Reviewer's report on

Title: The Ionospheric response over the UK to major bombing raids during World War II
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General comments

This manuscript presents data of the F2-layer ionospheric variability over Slough, UK observed after 152 major bombing raids over Europe during World War II. Using a superposed epoch analysis, authors found a significant decrease in peak electron concentration (~0.3 MHz decrease in foF2) measured in the noon after the raids. It is suggested that the released explosive energy caused heating the thermosphere, enhancing the temperature dependent loss rate of O+ ions.
This is somewhat unusual paper at a junction of the history and ionospheric physics. I think the material presented here may be interesting not only to ionospheric experts, but also to a broader auditorium.
The paper is clearly written. I may point out only few minor issues to improve or correct.

Specific comments

To explain the observed effect, authors suggest the only mechanism, namely (Page 6, lines 24-26):
"The dominant ion species in the mid-latitude ionospheric F-region is O+ whose recombination rate is temperature dependant (Rees, 1989). A rise in the background thermospheric temperature would therefore result in an enhanced loss rate, with the equilibrium between production and loss being established at a lower peak electron concentration, as observed."

The equilibrium between production (q) and loss is given by:

$$q = \beta n_e$$

Indeed, in the F peak region, the main ion species is O^+, but their recombination rate is very low. So that the F-layer electron loss is dominated by the following two chemical reactions:

$$O^+ + N_2 \rightarrow NO^+ + N$$
$$O^+ + O_2 \rightarrow O_2^+ + O$$

After that, molecular ions (NO^+ and O_2^+) recombine immediately.
The rates of the reactions (k_1 and k_2, respectively) depend on the temperature, however the electron loss rate (β) depends on concentration of the molecules (N_2 and O_2) as well:

$$\beta = k_1 \cdot [N_2] + k_2 \cdot [O_2]$$

Authors suggest only one mechanism for the foF2 depletion, namely the temperature dependence of k_1 and k_2, however the thermospheric temperature increase leads also to an increase of the scale height of atmospheric gas $H_s = (k_B T)/mg$ (here m is mass of the molecules). Hence, concentration of N_2

and O_2 in the F layer peak will increase, which is a second possible reason for increasing the loss rate (β) and corresponding decrease of the plasma density.

The thermospheric temperature increase may be estimated numerically as

$$\Delta T = Q/C_p n k_B$$

where Cp ≈ 3 is the molar heat capacity, $n \approx 10^{10}$cm^{-3} is concentration of the atmospheric gas at the F peak, k_B is the Boltzmann constant, and Q is the heat energy per volume. For 1000 metric tons of TNT, assuming the energy was uniformly distributed in the range of 1000 km at height up to 300km, we get:
1000*4.184e9J/(pi*1000km*1000km*300km)/(3*1e10cm-3*1.381e-23J/K)
=11K

Grandin et al. [J. Geophys. Res. Space Physics, 2015, doi:10.1002/2015JA021785] studied the ionospheric foF2 decrease caused by the solar wind high speed streams, and have shown that the thermospheric temperature increase by 20-50 K may cause the foF2 decrease of the order of 0.5-1.0 MHz. Hence, energy of the explosions during the raids could potentially cause the 0.3 MHz effect in the foF2, although the above numerical estimates are very rough.

I may mention one more hypothetic mechanism for transport of N_2 and O_2, namely the turbulence provoked by the shock waves [see e.g., Kelley, et al., (2009), Two-dimensional turbulence, space shuttle plume transport in the thermosphere, and a possible relation to the Great Siberian Impact Event, Geophys. Res. Lett., 36, L14103, doi:10.1029/2009GL038362].

If authors will wish, they may consider these issues in the paper.

For the case if other experts will be interested to make a more comprehensive numerical analysis, I recommend adding in Table 1 two columns showing data of the foF2 for the noon following the raids and the monthly median values.

Finally, I think citation [Kurt Vonnegut (1969), Slaughterhouse-Five, or The Children's Crusade] may be very relevant in the paper.

Technical comments

Page 6, line 17: "For the ionosphere (at ~ 250-350 km) above the UK to respond…"
- I suppose authors assume here true height, whereas 250-350 km may be the virtual height measured by the ionosonde (it is typically higher than the true height).

Page 6, line 24: "The dominant ion species in the mid-latitude ionospheric F-region is O+ whose recombination rate is temperature dependant"
- It is correct to say: "…whose loss rate is temperature dependant…"

Page 7, line 1: "Infrasonic waves generated by explosions are launched preferentially in a vertical direction."

- A reference or a more detailed explanation for why it is so will be very relevant here.