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Interactive comment on "A study of dispersion in complex terrain under winter conditions using high-resolution mesoscale and Lagrangian particle models" *by* J. L. Palau et al.

Anonymous Referee #1

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General Comments: This paper addresses the dispersion of pollutants from an elevated release in complex terrain during the winter. Simulation of the transport (advection and dispersion) using a mesoscale model (MM5) and companion Lagrangian particle dispersion model (FLEXPART) is performed and comparisons to measurements both aloft (passive remote sensing) and at ground level (air quality network) are made in an effort to validate the modeling. The evalution of MM5/FLEXPART is restricted to advection and turbulent dispersion. Whereas the air quality network provides good temporal resolution and coarse spatial resolution, a unique database (Els Ports) containing 10 years of monitored SO2 plumes emitted from a tall stack along a road net-

work provides much better spatial resolution than is normally found in studies of this kind.

The use of the model with measurements allows the authors to more clearly understand the complicated impacts at ground level due to mesoscale and thermodynamic flows, as well as the consequences of orography. Although the basic concept of using models and measurements to understand atmospheric behavior are not novel, the availability of the Els Ports database makes the evaluation more thorough than typically performed in papers of this kind. Besides a thorough treatment of the technical aspects of the paper, the results are useful to the atmospheric community due to the quantification of the daily evolution of dispersive conditions in complex terrain, a subject inherently difficult to model.

Publication of this document is therefore recommended after addressing the following minor points.

Specific Comments: p. 11970, lines17-18: How is the 4th database (vegetative state) of the Els Ports database used in the analysis here? You can mention it in the text, but should probably state that this particular database is not used further in the analyses discussed in the current paper.

p. 11982, line 17: How does one conclude there is a decrease in transversal dispersion by looking at Fig. 12?

p. 11984, line 4: (Fig. 12 and Table 1). Again, it's not clear how Fig. 12 shows this. This could be cleared up for the reader by adding another sentence to the description of Fig. 12. It could read perhaps: "Note that values plotted here are listed in Table 1, implying downwind distances between 6 and 33 km."

Technical Comments: p. 11970, bottom line 27. What is 11.2 g/m3N? I do not understand the significance of the letter N. p. 11981, line 1: "Ěwhen short radiation is higher...". Perhaps change to "Ěwhen incoming shortwave radiationĚ" p. 11982, line

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18: “slighly” should be “slightly” p. 11982, line 29: Reference to “(Fig. 8)” could be changed to “(compare Figs. 7F and 8C)”. This makes it clearer as to how the convective scheme (afternoon) reduces the impacts near the source. p. 12027, 12028: Figures A3 and A4. Be consistent in labels. In Fig. A3, the text label (as well as within the body of the paper, p. 11993) uses “c.g._r” while the figure label is “C.O.G._r”. Similar reasoning for Fig. A4.

Reference problems: Comparing the text with the reference list, I see the following discrepancies. p. 11999. There are two Gangioti et al. 2002 papers (1) Gangioti et al, “Regional Transport of Ĕ”. Call this 2002a. (2) Gangioti et al, “UHF radar detectionĔ”. Call this 2002b. p. 12001. There are two Millan 1978 papers. (1) Millan, “Recent Advances Ĕ”. Call this Millan 1978a. (2) Millan, “Remote Sensing Ĕ”. Call this Millan 1978b. Thus, when going through text: p. 11967, line 13. Millan 1978. Is it (a) or (b)? p. 11971, line 22. Gangioti et al. 2002. Is it (a) or (b)? p. 11973, line 9. Millan 1978. Is it (a) or (b)? p. 11978, line 13. Millan 1978. Is it (a) or (b)? p. 11988, line 19. Gangioti et al. 2002. Is it (a) or (b)? p. 11992, line 11. Millan 1978. Is it (a) or (b)? p. 11993, line 25. Millan 1978. Is it (a) or (b)?

p. 11968 (text), line 20: Salvador et al. 1992. p. 12002 (reference list), line 24: Salvador et al 1999. Which year is it?

p. 11971 (text), line 13: COST-710, 1998. p. 11988 (reference list), line 29: COST-710, 1978. Which year is it?

Other reference issues in text. p. 11967, line 25: “ĔNantichoke Shoreline Diffusion Experiment (Hoff et al., 1982, 1995). What is 1995 referring to? There is no reference cited in the reference list. p. 11968, line 17: Carvalho, 2002. I believe this should be Carvalho et al., 2002. p. 11968, line 19: Millan et al, 1986. I don’t see this in the reference list. Could this be Millan et al, 1976? p. 11968, line 20: Millan et al, 1989. I don’t see this in the reference list. p. 11972, line 10-11: Palau et al., 2004. Is this Palua et al, 2001? Perhaps so, as there is no other citation in the body of the text and

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a Palue et al, 2001 exists in the reference list. p. 11993, line 25: Millan 1976. Is this Millan et al, 1976? p. 11994, line 15: Millan 1976. Is this Millan et al, 1976? p. 11996, line 13: Portelli 1982. Is this Portelli et al, 1982?

References in the listing not specifically cited in the text. p. 11999, line 14: Fast, “Mesoscale modelingĚ” 1995. p. 12002, line 2: Palua et al, 2001. See comment regarding p. 11972, line 10-11 above.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 11965, 2005.