In the Kingdom of Saudi Arabia, Lower Paleozoic rocks crop out extensively in many areas and are well known from the subsurface. In the southern part of the country, the Paleozoic deposits are known as the Wajid Group, which is composed of five formations. Two of them, the Sanamah Formation and the Juwayl Formation record the two major Paleozoic glaciations that affected large parts of Gondwana.

The Sanamah Formation is of presumed Late Ordovician or Early Silurian age. It was mainly deposited in a succession of channels that are deeply cut into the underlying rocks. The geometry of these channels is not yet clear; however, the maximum depth hitherto observed is on the order of 80 m.

We have distinguished several lithologic units within the Sanamah Formation. The basal succession consists of red conglomerates and coarse-grained sandstones. Most of the clasts are rounded to well rounded, sorting is moderate to poor. Sedimentary structures include large-scale trough cross bedding and lateral accretion complexes. The second unit is composed of massive yellow to beige coarse-grained sandstones. There is hardly any cross bedding visible, and only a few reactivation surfaces have been found. Close to the top of the unit a few horizons have been found that show ripple marks. The third unit is a succession of sandstone that shows repeated horizons of slumping. The sediments are well bedded; grain size is medium to coarse sand. Along the margins of the channels, thin units of conglomerates are preserved that show trough cross bedding, a bad sorting and clasts that subangular to subrounded. In these sediments, a few striated clasts have been found.

At first glance, there is little evidence for a glacial origin of these deposits. However, the following observations lead us to suggest that the sediments of the Sanamah Formation represent deposition in a glacial/proglacial setting.

The origin of the channels or valleys in which the Sanamah sediments were deposited is unknown. However, from their presumed geometry, they are similar to tunnel valleys described from other places along the North Gondwana margin. The valleys were filled by steeply-dipping clinoforms interpreted as prograding subaqueous delta foresets probably indicating sea-level rise after the main glacial episode.

The origin of the channels or valleys in which the Sanamah sediments were deposited is unknown. However, from their presumed geometry, they are similar to tunnel valleys described from other places along the North Gondwana margin. The valleys were filled by steeply-dipping clinoforms interpreted as prograding subaqueous delta foresets probably indicating sea-level rise after the main glacial episode.

In the lower conglomeratic unit, several large blocks have been observed that consist of friable, well-beded sandstone. We suggest that these blocks, which during fluvial erosion would have been destroyed, were transported in a frozen state and thus survived destruction during transport. Striated clasts are conspicuously concentrated in the facies that covers the valley fills and transgress across the margins of the channels. These facies represent periglacial braided river deposits in which reworked glacial material is present.

We have observed up to 5 horizons in a 40 m section of coarse friable sandstone with structures resembling glacial striations. As it is unlikely that each of these horizons represents an individual glacial advance we will present a new model to explain glacial striations in soft sediment.

In general, depositional environments differ distinctly from Recent glacial and proglacial environments. The absence of cobbles and blocks and the relatively mature sediments (no clay) indicate a low-relief environment and probably reworking of Phanerozoic sediments in the west.
The sedimentary architecture and composition indicate that this part of the Arabian Platform was beyond the actual reach of the glaciers and that the Sanamah Formation most likely represents a proglacial environment in front of the inland ice shield of northeastern Gondwana.