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Climate Change: A reality or a myth? Koa Dunefield case study, Northern Cape, South Africa

Faul, C.[1], Van Deventer, P.W.[1], Strydom, J.[1] and Harmse, H.J. Von M.[1]

[1]Unit for Environmental Sciences and Management, North-West University (Potchefstroom Campus), cindyfaul35@yahoo.com

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Several dune studies proposed that shear velocity measurement would provide an understanding of downwind changes in sediment flux across dune surfaces [1]. Sand dunes are researched with the paradigm that good quality empirical data concerning wind flow and sand flux will provide the efficient information in order to understand how dunes are formed and how they maintain their form. The role of turbulence in sediment transport as well as the formation of geometric structural formations like the Koa dunefield is however not well discussed in literature [2].

The Koa dunefield falls within a study area, characterised by an arid climate with a mean annual summer rainfall of approximately 100 mm to 150 mm per year. Geologically, it forms part of the Namaqualand Metamorphic Complex, with areas overlain by strata of the Karoo Super Group and intruded by massive pegmatites with large quartz cores. Major sediment movement were already observed during November – December 2015 on sand dunes which were identified as stabilised/permanent dunes during field surveys by research institutions in the past. This indicates that the effect of global warming and climate changes can be observed in South Africa on a much larger scale than expected and it is a real time reality.

The main objectives of this study are:

- identification of geo-environmental and physical properties of the Koa dunefield;
- explaining the geometry and morphology of the dunes;
- investigate the origin of the dune sediments;
- investigate unique fauna and flora species on these dunes;
- investigate the migrating tempo of the dune systems, as well as the potential contribution of the dune sediments to the sandblasting damaged at the nearby solar energy facilities;
- investigate methods in order to decrease sediment transportation;
- to proof climate change influences on recent geology.

Geological and mineralogical overviews and descriptions as well as geomorphological mapping and interpretation of existing wind flow data are used to provide a broad overview of the study site. Our existing observations on the dunes include weather stations and also weather stations at other locations in the Northern Cape. Mineralogical and chemical characterisation by means of particle size distribution analysis, scanning microscope studies, XRF, XRD and isotope analyses will contribute to a fundamental understanding of the dune system dynamics and sediment fingerprinting to confirm the origin source of the dune sand. Observations and conclusions resulting from the study will be confirmed with wind simulation models and wind tunnel experiments, to introduce a platform for more detailed research for similar studies.

Key words: Unique sand dunes, sand flux, sediment transport, turbulence, wind friction.

References:

[1] Livingstone I et al. (2007) Science Direct 80: 239-257
[2] Lancaster N et al. (1997) Sedimentology 44: 1103-1113