Hydrothermal origin of the Paleoproterozoic xenotimes from the King Leopold Sandstone of the Kimberley Group, Kimberley, NW Australia: Implications for a ca 1.7 Ga far-field hydrothermal event

Z.W. LAN[1]*, Z.Q. CHEN[2], X.H. LI[1], B. LI[3] AND D. ADAMS[4]

State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China (*correspondence: lzw1981@126.com)

[2]State Key Laboratory of Biogeology and Environmental Geology, China University of Geosciences (Wuhan), Wuhan 430074, China

[3]Centre for Exploration Targeting, ARC Centre of Excellence for Core to Crust Fluid Systems, The Univeristy of Western Australia, WA6009, Australia

[4]Centre for Microscopy, Characterisation and Analysis, The University of Western Australia, WA6009, Australia

New xenotime overgrowth ages are obtained from the Paleoproterozoic King Leopold Sandstone of the Kimberley Group, NW Australia. The concordant age of 1679 ± 13 Ma can be equated with the *ca* 1.7 Ga xenotime overgrowth ages within errors obtained from the Warton and Pentecost Sandstones of the same group and the ca 1.7 Ga zircon U-Pb ages from the Dingo Granite in northern Australia, and together they are consistent with the age of Capricorn orogeny. These ages are much younger than the robust SHRIMP ages (1790 ± 4 Ma) obtained from zircons from the Hart Dolerite intrusions, and thus indicate that the xenotime overgrowths recorded in the Kimberley Group are unlikely to be diagenetic in origin, but may have been resulted from a post-depositional hydrothermal event. The *ca* 1.7 Ga age could point to a common hydrothermal event possibly associated with the low temperature far-field Dingo Granite intrusion during Capricorn orogeny in the Paleoproterozoic Australia. The hydrothermal origin of the xenotime overgrowths is also supported by its mineral chemistry characterized by LREE depletion, MREE-HREE enrichment, higher Zr content, and lower U, Fe, and Lu contents. The differing U and Th concentrations suggest a differing chemical pore fluid would have been responsible for the formation of xenotime overgrowths from the King Leopold, Warton, and Pentecost Sandstones as the zone of xenotime precipitation was reached by siliciclastic sediments.

Regional geochemical mapping at high density sampling: Various criteria in representation of Romagna Apennines, Northern Italy

V. LANCIANESE[1]* AND E. DINELLI[1]

[1]I.G.R.G, Università di Bologna, via S.Alberto 163, 48100 Ravenna (*correspondence: valerio.lancianese2@unibo.it)

Geochemical mapping is a fundamental tool in environmental monitoring and land management. For this reason, regional-, national- and global-scale geochemical mapping projects have been carried out in some countries since the late 1960s. The surveys had sample densities ranging from 1 site per 1 Km^2 to 1 site per 18000 Km^2 and each research group used different representation techniques.

In the Romagna Apennines (Northern Italy) has been conducted an high density stream sediment geochemical survey (1 sample per 5 km^2): 770 samples were collected in a regional-scale area (4125 km^2) and analysed for 30 elements by X-ray fluorescence spectrometry on the fraction < 180μm. In the area industrial settlements and largest towns are in the plains, agricultural areas in the hills and a wooded mountainous area is common in the upper reaches of the major streams. The area has a complex geology characterized by different geological units: Messinian gypsum, Plio-Pleistocene marls, chaotic clays with extensive outcrops of quartz-rich sandstones, carbonatic sandstones and limestones, and the extensive Serravallian-Tortonian Marnoso-arenacea Formation. In data interpretation different techniques were applied: EDA [1], IDW interpolation and Sample Catchment Basin (SCB) mapping approach [2,3]. EDA highlights very well the control of geological units and different background values using major elements. IDW interpolation point out the nature of some anomalies (Zn, Sr, V, Cr) showing the spatial distribution of geochemical data. Otherwise SCB mapping technique is useful in geochemical maps of Cu, Pb, Ba, S because identifies the effects of human activities localized along the valleys.

This study shows how in an area characterized by multiple factors, chemical elements can not be represent properly with a standardized mapping technique. Indeed, the use of different mapping techniques point out peculiarities useful for interpretation of the effect of geology or of the human impact.

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