Comments on the manuscript: “Generation of a severe convective ionospheric storm under stable Rayleigh-Taylor conditions: Triggering by meteors?” by M. C. Kelley and R. R. Lima.

This manuscript presents some rare cases of radar plume events, observed by the Jicamarca radars, that are associated with equatorial spread F/plasma bubble irregularities, a.k.a Ionspheric Convective Storm (ICS). The high power Jicamarca radar observed two of the events on 8 and 9 September 1993, and the JULIA radar observed three others in Sept. 1996, Aug. 2003 and March 2006. All of them occurred after around 22 LT, which indicated that they are not the post sunset type events usually caused by the evening prereversal enhancement related F layer uplift. The authors qualify them as unusual events that are rare, in that only five events with their unique features have been identified in a search of the observational data available during the period 1993-2006. The authors are proposing that large meteors impacting E region off the magnetic equator can trigger these irregularity events. Electric field generated during the meteor ablation (with trail formation and decay processes) mapped to equatorial F region bottom-side is invoked as being responsible for the plasma irregularity growth that produced the observed radar plumes. While the idea that large meteors impacting the E region can be responsible for F region plasma bubble irregularity development is new and appealing, the present reviewer is of the view that further clarifications and considerations on the relevant electrodynamics processes need to be presented and discussed before the paper can be acceptable for publication. There are questions that need to be addressed concerning the two aspects: (1) the classification of the event as unusual requiring a new mechanism for its generation, and (2) the meteor ablation hypothesis as a possible cause of plume events.

Regarding the aspect (1) we note that all the plume maps in figures 1, 2 and 5/6 are obtained from the radar 3 m backscatter echoes, and as such do not always reveal the background plasma features. Some times, depending upon the existing instability growth conditions the 3m irregularities may serve as a tracer of the background plasma. A good example appears to be the map of 01/14-15/2004 (in Fig. 5) wherein we have a case of irregularity growth from an upwelling of background plasma (as traced by the 3 m irregularities), which is a well-known processes for irregularity development of the nighttime equatorial ionosphere. Since all the events shown here occurred after 22 LT (not being directly related to the evening F layer uplift) the irregularity growth from upwelling of the background ionosphere (likely caused by gravity wave oscillations) as typified by the example of 01/14-15/2004, can probably be applied to all these cases, although the background plasma features are not explicit in many of the 3m backscatter map. In other words, the uniqueness of these five plumes needs to be established better.

Another point to note is that in the case of the event in Fig-1 which is one of the five “rare cases”, the vertical drift increased significantly (from negative values to approximately 50 m/s) in the period 22:20 to 22:45 just preceding the plume onset at 22:45 LT, an indicator that the layer uplift (or upwelling) could have been responsible for the instability growth that produced the plume.

As regards the aspect (2) an important point to consider is the strength of an electric field in the F region when that electric field is the result of mapping from the E region where it was generated, by the meteor ablation process as assumed in this case. The strength of the electric field in the F region should depend upon the E- to F-region field line integrated conductivity ratio, that is, ($\sum_E / \sum_F$). During the night hours of the present interest (after 22 LT) the E region conductivity is much smaller than the F region conductivity, and hence the F region electric field should be very weak and of questionable value for driving instabilities. Further, the meteors of large size required for electric field generation must be of the over-dense type that may last usually of the order of a minute or two. If such a short duration electric field, and especially when that is further weakened when mapped to the F-region, can produce instabilities in the F-region, is a question that needs to be clarified better.

Additional, specific, comments:

1. Line 19: Fig. 4 is not really necessary, as the concept of the slit camera imaging has been explained before, for example, in Woodman and La Hoz, 1976.

2. Line 34: “downward electric field” – to be precise it should be “background downward electric field”.

3. Line 42-43: “a turbulent volume of over 4 X 10^8 cubic kilometers, where we have used the length of the magnetic field line for the third dimension”- How are we sure that the 3m irregularities are present in the entire length of a depleted flux tube? Local conditions can have large influence in the generation of the 3m irregularities whose field line mapping is limited to relatively short distances only.

4. Lines 45-46: “but the drifts before and after the plume agree with the motion of the layer.” – Please specify the height region (or height range averaged) of the drift. A closer look at the figures 1 and 3 shows that in the LT interval between ~22:20 and 22:45 in which the upward drift rapidly increased the irregularity trace in Fig.1 does not indicate any uplift, which could suggest that a large vertical drift (of background plasma) preceded the sudden updraft of the plume structure that occurred precisely near 22:45 LT. Please clarify.

5. Lines 58-59: “The three events that we feel are very similar to those in Figures 1 and 2 are reproduced in Figure 6”. Please specify in this sentence if the JULIA radar observed these events. Otherwise the next sentence looks a bit out of context.

6. Line 86: It is stated here that “The evolution of a meteor trail, its plasma, and its electric field is very complex and time dependent”, whereas in the Appendix A, line 147 it is stated that the ion velocities are derived from steady state momentum equations. Please explain how the derived electric field (Ey) that is based on the ion velocity derived from steady state equations can represent the electric field

generated from meteor ablation process which is strongly time dependent.

7. Line 99: Please define what is r_0. Is it 40 m in this case?

8. Line 103: "(kBT) /(eL)" Please define "L".

9. Line 103: "This value is almost exactly the same as the one in Figure 3." In Fig. 3 the value of the zonal electric field varies with time. Please specify the time at which this electric field is referred to. One can note the time at which this value occurs to be near ~22:45 LT, which is also the time when the plume rises up sharply. This should correspond to the time when the meteor trail attains 100 m radius (and when 1 mV/m electric field is remaining) that is required to map to 250 km height over magnetic equator, as stated in line 77, for initiating the instability process. In this scenario one wonders what is the instability growth time. As per the narrative in the text it appears that the instability growth time is close to zero, which is unrealistic. Please explain better.

10. Lines 105-107: "The long duration during which radar echoes were seen indicates that the field remains saturated at 10 mV/m (the Farley threshold) for a long time" – This statement is confusing and misleading since no radar echoes from meteors (which should be from off magnetic equatorial location), has been shown in this paper. Please clarify.

11. Line 116: Please check the validity of the equation. The right side of the equation, R/U, has the dimension of time, whereas the dimension of the left side appears to be different.

12. In Appendix A an expression is derived for the electric field *Ey* that is in the direction of the geomagnetic field. Here it is important to justify how an electric field of the scale size and time scale required to be projected to F region for initiating the instability growth can be maintained along the geomagnetic field line. Will not such an electric field be annulled instantly by field line parallel conductivity?

13. Line 168: "In the nighttime E region at low latitudes, Sigma H is bigger than Sigma P by a factor of 10". For the purpose of current flow the field line integrated values should be considered, and in that case the ratio of the Hall to Pederson conductivities (at F layer bottom side) should not exceed a value of the order of 2-3 during nighttime. Please check.