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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fast transport from Southeast Asia boundary layer sources to Northern Europe: rapid uplift in typhoons and eastward eddy shedding of the Asian monsoon anticyclone" *by* B. Vogel et al.

Anonymous Referee #2

Received and published: 7 August 2014

General Comments:

The paper presents an interesting case study in which air in lower stratosphere over Europe has been influenced by tropical convection via eastward eddy shedding from the Asian Summer Monsoon anticyclone. While case studies such as this one lack the statistical foundation needed to determine how important the observed phenomenon is, the evidence presented by the authors is interesting enough and clear enough to warrant publication. My principal objection concerns the lack of discussion in the pa-

per regarding the limitations of trajectory analysis. In particular, it is unlikely that this analysis can reliably determine a specific tropical storm as a source 40 days in the past (i.e., due to trajectory dispersion by errors in the wind fields) – particularly with the small sample size used in this study for which only 23 trajectories descend below the 360 K isentrope and only 8 of these reach the surface. In addition, reanalysis data is not capable of resolving the small-scale rapid uplift in convective cores, which makes tracking parcel trajectories through tropical convection problematic. Sec. 4.3, which provides a hand-waving discussion of the connection between eddy shedding and topical cyclone Sanba, introduces a discussion that is beyond the scope of the research in this paper. It would be best if the authors omitted this section and wrote a separate paper that addressed the 'reasons for eastward eddy shedding and intensification of the super typhoon'.

Specific Comments:

Lines 19-20: Change 'is an additional fast . . .' to 'as a fast . . .'. The authors mention no other fast pathways that make the use of 'an additional' appropriate.

Line 44: Change 'vapour are only' to 'vapour is only'

Line 52: Remove 'in addition'. The use of 'Furthermore' makes it redundant.

Line 78: Inappropriate use of 'Vice versa'. Consider using 'Conversely'.

Line 127: Change 'appear' to 'appears'.

Lines 128-131: Sentence is awkward. Consider rewriting to: Hsu and Plumb (2001) inferred from shallow water calculations that, if the anticyclone is sufficiently asymmetric, the elongated anticyclone becomes unstable and westward eddy shedding occurs.

Line 194 (and also caption of Fig. 1): Change '11 degrees O' to '11 degrees E'

Lines 207 and 208: Remove 'respectively' (two occurrences).

Lines 241: Remove 'respectively'. Note: respectively is only used if the connections

between two sets of objects/facts are ambiguous. In your sentence, enhanced is unambiguously associated with tropospheric gases and reduced is unambiguously associated with ozone. The use of 'respectively' in Line 277 is appropriate.

Line 279: Change 'This implies' to 'This means that' (or something similar). That diabatic heating determines vertical motion in isentropic coordinates is a fact – not an implication.

Lines 368-377: It is worth noting in this paragraph that strong uplift in convection over India and Tibet is not well resolved in reanalysis data. Since tropical cyclones are much larger that most convective cells, strong uplift in TCs is better resolved in reanalysis data. This could account for the faster transport by TCs in the trajectories.

Lines 516-521: It seems that the trajectories in Fig. 3 are in the eddy shedding region $\sim$12 days before observation – approximately Sep. 14. This is too early to be affected by the Sep. 20 shedding event. Can you explain better why you think the departure is of the trajectories from the anticyclone is on Sep. 20 and not Sep. 14?

Lines 635-637: Wind fields from ERA interim might not resolve the convective cores that provide rapid transport from the boundary layer into the anticyclone over India and Tibet.

Line 639: function => functions

Line 642: origin => origins

Line 684: mid of September => in mid September

Lines 713-714: reference for supplemental material is missing

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 18461, 2014.