Response to Reviewer 1:

With respect to the Lagrangian analysis performed, are there any different conclusions between this study and that of Rutherford and Montgomery (2012)? GR14 state that "Nor did the Lagrangian analysis of Rutherford and Montgomery (2012) show dry air intrusion between the first two Gaston missions."

Our analysis of the dry air in this study is more explicit, with trajectories and manifolds computed directly and moisture analyzed along the trajectories. In contrast, RM12 analyzed the dry air intrusion more implicitly, via a tracer field, that would still have allowed for modification of the air during entrainment.

Can you think of possible reasons why there are such discrepancies between your results and those of GR14 in terms of inversions?

We are reluctant to speculate here. We think our analysis provides a picture that is consistent with the analyzed Lagrangian flow in and around Gaston's weak pouch. When one compares our results with GR14, it seems clear that we invoke a simpler dynamical interpretation of the data using new insights on convective-vorticity dynamics obtained by Kilroy and Smith concerning the negative impact of dry air on vorticity amplification.

Page 2, lines 23-25. The terms critical layer and critical latitude have not been defined. A definition here is necessary for readers not familiar with pouch theory.

We have added the requested definitions in the revised text.

Page 3, lines 12-13. "NASA's ongoing missions …" should be updated to 2016?

We have revised the text to include 2016.

Page 4, line 20. "and NHC", should be "and the NHC".

We corrected the error in the revised text.

Page 5, line 11. How is the pouch center calculated here?

The pouch center is defined as the intersection of the trough and critical latitude at the 700 hPa level. This has been clarified in the revised text.

Page 10, line 23: "Dry air reduced both the updraught and.." I assume you mean updraught strength?

Yes, the implication is that updraught strength is reduced. This has been clarified in the revised manuscript.

Page 11, line 13: Can you explain how dry air results in divergence near the 600 hPa level?

The reviewer is correct that *dry air, itself, does not cause divergence*. For the paragraph in question, we were attempting to link the work of KS12 to the elevated dry air observed in the PREDICT soundings.

The ECMWF analyses (with PREDICT data) indicate that there is an upward mass flux, that decreases in magnitude with height, up to the dry, 600 hPa level. From the continuity equation, one can see that a decrease of mass flux at and above the 600 hPa level implies a horizontal divergence of mass at these levels.

We have revised the text in question to clarify our scientific argument:

"Based on the findings of KS12, convective updraughts that form in this region containing dry air aloft would be expected to result in divergence near the 600 hPa level, thus causing an expanding material loop at these levels."

Page 12, line 7-8. “11 of the profiles show evidence of a dry layer above 600 hPa”. This sentence needs a “not shown” at the end.

We made this correction in the revised text.