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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Identification of gravity wave sources using reverse ray tracing over Indian region" *by* M. Pramitha et al.

**Anonymous Referee #2**

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To identify the sources of gravity waves observed by optical airglow measurements over Gadanki (13.5°N) and Hyderabad (17.5°N) at altitudes of about 97 km, reverse ray tracing methods based on the equations described by Marks and Eckermann (1995) are successfully applied. In 9 of 14 investigated events the authors could identify that these waves are launched in the upper troposphere (10 – 12 km) at regions with large vertical shears of horizontal winds. In all cases studies investigated here, tropical deep convection has been excluded as possible sources for the upward propagating gravity waves. To get confidence to the results, the backward ray tracing estimations have been done by considering a realistic variability of winds and temperatures caused by tidal waves.

The derived results are very interesting. Before publication in ACP the authors should



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extend their discussion, consider the following remarks:

1) A broader discussion in connection with previous results is recommended.

2) As an example: Preusse et al., (2008) used GROGRAT to discuss the propagation properties of high frequency waves with short horizontal wavelengths and questioned whether these could possibly reach the mesopause region. In their Figure 2 they show that most GW with horizontal wavelengths smaller than 50 km propagating upward from the troposphere (5 km) or stratosphere (20 km), respectively, are evanescent at the sources or are reflected by wind shears and hence cannot reach altitudes of 80 km or higher during summer. How are their results related to the findings during these case studies?

3) Five of the total 14 wave events are restricted to mesospheric altitudes. A stronger discussion on the origin of these waves, e.g. as secondary waves, is recommended.

4) Following the suggestions given by the first interactive comment, it is recommended to delete Section 3 (which follows the appendix of Marks and Eckermann, 1995) and substitute it by an explanation and evaluation of the used program packet.

5) The English needs a revision.

6) P19592 L3 : The zonal, meridional and vertical wavelength are not provided in table 1 but can be derived using the values provided in table 1

7) P 19593 Sect 2.3 To improve the readability it is recommended to explain that the OLR values are later shown in Fig 8.

8) Page 19599 line 25 Runge-Kutta

9) Page 19600 line 28 is nearly identical to page 19598 line 16

10) Page 19606 line 18 Rayleigh

11) Figure 5c and f please add “at 97 km”



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14, C8015–C8017, 2014

References: Preusse, P., S. D. Eckermann, and M. Ern (2008), Transparency of the atmosphere to short horizontal wave-length gravity waves, J. Geophys. Res., 113, D24104, doi:10.1029/2007JD009682.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 19587, 2014.