Reply to Reviewer #2 Comments

The manuscript "Simultaneous OI 630 nm imaging observations of thermospheric gravity waves and associated revival of fossil depletions around midnight near the EIA crest" by N. Parihar et al presents observations of airglow depletions from the low-to-mid-latitude station, Ranchi, India. The study focuses on the fossil depletions and their evolution in the presence of gravity waves. The main conclusion of the work is that the gravity waves can revive the observed fossil depletions. The presented observations and focus of the study are interesting and deserve publication. I am listing a few doubts which I encounter while reviewing the manuscript:

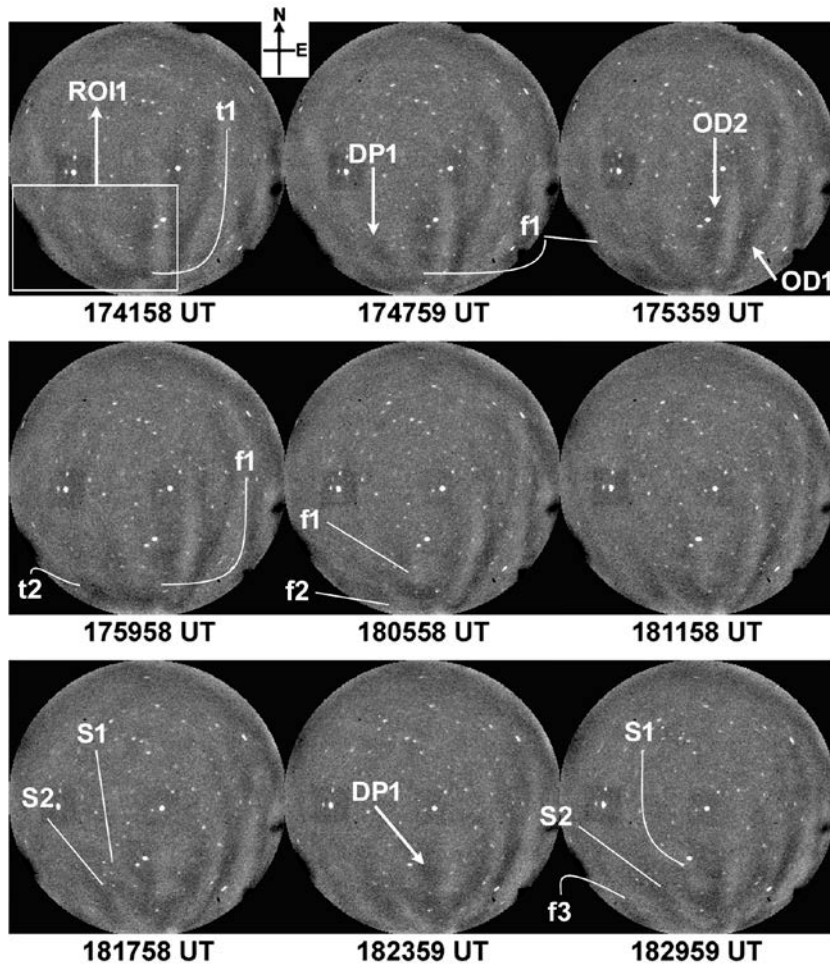
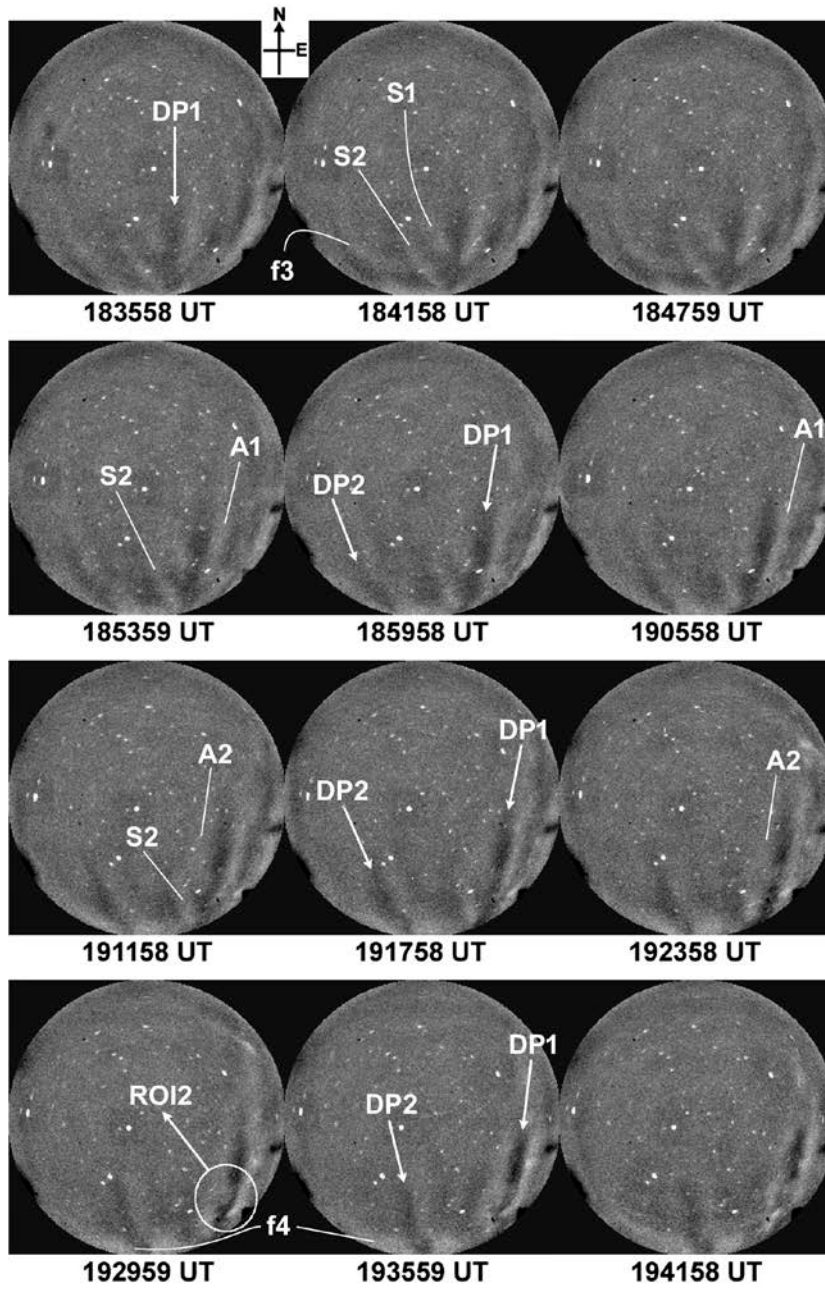
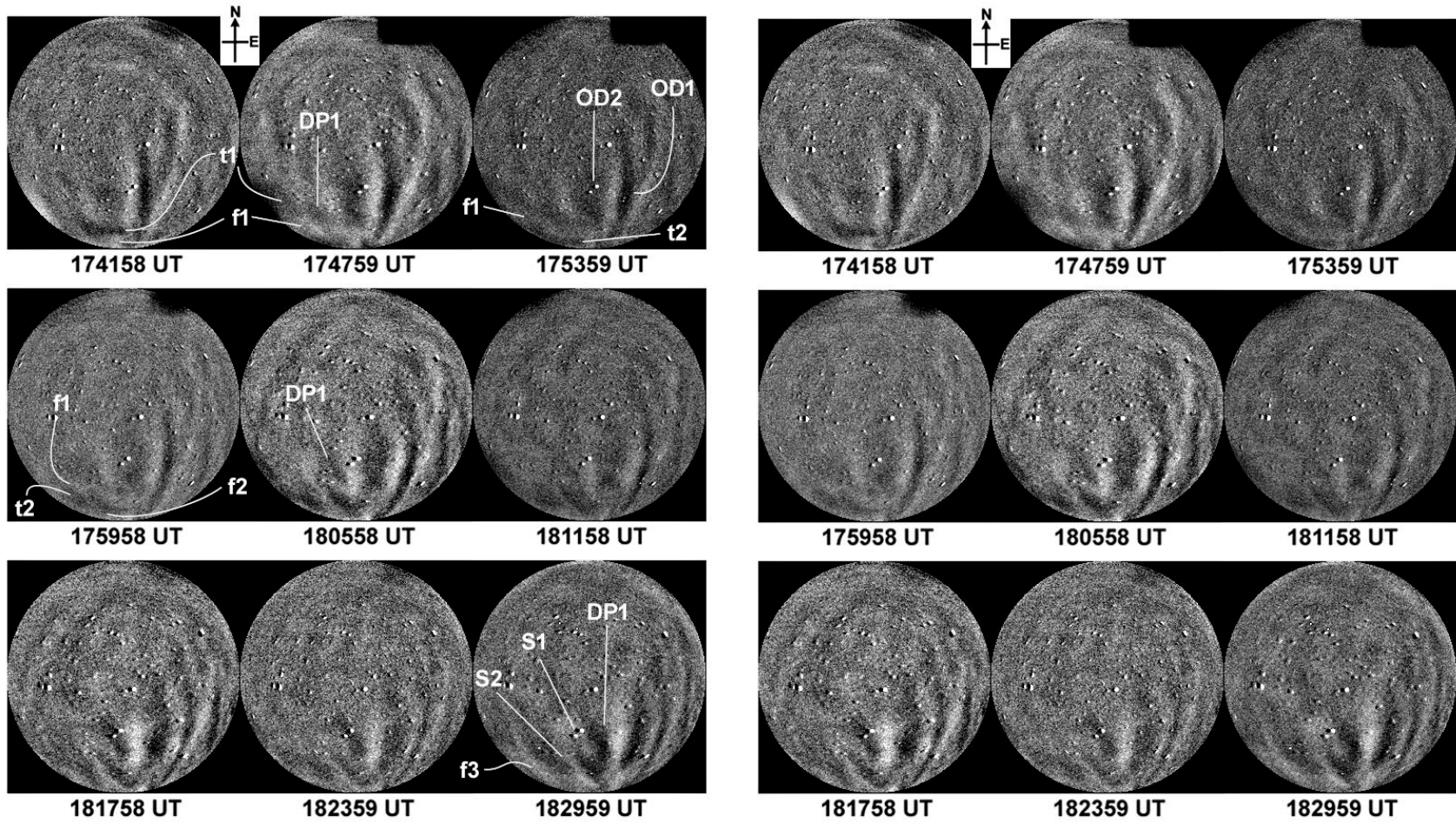
Reply: We sincerely thank the esteemed Reviewer for his tremendous encouragement and invaluable insight into our submission. His critical comments have provided us with insightful perspectives to enhance the clarity and robustness of our findings. We have tried our level best to address his concerns in this Revised Version.

(1) The airglow images are linearized or still suffer from the curvature effects?

Reply: Many thanks for this comment. During unwarping, faint features seen in all-sky images were getting lost. Hence, airglow images presented herein are not linearized and suffer from curvature effects. We used unwarped images to determine the eastward drift speed of depletions as well as the speed of GWs along the propagation direction.

(2) Authors should enlarge the ROI frame for clarity and to distinguish the gravity waves and depletions.

Reply: We sincerely thank Reviewer for this suggestion. We have added a New Figure of time difference images and Movie as Supplementary Material to show gravity waves. Probably because of their co-existence and interaction, GWs fronts and fossil depletion in early stage were not clearly seen in airglow images. Using the detrending technique suggested by Wrasse et al. (2021), we have prepared New Figure 1 and 2 as under as:

Corrected Figure 1:

Corrected Figure 2:

New Figure 3: We generated such time difference images and present below some of them during 1742-1830 UT showing faint fronts of GWs. We present labelled and unlabelled sequence of OI 630 nm images, respectively, on the left and right for the kind preview of Reviewer.

Correction in 'Observations' Section:

Supplementary material S1 shows the movie created from these images that feature this event.

(3) Should one refer to any dark patch at the corner of the airglow image as depletion?

Reply: Many thanks. We understand the concern of Reviewer. We were able to identify depletion after going through the sequence of images. We have included a Movie of all-sky images as Supplementary Material for the Preview of Reviewer.

(4) Both gravity waves and depletions characteristics are drawn from airglow observations. Does the author use any criteria to distinguish them?

Reply: Many thanks. We

(5) Obviously, if one draws their characteristics from the same image and the same region of interest, one would expect a kind of relationship that authors have found. To what extent this kind of approach is consistent and reasonable?

(6) Are the revivals of these fossil depletions are in-situ or the reflections of the equatorial energetics?

Reply: We sincerely thank the Reviewer for this critical comment. Using vertical TEC measurements from Hyderabad (17.3° N, 78.6° E, mlat. ~12.0° N, located nearby and south of Ranchi), we estimated the rate of change of TEC index (ROTI) and found ROTI index to increase from 17.25 to 20.25 during 1700-2000 UT. These ROTI values signify the presence of weak EPBs (Ma and Maruyama, 2006).

(7) If the revival is in-situ then why do authors discuss the apex height characteristics?

Reply: Many thanks. Because of complex interaction between GW fronts and depletions over the Southern edge of imaging, we were unable to determine the NS scale size of depletion DP1. Owing to this, we use Apex height to highlight the evolution of depletion DP1.

(8) If the revival is a reflection of the equatorial energetics then is it possible to have gravity waves reaching at 600 km altitude at the equator?

Reply: We sincerely thank the Reviewer for this critical comment and understand that this is not possible.

With these comments, I recommend the manuscript for publication with a minor revision.

Reply: We sincerely thanks Reviewer for this encouragement and critical comments which immensely helped us to improve our work.