Reply: Comments by Colliston and Schoch (2008) on paper by Lacassie et al. (JGE, 91, 81–98 (2006))

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We appreciate the comments by Colliston and Schoch (2008) on our recent publication (Lacassie et al., 2006) that highlights the importance of understanding the structural complexity of the Bushmanland Group. While we agree with the authors that the structural complexities require a vigilant approach to any stratigraphic analyses, we disagree that the structural and stratigraphic complexities prohibit stratigraphic correlation within the Aggeneys–Gamsberg District or regionally (Bushmanland Subprovince). McClung (2006) recently completed a multidisciplinary investigation for the northern Bushmanland Group (Fig. 1). The results of this study are based upon extensive, detailed lithostratigraphic mapping, combined with the application of sequence stratigraphic principles to recognize important depositional cycles. Importantly, we wish to draw attention to the fact that the field-based results are independently supported by whole-rock geochemistry and detrital zircon geochronology (McClung, 2006). The results of the latter study support a simple stratigraphic subdivision as previously proposed by Joubert (1974, 1986), Rozendaal (1975), Ryan et al. (1986) and Lipson (1990), and confirm the correlatability of important lithostratigraphic units as suggested by Joubert (1986), Praekelt et al. (1983, 1997) and Praekelt and Schoch (1997).

Our study provides an important and independent test to the investigation of McClung (2006). Colliston and Schoch (2008) are regrettably mistaken in assuming that samples were "grouped on lithological basis." Indeed we clearly state that "*a priori* knowledge was not used during the unsupervised training of the GCS map" (emphasis added, Lacassie et al., 2006, p. 90). Furthermore, we would like to stress that our analysis is based on a subset of whole-rock geochemical data for the three most important schist units of the Bushmanland Group in the Aggeneys–Gamsberg District, presented by Lipson (1990; see Lacassie et al., 2006, p. 87). As such, we did not produce any new analytical data as erroneously invoked by Colliston and Schoch (2008).

Based on the aforementioned, the clustering or group separation of the data in the trained network is a natural characteristic of the samples, irrespective of their lithological nature or lithostratigraphic position, and indicates that the geochemical associations are not merely "geochemical correlations between rocks with similar lithology" as suggested by Colliston and Schoch (2008). Furthermore, the results of Lacassie et al. (2003, 2004) show that the GCS analysis is sensitive to subtle geochemical differences between stream sediments of the same fluvial system located at relatively close geographical positions, i.e. between sediments of "almost identical lithology". In particular, the subtle geochemical associations found by Lacassie et al. (2003, 2004), using GCS maps, indicate the presence of an unexpected geochemical signature, not seen by previous studies using more conventional methods, which were later confirmed by Ortiz and Roser (2006). Therefore, contrary to Colliston and Schoch (2008), we are confident that the obvious consistency of neural network clusters with lithostratigraphic position of samples collected at various localities throughout the Aggeneys–Gamsberg District is an important contribution to the understanding of the Bushmanland Group. Such

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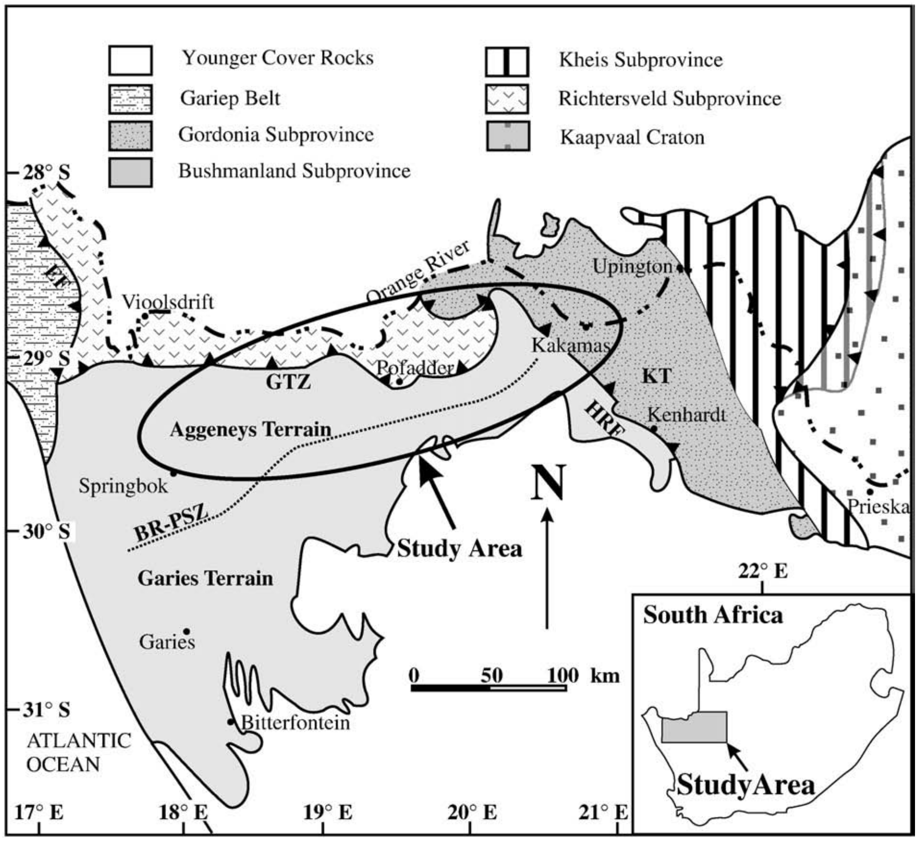

Fig. 1. Tectonic subdivision of the South African portion of the Namaqua Metamorphic Province illustrating the study area of McClung (2006), modified from Hartnady et al. (1985) and Joubert (1986). Abbreviations: KT — Kakamas Terrains; EF — Eksteensfontein Fault; GTZ — Groothoek Thrust; HRF — Hartsbees River Fault; BR–PSZ — Buffels Rivier—Putsberg Shear Zone.

consistency should be entirely unexpected, if one assumes the schist units were unrelated to one another, as repeatedly proposed by Colliston and Schoch (1998, 2002, 2003, 2006, 2008).

Finally, if one regards the geochemical similarities of sample sets from different localities as genuine, then this method can be used to also test the validity of field-based lithostratigraphic correlations as well as to identify areas that display anomalous geochemical signatures at sites where the lithostratigraphy is confidently known. This is the case for the Namies Schist Formation at Namiesberg, the type locality for this important stratigraphic unit (Moore, 1977). Because the sample set remains small (N=4) for this particular site, as correctly pointed out by Colliston and Schoch (2008), we remain cautious about the interpretation of the data in our contribution (Lacassie et al., 2006, p. 93). We do not propose stratigraphic correlation between this site and the Ore Schist Formation at the Broken Hill Mine as alleged by Colliston and Schoch (2008). In this context, it is important to note the occurrence of a barite ± magnetite bed at the stratigraphic contact between the Namies Schist and Broken Hill Quartzite Formation at Gamsberg (Moore in Barr, 1988), as well as the recent identification of the world-class Gamsberg East deposit (Creamer, 2006). Both of the above are in close spatial proximity to the sample sites of Lipson (1990) at Namiesberg. We view these geological facts as further support for our conclusion that the Namiesberg area has not received sufficient attention during previous exploration campaigns.

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