Stable isotope compositions of fossil sun/shade leaves and difference for paleoenvironmental reconstruction

LIANG XIAO[1]*, HONG YANG[2] AND BAINIAN SUN[3]

[1]College of Earth Science and Resources,Chang'an University,Xi'an 710054,China (*correspondence: correspondence: zyxiaol@chd.edu.cn)
[2]College of Arts and Sciences, Bryant University, USA
[3]Lanzhou University, Lanzhou 730000, China

Stable carbon isotope ($\delta^{13}C$) measured on terrestrial plant leaves is being used increasingly to infer paleoenvironments. However, there is considerable variation in $\delta^{13}C$ even between the leaves of a single plant due to different microhabitats [1], which can bias the paleoenvironmental interpretation. One important factor causing microhabitat variations is leaf position on a tree (i.e. sun and shade). In this work, totally 18 well-preserved leaf compression fossils assigned to *Liquidambar miosinica* Hu & Chaney which collected from eastern China, were measured to obtain bulk isotope values (seeing in Table 1). Based on the data, we discuss whether the isotopic parameters can become good indicators identifying sun/shade morphotype.

Character	Sun	Shade
$\delta^{13}C$ (‰)±s.d.	-27.32±0.71	-27.65±0.38
$\delta^{15}N$ (‰)±s.d.	3.76±0.40	3.39±0.52
C%±s.d.	16.11±7.45	14.16±7.31
N%±s.d.	0.53±0.22	0.49±0.22
C:N	29.38	28.43

Table 1: The mean isotope values of fossil leaves.

Our results show that C% and N%, C:N ratio, $\delta^{13}C$ and $\delta^{15}N$ do not present apparent difference between sun and shade morphotypes. The mean value in sun leaves is only about 0.33‰ enriched in ^{13}C than that in shade leaves. The four other isotopic parameters are also similar between sun and shade morphotypes. As a result, we conclude that the isotopic values of fossil leaves offer only limited distinction between sun and shade leaves. Here, C% and N% of sun morphotype are higher than that of shade morphotype, suggesting that sun leaves are involved in better resistant ability against decomposition. Moreover, the variation of $\delta^{13}C$ are more profound in sun leaves than that in shade leaves for fossil *Liquidambar*, proposing sun leaves may be more sensitive to environmental changes. Together, the two conclusions indicate that $\delta^{13}C$ of sun morphotypes are better proxy in reconstructing paleoenvironments.

[1] Kürschner (2002) *New Phytol*. **155**, 199–200.

Small volcano swarms on the Moon: Common volcanic edifices on terrestrial planets

L. XIAO, J. HUANG, Q. HE AND X.X. HE

Faculty of Earth Science, China University of Geosciences, Wuhan, Hubei, 430073, China (longxiao@cug.edu.cn)

We re-examined lunar mare domes using newly obtained CE-1 and Selene imaging data, and did comparative study with terrestrial and Martian volcanic domes. Lunar mare domes have been classified into seven classes by Head and Gifford (1979). Our study suggests that there are five small volcano swarms on the Moon: Marius Hills, Aristarchus, Horrensius, Cauchy and Mons Rumker. In which, Marius Hills consists of more than one hundred small domes, Aristarchus has tens domes, the Mons Rumker is a big dome built by tens small volcanoes and the Horrensius region has nine domes. All of these domes are small in scale, their diameters ranging from 2km to 18km and tens to several hundred meters in height.

These domes are all volcanic in origin and display as volcano swarms or clusters. We compared their features with small volcano swarms of Syria Planum on Mars, Beta-Phoebe-Alta, Ulfrum Regio, Western Helen Planitia and Akkruva Colles volcano clusters on Venus, Arizona volcanic field, northeastern China volcanic field on Earth. The comparative study suggests that most of these domes are low shields and have basaltic composition. Large basaltic magma chambers have been suggested underneath the volcano swarm fields. Multi-vents that link surface volcanoes and magma chambers were caused by impingement of mantle plumes.

It was proposed that the Moon had experienced long-term mantle melting and differentiation in its early history. Global-scale magma ocean hypothesis was widely accepted to interpret the formation of lunar feldsparic highland crust. Magmatism was suggested stopped 2.5Ga ago, although several lava ponds was dated as young as 2.0Ga. Isolated volcanic dome swarms mainly on the near side are expressions of later local mantle plume activities along with cooling of the interior post-dated regional flooding volcanism, similar to volcanoes on Mars and Venus and intra-plate volcanoes on Earth.