



Characterisation of sub-basin scale dust sources

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Recent research has concluded that the major global dust source regions are inland drainage basins with annual rainfall <250 mm. These areas are often characterised by extensive alluvial or playa lake deposits (contemporary and/or ancient) which are assumed to be an important sediment source. However, most inland basins are patchworks of different soils and geomorphological units – for example not only including playas, but also dunes, stone pavements and ephemeral channels – and each has the potential to yield different quantities and types of dust under certain conditions. This paper uses a combination of meteorological data, geomorphological mapping and satellite image analysis to determine the relative importance of different land types as dust sources at the sub-basin scale. Focusing on the Lake Eyre Basin, Australia, meteorological data are used to characterise individual dust events and satellite data (predominantly ‘split window’ analysis of MODIS imagery) are used to identify the origin of dust plumes detected between July 2003 and June 2006. The frequency with which different geomorphological units emit dust, the magnitude of events with which these emissions are associated, and the variability of emissions from individual units (both spatially and temporally) was examined. Of the 532 dust plumes examined, 56% were point sources (≤ 10 km across) whilst 44% were zonal or broad sources (> 10 km across). Over the three years, 37% of plumes originated in areas of aeolian deposits (which comprise 33% of the basin area), 30% from alluvial deposits and floodplains (which comprise 12% of the basin) and 29% from ephemeral lakes, claypans and playas (which together comprise just over 2% of the basin), however there was considerable interannual variation. For example in 2003/4 49% of dust plumes originated in dunefields and 23% originated in areas of alluvial deposition compared with 35% from dunefields and 44% from alluvial deposits in 2005/6. Local geomorphological

associations are also important for dust emissions, for example lake margins are consistently more common sources of dust plumes than the centres of lake beds and dunes with sandy interdunes are 2-4 times more likely to be dust sources than dunes with interdune pans or interdunes subject to inundation.