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Local and Long-Range Dust Transport over the Australian Region

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The main aim of this study is to investigate, using the integrated wind erosion assessment and prediction system described by [1], the chief meteorological factors affecting *local* versus *long*-range transport of dust of three recent dust storm events that occurred within the same season and affected the same central-eastern areas of Australia, that is, within the spring-summer dust storm group delineated by [2].
From the total of 52 dust reporting days between 1995 to 2004 (Sept. to Feb.) it was found that 41 were associated with the passage of a cold front (either before or after). The presence of a low-level temperature inversion in the post-frontal air may also contribute to a concentration of dust particles close to the surface and hence a reduction in visibility from one to several days after the passage of the front. This may have occurred on as many as 8 days out of the 41. In the absence of strong synoptic scale low-level winds, there were 7 days when convective gusts were the most likely cause of local dust generation. Of the remaining 4 that were non-frontal associated, three resulted from very localized dust devils near Whyalla and Adelaide in South Australia and one resulted from a dry, continental southeast wind surge in tropical north Queensland. The main meteorological factor distinguishing *local* from *long-range* dust transport was wind speed associated with the frontal system. In the climatology, 900 hPa wind speeds at 0900 (Local) at Woomera (nearest to the most probable source area) on the day the dust was reported, were all greater than 30 knots for *long*-range dust transport associated with fronts and greater than 20 knots for *local* dust transport associated with fronts. However, there was no maximum 900 hPa wind speed threshold discriminating *local* from *long*-range frontal dust transport.
The model predicted trajectories in the three case studies were consistent with the observations from stations reporting dust. Synoptic scale frontal movement distinguished the local dust transport case from the two long-range dust transport modelling case studies. To further analyze *local* dust transport mechanisms, e.g. where convective gusts are involved, storm scale modelling studies would be needed.

References

[1] Y. Shao and L.M. Leslie, *J. Geophys. Res.* **D25,** 30,091-30,105 (1997).
[2] M. Ekström, G.H. McTainsh and A. Chappell, *Int. J. Climatol.* **24,** 1581-1599 (2004).