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I. CENOZOIC GEOLOGY OF IRAN: AN INTEGRATED STUDY OF EXTENSIONAL TECTONICS AND RELATED VOLCANISM

II. EDIACARAN STRATIGRAPHY OF THE NORTH AMERICAN CORDILLERA: NEW OBSERVATIONS FROM EASTERN CALIFORNIA AND NORTHERN UTAH

Thesis by

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ABSTRACT

I.

The late Oligocene to Miocene collision of Arabia and Eurasia was preceded by ~175 My of subduction of Neotethyan oceanic crust. Associated magmatic activity includes late Triassic(?) to Jurassic plutons in the Sanandaj-Sirjan zone of southern Iran, limited Cretaceous magmatism in the Alborz Mountains of northern Iran, and widespread Eocene volcanism across central Iran. Metamorphic core complexes of Eocene age have recently been recognized in widely separated parts of Iran, suggesting that Tertiary volcanism was related to extension. Geochemical data indicate that Eocene volcanism was typical of continental arcs and was followed by less voluminous Oligocene basaltic volcanism of the type often associated with back-arc basins. This set of observations suggests that mid-Mesozoic plutons in southern Iran are the remnants of an original volcanic arc that was only weakly developed because of slow subduction rate. Magmatic activity largely ceased in southern and central Iran during the Cretaceous and shifted to the north, suggesting a period of flat slab subduction. Subsequent slab-rollback during the Eocene extended the overriding plate, forming metamorphic core complexes and inducing pressure-release melting of partially hydrated lithospheric mantle and upwelling of asthenosphere.

II.

The Ediacaran Period spans from the base of cap carbonates overlying glacial deposits of the Marinoan “Snowball Earth” event to the Precambrian-Cambrian boundary, ~635 to 542 Ma. Sediments deposited during the rifting of southwest Laurentia, which are now

exposed in a relatively narrow belt in the western US, are one of the best records on earth of the geological, geochemical, and geobiological events that occurred during this period. Evidence for one of the most significant of these, the final oxygenation of the oceans, is found within the upper Johnnie Formation in the southern Great Basin. C isotope data from thick, basinal facies of the Johnnie Fm. in the Panamint Range provide a more complete record of ocean chemistry associated with this event than previously determined from thinner, platformal facies. Strata in northern Utah of roughly the same age include a rift-related basalt, providing some of the youngest geologic evidence for the rifting of western Laurentia.

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