

ARCHITECTURE OF MESOPROTEROZOIC LINEAR DUNES: GALHO DO MIGUEL FORMATION, SE BRAZIL

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ABSTRACT: Linear dunes are the most widespread dune type in the recent wind systems. However, ancient aeolian deposits are commonly interpreted as transversal dunes. On the contrary, few examples of linear dunes are documented in geological record, due to clear evidence of identification. During the Precambrian time, the development of aeolian systems should have been favoured by the absence of vegetation. In South American Plate, extensive Mesoproterozoic sandstone deposits belonging to the Galho do Miguel Formation can contribute to the current understanding of aeolian dune systems and in particular on the construction of linear dunes. Exceptional lateral and vertical exposures favour a detailed analysis of the facies, bounding surfaces, palaeowind direction indicators, and depositional architecture. Galho do Miguel Formation is a low-grade metasandstone, more than 3,000 m thick, where sedimentary structures, large scale architecture can be easily identified, although the metamorphism disrupted microscopic scale features. Three facies associations have been recognised: (i) linear dunes/draas characterised by laterally continuous, tangential cross-bedding sets of sandstone; (ii) superimposed dunes consisting dominantly of sandstone with trough-shaped sets; and (iii) interdune characterised by planar to undulated parallel stratification and low-angle cross-bedding. Linear dunes deposits are organised in vertically stacked sets, 0.8 - 21 m thick, laterally continuous for 900 m, exhibiting common reactivation surfaces. Occasionally, the sets thin sideways. Variable patterns of foreset dip are measured in this facies association: northeast and east dip direction are dominant, while south and southwest are less frequent. Usually, the bounding surface of the sets are characterized by truncating scalloped bases. Superimposed dune strata present wide trough-shaped sets, that dip to southeast and east. These sets are discontinuous, ranging from 0.6 to 3.0 m of thickness and occur dominantly in the topset of linear dune beds. Planar strata are widely distributed and comprise 12 m thick layers that interbed with cross-strata. Dunes/draas trend appears to have been approximately west-east, with asymmetrical shape and north-facing slopes steeper. The dunes migration is oblique, with main face of avalanche towards the northeast/east. On the other hand, the south/southwest foreset dip direction may be attached to the flip orientation caused by seasonal wind reversals. The north-facing slopes of linear dunes was the main accumulation face, whereas the south/southwest-facing slopes are less steep and main erosion face. The erosion face is characterized by outcropping of older semiconsolidated aeolian sand that generated scalloped surfaces. The foresets are truncated by stacked large trough-shaped sets were deposited by superimposed bedforms that migrated southeast and eastward along the crest and plinth of linear dunes/draas. These superimposed dunes probably had a barchan and/or barchanoid forms. The multidirectional pattern of the foresets, as well as the organization of sedimentary structures in the Galho do Miguel Formation, indicate the Mesoproterozoic ergs complexity. These ergs consisted of linear draas with superimposed dunes, and extensive interdune areas associated with wind regime seasonal changes.

KEYWORDS: AEOLIAN, ARCHITECTURAL ELEMENTS, PRECAMBRIAN.