**Japan Geoscience Union Meeting 2011**
(May 22-27 2011 at Makuhari, Chiba, Japan)


SMP005-08 Room:201B Time:May 23 16:30-16:45

# Significance of metacarbonate rocks in understanding the supercontinental evolution

Satish-Kumar Madhusoodhan[1*], Tomoharu Miyamoto[2], Nobuhiko Nakano[2], Daniel Joseph Dunkley[3], Tomokazu Hokada[3], Yasuhito Osanai[2], Brian Windley[4], Geoff Grantham[5], Joerg Hermann[6], Kazuyuki Shiraishi[3], Yoshikuni Hiroi[7], Yoichi Motoyoshi[3], Hideki Wada[1]

[1]Shizuoka Univeristy, [2]Kyushu Uniiversity, [3]National Institute of Polar Research, [4]Leicester Univ. UK, [5]Council for Geoscience, South Africa, [6]ANU, Australia, [7]Chiba University

Extensive metasedimentary supracrustal sequences exposed in the crustal fragments of the East Gondwana supercontinent, especially in East Antarctica, Sri Lanka, peninsular India, Madagascar and Mozambique, provide us with an opportunity to understand the geodynamic evolution of supercontinent assembly and breakup, as well as to extract key information on the depositional environments of paleo-oceans that separated the proto-continents. The closure of the Neoproterozoic Mozambique Ocean is considered to be a consequence of supercontinental assembly of East Gondwana and West Gondwana during a protracted Pan-African Orogeny that spatially extended from the Arabian-Nubian Shield to the East Antarctic shield, through East Africa, Madagascar, peninsular India and Sri Lanka. The difficulty in constraining the characteristics of the Mozambique Ocean is mainly due to the high-grade metamorphism and tectonic reworking of the sediments during the regional Pan-African Orogeny. However, metacarbonate rocks potentially provide valuable information on the paleo-ocean geochemistry and depositional environments. Here we present a comprehensive geochemical/isotopic evaluation of metacarbonate rocks from East Antarctica, Sri Lanka, peninsular India, Madagascar and Mozambique to constrain the age of deposition of carbonate in the Mozambique Ocean. An extensive data set of C, O and Sr isotope geochemistry combined with trace and rare earth element geochemistry of the high-grade metamorphosed dolomitic and calcitic marbles shows that most underwent post-depositional geochemical alteration. In particular, Sr and O isotope alterations are extensive, with $^{87}Sr/^{86}Sr_{(550Ma)}$ ratios as high as 0.758 and oxygen isotope values as low as -5 parts per thousand. For this evaluation we carefully screened out samples affected by diagenetic and metamorphic alterations based on the carbon, oxygen and strontium isotope results in comparison with reported geochemical parameters of non-metamorphic Meso- to Neo-proterozoic carbonate sediments. Some of the metacarbonate layers preserve pre-metamorphic geochemical characteristics, such as low Sr isotope ratios, high oxygen and carbon isotopic values and well-equilibrated, unaltered trace and rare earth element patterns. Consistently low $^{87}Sr/^{86}Sr_{(550Ma)}$ ratios of 0.705 with high carbon and oxygen isotopic compositions suggest an apparent age of deposition in the Neoproterozoic (ca. 700-850 Ma), with rare exceptions of 0.704 that indicate a Mesoproterozoic age. These apparent depositional ages are consistent with ages obtained from detrital zircons in metapelitic rocks associated with the metacarbonates. Our study thus provides important constraints on the age of carbonate deposition in the Mozambique Ocean that separated East and West Gondwana.

Keywords: metacarbonate geochemistry, strontium isotopes, carbon and oxygen isotopes, gondwana, chemostratigraphy