II - THE EARTH

Using published analyses of REE in modern oceanic rocks (basalts, gabbros, peridotites), one may with Hess model ( ) of the oceanic crust, calculate the REE composition of the parent magma, which has given rise to the oceanic basalts and gabbros. A lherzolite mantle with about 1% spinel and a REE abundances of 1.0 to 1.8 times, the chondritic abundances will produce upon partial fusion a magma very similar to the parent magma of these oceanic basalts and gabbros.

A COMPARISON OF THE RARE EARTH ELEMENT CONTENT OF THE MOON AND EARTH
M. Loubet, et al

This conclusion is confirmed by our REE measurements on various Mediterranean ophiolite suites (Troodos, Vourinos, Pindos and ophiolites from Turkey).

III - THE MOON

Most of the lunar rocks give the impression of not being the uncontaminated partial fusion products of a lunar mantle. In particular, their ($^{87}Sr/^{86}Sr$) initial and their REE abundances suggest that these rocks have been somewhat contaminated by an acidic component. Hence, one should not compare these rocks with terrestrial mantle derived rocks.

To circumvent this problem, we have used our REE abundances measurements for a Apollo 17 anorthosite with a very low ($^{87}Sr/^{86}Sr$) ratio, to derive by means of plagioclase/basalt partition coefficients, the REE abundances of the parent magma of this anorthosite. The anorthosite we used had chondrite normalized REE abundances as low as 0.04, and should thus have been in equilibrium with a parent magma with chondrite normalized abundances of about 1.2, assuming that the lunar anorthosite deposits are not extremely thick. In this way, we arrive at an REE abundances estimate for the lunar mantle, which is in agreement with the observed abundances of uncontaminated Apollo 15 and 17 basalts, if those basalts were the result of a 20% partial fusion of an ultramafic lunar mantle.