Mean flow and Reynolds stress structure over aeolian ripples

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Mean flow and turbulence structure on transverse ripples have been well documented in hydrodynamic literature. However, very few studies have described the flow characteristics over aeolian ripples. This study adopted laser Doppler anemometry (LDA) to measure the wind field above granular ripples with different bimodal particle size distributions in a wind tunnel. Multiple runs were conducted to examine the vertical profiles of time-averaged horizontal and vertical velocities and Reynolds stress above four different locations: crest, lee slope, trough, and stoss slope. The rippled sand bed has a fine beige fraction with grain size smaller than 0.542 mm concentrated in the troughs and a coarse fraction dyed in red with grain size greater than 0.542 mm concentrated in the crests. The magnitude of the ripples at equilibrium is controlled by both wind velocity and the ratio of beige sand to red sand. Freestream velocity has a range between 8-11 m/s (above the saltation threshold of beige sand and below the threshold of red sand) and the percentage coarse by mass varies from 5.2