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Dust from arid South Africa: A story of drought, mining, and land degradation

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The arid west coast of South Africa has shown a large increase in dust events and wind erosion, with consequences for public health and the environment. MODIS satellite imagery allowed for the detection of dust source points on the west coast of South Africa from 2000 to 2021. In total, 569 dust source points were detected during the 22 years of analyses. Most dust sources can be associated with either inland shrubland areas or coastal extraction pits and quarries. The coastal mining areas are dominated by diamond extraction and prospecting activities, which can lead to disturbed surfaces with a high dust emissivity. The dust source points count showed a large increase in dust source points from 2017 onwards, with a tripling of points in 2020 and 2021 compared to the previous years. This increased emissivity is likely the result of the five-year drought that occurred in the same period and these droughts could become more common and extreme with climate change. The drought was accompanied by a continuous decrease in vegetation as observed by both vegetation monitoring and vegetation indices derived from satellite data, leading to an increase in emissivity. However, the relationship between dust emission, vegetation, geography, meteorology, and land use is complex. Furthermore, the degrading effects of wind erosion can result in a cascading effect of degradation and dust emission. We present an overview of the processes at play in this area and the different landscape and vegetation states. Furthermore, the offsite impacts of the dust in this area are summarized, which include offsite degradation by wind erosion, health impacts, economic impacts, and the influence on deposition areas. Especially the Benguela Current and the Southern Ocean are impacted by the dust from this region, where the deposited dust can contribute to the ocean's biogeochemistry.

Considering the predicted further decrease in precipitation as a result of climate change on the west coast of South Africa, improving our understanding of the relationship between land use, vegetation cover, drought, and dust emission is important. It can furthermore help develop sustainable land use practices for arid regions such as these.