Mesoproterozoic bimodal magmatism of southern Australia: assessing relative mantle input and implications for IOCG mineralisation prospectivity.

Thesis submitted in accordance with requirements of the University of Adelaide for an Honours Degree in Geology

Henry Charles Chalk

November 2014

MESOPROTEROZOIC BIMODAL MAGMATISM OF SOUTHERN AUSTRALIA: ASSESSING RELATIVE MANTLE INPUT AND IMPLICATIONS FOR IOCG MINERALISATION PROSPECTIVITY.

RUNNING TITLE: MESOPROTEROZOIC MANTLE INPUT IN SOUTHERN AUSTRALIA

ABSTRACT

Mesoproterozoic magmatism of the Gawler Craton and the Curnamona Province demonstrates regions of variable mantle input characteristics. Zircons from Hiltaba Suite granitoids and Gawler Range Volcanics, Gawler Craton, return ε_{Hf}(T) values ranging from +7.1 to -0.4, +2.0 to -7.4, and +0.2 to -5.3 from the western, central, and eastern Gawler Craton respectively. Ninnerie Supersuite granitoids and Benagerie Volcanic Suite, Curnamona Province, return ε_{Hf}(T) values ranging from +2.5 to -3.8. Mantle input modelling of the central/eastern Gawler Craton and the Curnamona Province returns similar mantle input fraction values ranging from 0.1 to 0.6, averaging 0.3, and 0.1 to 0.6, averaging 0.3, respectively. Hiltaba Suite magmatism of the western Gawler Craton is compositionally more juvenile than the central and eastern regions. The western Gawler Craton mantle input fractions range from 0.2 to 0.9 averaging 0.5, more elevated than the central/eastern regions of the Gawler Craton and the Curnamona province. The Benagerie Ridge region of the Curnamona Province displays similar bimodal *ca.* 1590 Ma magmatism, ε_{Hf}(T) values, mantle input characteristics, crustal preservation (exhumation) and regional iron oxide copper-gold alteration as the highly prospective Olympic IOCG Province, Gawler Craton.

KEYWORDS

Gawler Craton; Curnamona Province; Olympic IOCG Province; Benagerie Ridge; Mesoproterozoic; Lu-Hf; U/Pb geochronology; Hiltaba Suite; Ninnerie Supersuite; IOCG prospectivity

TABLE OF CONTENTS

LIST OF FIGURES