

Analysis of land surface and synoptic conditions during dust storm events in the Middle East via a new high resolution inventory of mineral dust derived from SEVIRI.

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This paper provides the most up-to-date dust climatology for the Middle East, presenting a new high resolution inventory of over 27,000 dust emission events observed over the Middle East in 2006 – 2013. The inventory was derived from the dust RGB product of the Spinning Enhanced Visual and InfraRed Imager (SEVIRI) on-board Meteosat's second generation satellite (MSG). Mineral dust emissions were derived from visual inspection of the SEVIRI scenes which have 4-5 km² spatial and 15-minute temporal resolution. The location of every emission event was recorded in a database, along with time and trajectory of dust movement. This is an improvement on previous studies, which derive dust source areas from the daily observations of Aerosol Optical Depth whose maxima do not necessarily coincide with sources of emissions and produces more accurate information on the location of the key dust sources in the region. Results showed that dust sources are constrained to relatively small areas, with 21% of dust emission generated from just 0.9% of total surface area of the Middle East, mainly from eight source regions including the Tigris-Euphrates flood plains of Iraq and Syria, Western and Northern Saudi Arabia and the Sistan Basin in Eastern Iran. The Tigris-Euphrates flood plain was the most active dust region, producing 41% of all dust events with a peak activity in 2009. The southern areas of the Arabian Peninsula recorded very few dust emission observations, in contrast to many previous studies which do not use such high temporal resolution data. The activation and frequency of dust emissions are characterised by strong seasonality developing in response to specific synoptic conditions. To characterise synoptic conditions conducive to the development of dust storms, dust days' emission thresholds, based on number of dust emission events per day / per region and specific to each of the eight main dust emitting regions, were determined. ERA Interim reanalysis data were used to characterise synoptic conditions on the identified dust days. With vegetation cover dictating the ability for surface areas to deflate, Normalised Difference Vegetation Index (NDVI) data was acquired from the Moderate Resolution Imaging Spectroradiometer (MODIS) (MOD13A2) 1km database and correlated with dust emission frequency data in the region of greatest dust activity, the Tigris and Euphrates flood plain in Iraq and Syria.