The genesis of Jadeitite: A viewpoint from Zirconology

T.F. YUI[1]*

[1]Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan (*correspondence: tfyui@earth.sinica.edu.tw)

Jadeitite is a rare rock type formed in subduction zones. Its genesis has attracted much attention recently. Two formation mechanisms have been proposed: the whole-sale metasomatic replacement and the vein precipitation. These two mechanisms would imply different chemical cycling paths for elements such as Al, Na, Zr and Hf, in subduction zones as a result of different physical-chemical conditions. Correct deciphering of jadeitite genesis around the world could therefore provide important information on subduction environment/processes. Recent advance on in situ micro-analysis of zircons provide a unique opportunity to tackle this issue.

Zircon as an accessory mineral in jadeitite would be either inherited from igneous protolith or recrystallized/newly-formed through metasomatic processes. Theoretically, jadeitite fromed from whole-sale metasomatic replacement would contain both types of zircon, while jadeitite fromed through vein precipitation may only have metasomatic zircon. Mineral inclusions, trace-element and isotopic compositions, as well as textures of zircon have been employed as criteria to distinguish magmatic from metasomatic zircons in recent studies on jadeitite. Unfortunately, with more case studies, it turns out that none of the criteria mentioned above is conclusive. For example, mineral inclusions of metasomatic origin may actually be pseudo-inclusions in inherited, but not metasomatic, zircons. The resetting rate of trace element compositions and U-Pb isotope system of zircon, as well as zircon texture changes, may not take place "in phase" during zircon recrystallization in association with jadeitite formation. Even with "apparent" metasomatic textures, zircons may not necessarily display metasomatic chemistries or yield metasomatic ages. Only through careful and detailed examination of integrated data can the correct interpretation on the origin of zircons, and hence the genesis of jadeitite, be retrieved. A thorough review shows that most jadeitites that have been studied recently would have formed through whole-sale metasomatic replacement processes. Jadeitite formed through vein precipitation process can only be convincingly identified from north of the Motagua fault, Guatemala.

Inverse Modeling of Asian Dust Emission with MODIS AOT and the SPRINTARS Adjoint Model

KEIYA YUMIMOTO[1,*] AND TOSHIHIKO TAKEMURA[2]

[1] Meteorological Research Institute, Japan Meteorological Agency, Nagamine 1-1, Tukuba-city, 305-0052, Ibaraki, Japan (*Correspondence; yumimoto@mri-jma.go.jp*)

[2] Research Institute for Applied Mechanism, Kyushu University, Kasuga Park 6-1, Kasuga, 816-8580, Fukuoka, Japan (*toshi@riam.kyushu-u.ac.jp*)

In this study, we performed inverse modeling of Asian dust using MODIS coarse-mode aerosol optical thickness (AOT) and the adjoint of global aerosol climate model [1] for four years (2005–2008). Gridded (T42 horizontal resolution; approximately 2.8° × 2.8°) and daily dust emissions in Asian dust sources were optimized. The adjoint inverse modeling generally increased dust emissions from the Gobi desert, and emphasized the daily and inter-annual variations of dust emission amount, comparing with a priori emission (Figure 1). For a sever dust storm in late March 2007, the peak of dust emission was shifted by one day earlier by the inverse modeling. The inversion results were widely validated independent observations (e.g. lidar observation network).

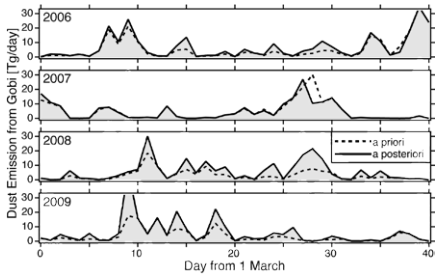

Figure 1. Time series of dust emission in the Gobi desert. Solid and broken lines represent a priori and a posteriori emissions, respectively.

Direct Aerosol Radiative Forcing (DARF) for dust aerosol was estimated with a posteriori dust emissions. The increase of dust emissions leaded increases of longwave DARF at both the top of atmophere and surface. A posteriori DARF exhibits the different trend and the larger inter annual variations than a priori one.

[1] Yumimoto and Takemura (2013), SPRINTARS/4D-Var Data Assimilation System: Development and Inversion Experiment Based on OSSE Framework, submitted to Geoscientific Model Development.

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.25