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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The SCOUT-O3 Darwin Aircraft Campaign: rationale and meteorology" *by* D. Brunner et al.

Anonymous Referee #2

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Review of acpd-2008-0410 The SCOUT-O3 Darwin Aircraft Campaign: Rationale and Meteorology by D. Brunner, and THE SCOUT-O3 DARWIN PLANNING TEAM

A. General comments:

This paper succeeds admirably in its primary intended purpose which is to provide a summary of the meteorological context for each of the flights during the SCOUT-O3 aircraft campaign in Darwin, Australia in November and December 2006. Both the evolution of the large-scale circulation and the day-to-day variability of local meteorological conditions are discussed in sufficient detail to provide the reader with the background necessary to interpret the more specifically focused papers from the mission. I generally found the discussions of the unfolding conditions during the individual aircraft sor-

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ties illuminating, and thus of great value in the reference sense, without straying into the kind of extraneous detail that would have otherwise made this long paper overly so. Overall the paper is extremely well written and in places displays a refreshing liveliness of style for this kind of work.

It should be mentioned, of course, that the thrust of the paper is more programmatic than scientific. Nonetheless the authors do a good job of tying the variations of the local meteorology over the course of the mission to the evolution of the large-scale flow and, in particular, the influence of a Rossby wave-breaking event mid-mission.

B. Specific comments:

p. 1, Introduction, paragraph 2, sentence 1: While it is generally agreed that the Maritime Continent must play a key, indeed the major, role in TST and dehydration globally, I think it is still fair to say that direct demonstration of the former in particular remains elusive although there is a considerable amount of indirect evidence from trajectories studies, etc. to support this idea.

p. 2, column 2, paragraph 1, sentence 3: Is the statement that Hector occurs almost daily during monsoon breaks (as it obviously does in the pre-monsoon) supported in the published literature?

p. 3, column 2, final paragraph (discussion of Figure 3): The choice of -67 °C for the first isotherm should be explained.

p. 4, column 2, final paragraph (discussion of Fig. 4, Hovmöller diagram) and p. 8, column 1, paragraph 3 (discussion of Fig. 5b): The text mentions the westward propagating wave event reaching Darwin on November 10. There also appears to be a second weaker, though more swiftly moving, event arriving just a few days later. Both seem to have lowered and warmed the tropopause and show significant downward phase propagation (Fig. 5b). The authors ascribe the warm to cold evolution between November 10-21 as a Kelvin wave effect, but initially it would appear to be more related

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to the westward propagating disturbances. Inasmuch as there may be as many of a half dozen of these events showing in Fig. 4, and furthermore since such westward propagating modes off the equator are observed in other regions of the tropics this phenomenon would appear to be worth some commentary.

p. 8, column 1, paragraph 4 (discussion of Fig. 7): What is the reason that the tropopause parameters plotted in Figure 7 are limited to 00 UTC (0930 LT)?

p. 8, column 2, final paragraph (discussion of Figure 8): While Figure 8 taken as a whole gives a good overview of the evolution of the large-scale cloud patterns over the course of the mission, the size of the maps makes it very difficult to see the local convection over the Tiwi Islands and the drift of the Hector anvils discussed in the text. Indeed, the red dot over the Apsley Strait on many days obscures good portions of the anvils.

p. 11, section 4.2, first paragraph (discussion of 19 November): Here the discussion of the development of the convective line over Melville Island would have benefited from some wind barbs to show the prevailing wind flow, as opposed to a reference to the mean flow which I assume is meant to mean the November time mean plotted in Fig. 1b. In any event, neither the strength of the mean flow, the direction and strength of the regional prevailing on that day nor the intensity of the southern seabreeze are discussed.

p. 11, column 2, final paragraph: The first two sentences are tautological: one would expect the trajectory analyses in section 5 to confirm the trajectory forecasts!

p. 12, column 2, section 4.3, final paragraph: I would either re-phrase this paragraph or omit it entirely.

p. 14, column 2, section 4.4: What is mean by golden Hector day?

p. 14, column 2, section 4.4: The southward propagating Melville Island squall line is mentioned. Here again surface wind barbs might be instructive and/or worthy of

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comment.

p. 17, column 1, line 4: This is the first mention of the Multiwavelength Aerosol Scatterometer (MAS) sonde in the paper so it might be good to mention very briefly how it is deployed in flight.

p. 17, column 1, sentence 3: It is not obvious how the low water vapor observed at 15-16 km ("the lower two levels") on 23 November could be associated with the "Kelvin wave" cold phase which from Fig. 5b appears to have ended the day before. Indeed the temperatures were anomalously warm at these levels on the day of the flight.

p. 17, column 1, first full paragraph, first sentence: This is the first mention of Hector on this day.

p. 17, column 2, final paragraph, first sentence: This is the first mention of Hector on this day.

C. Technical comments on the Figures:

Figure 1: This figure is pleasantly drafted, but my weak eyes had a little difficulty with the fineness of the wind arrows. Secondly, the isotherms and their labeling are very hard to discern. Finally, there are no isotachs nor is there a reference wind arrow to assess wind speed.

Figure 2: Same criticisms.

Figure 3: The wind speed legend has too many labels, and consequently they are too small.

Figure 8: The meaning of the light and dark backgrounds on the date labels should be mentioned in the caption.

Figures 10-13:

a. Lat/long labels are missing on both upper and lower (Berrima 256 km range radar

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picture) panels. b. The lower panel's northern edges are truncated and should be extended, if possible, to encompass the entire Falcon flight path. Or, if that is impossible, the entry/exit points from the panels should be done somewhat more elegantly. c. In that regard, a few well-place arrows along the flight paths would help in following the discussions in the text. d. The text of the place names on the radar diagrams are nearly impossible to read they are so small. e. Wind barbs from the local surface stations, if plotted on the radar pictures, would be very useful in following the discussions of the evolution of the convection during the flight days.

Figure 13: The Falcon flight path is truncated. Presumably this is due to missing data?

Figure 15: a. The caption refers to the M55 north-south section to be in "black and colors". I presume the latter refers to the wind arrows in the upper panel, but these are mostly obscured by the heavy black lines plotting the altitude. I would also choose a darker and/or heavier gray for the Falcon plotting. b. The text discusses the relatively colder middle section of the 10°-11°S leg by the M55, but it is very difficult to see how much colder from the Figure.

Figure 16: No date given.

Figure 17: Nothing plotted in "colors".

D. Technical corrections, typos, stylistic suggestions:

p.1, Abstract, line 16 (typo): leading double quotes needed on "Hector"

p. 1, Abstract, line 20 (stylistic): "lidar" need not be capitalized [this occurs a number of times further on in the text]

p. 2, column 1, paragraph 1, sentence 3 (rewording): "...however, suggest that convection hydrates rather than dehydrates the lower stratosphere."

p. 2, column 1, final paragraph, sentence 1 (typos): Minutes of longitude and latitude should be indicated by tick marks (') rather than single quotes.

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p. 7, column 1, first sentence (rewording): Replace "during" with "for".

p. 11, column 2, last paragraph, last sentence (rewording): Replace "by" with "at".

p. 12, column 2, section 4.3, sentence 2 (grammar): Replace "was" with "were".

p. 12, column 2, section 4.3, sentence 2 (rewording): "...predicted the presence of high altitude cirrus formed in situ."

p. 18, column 2, section 4.7, sentence 5 (rewording): "... the M55 descended to 14 km..."

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 17131, 2008.

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