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The Geodynamic Evolution Of The Italian South Alpine Basement From The Ediacaran To The Carboniferous: Was The South Alpine Terrane Part Of The Peri-Gondwana Arc-Forming Terranes?

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ABSTRACT

Zircon U–Pb LA-ICPMS ages were obtained from three metasedimentary and two metavolcanic samples from the Monte Cavallino (South Tyrol) and the Cima Vallona (Carnic Alps) tectono-metamorphic groups from the eastern South Alpine crystalline basement in NE Italy. These analyses were performed to constrain the maximum depositional ages of the South Alpine domain, and to compare the spatial and temporal provenance variations with those of adjacent terranes. The detrital zircon dataset from the metasedimentary rocks (416 grains) yield populations with age peaks at 2.7–2.9 Ga, 1.8–2.1 Ga, 1.2-0.85 Ga, and 0.65-0.45 Ga, with maximum depositional ages ranging from the latest Neoproterozoic to the Silurian. The metavolcanic zircon dataset (209 grains) documents the presence of a two Ordovician volcanic events in the South Alpine domain. The detrital zircon dataset implies that the clastic units of the South Alpine crystalline basement were (a) deposited on the peri-Gondwanan active continental margin and (b) were originally sourced from the Proterozoic and Paleozoic units of NW Gondwana and hence should no longer be considered as exotic elements. The age spectra of the three metasedimentary units highlight differences between the Ediacaran basement gneiss, the Ordovician greywacke, and the Silurian metaconglomerate, suggesting up-section age variations due to a temporal change in provenance. Collectively, these new detrital zircon U–Pb ages imply that the clastic units within the South Alpine domain recorded sedimentation at c. 550 Ma on the peri-Gondwanan active continental margin, followed by rift-related continental and marine sedimentation in a back-arc basin setting until at least the Silurian. The South Alpine domain ultimately rifted off from Gondwana due to back-arc spreading, and subsequently underwent Variscan metamorphism during accretion onto the Laurussia margin, which started at c. 380 Ma and lasted until at least c. 320 Ma.

1. INTRODUCTION

The basement of the Eastern Alps is a collage of allochtonous terranes and tectonometamorphic/tectonostratigraphic units (Figure 1a), which rifted off from the northern margin of Gondwana and were transferred across the Rheic Ocean to Laurussia during the Paleozoic (Stampfli et al., 2003, 2011, 2013). Basement rocks occur in two different regions of the eastern Alps, the Austroalpine domain within the orogenic belt and South Alpine domains adjacent to the Adria buttress. These two domains are separated by the Periadriatic Line (Figure 1a).