Response to Referee #1

We wish to thank the referee for the useful comments and suggestions.

(1) Response to minor points: the corrections have been made as per the referee's comments.

(2) The special filling-in procedure has been described in greater detail. We have also included a flowchart of the filling-in procedure in Figure 3. For O^+ distributions, the number of iterations is usually 2 or 3 until it reaches the minimum deviation. For H^+ distributions, the number of iterations depends strongly on the initial input estimates of density and temperatures.

(3) The "uniform" low density shown in old Figure 3 was actually for zero counts. In the initial version of the paper, we had a different gray scale bar. We recognized that this was confusing, so we have made zero counts white in the new version. The H^+ distributions after the filling-in process are replotted in the new Figure 4. We have also emphasized that the polar wind moments are only calculated over a relatively small region of velocity space, so that the outlying velocity space regions do not contribute to the moments, anyway.

(4) We have investigated TIDE polar wind characteristics with magnetic activities (e.g., K_p), and we found no clear correlation with K_p from our survey. For the 20 perigee passes, the K_p varied from 1– to 5. Coincidentally, the higher K_p (3–5) appeared at low SZA (< 100^o) passes and the lower K_p (1–3) appeared at the high SZA passes. The K_p index was 3+ to 5 at POLAR apogee on April 19, 1996, and was 1– to 1 at apogee on May 28, 1996. Moreover, there is no relationship with the IMF B_z component, either. We have included this in the newly revised version of the paper.

Response to Referee #2

We wish to thank the referee for the useful comments and suggestions.

Response to general comments:

2. We thank for the referee providing several useful references. We have included those references either in the introduction section or in the summary and discussion section.
3. We do agree that the paper is quite large in size. Since the sections are closely tied each other, we decided not to divide it into two papers. We also considered replacing several figures with tables, but we were concerned about potential important information in the histograms being thus unavailable. Hence, we still present our survey results in figures rather than in tables.

Response to additional remarks:

(1) We do not have a seperate section to discus the limitations of the measuring techniques, but we do discuss these in various places in the paper, for example, the limitations of the TIDE energy range from 0.3 – 450 eV (page 7) and the limitation of the survey data being only occurred during April – May, 1996 (pages 7 and 13). We have now included two new paragraphs to discus the origins of possible uncertainties in section 2 (pages 11-12) in the revised version. Some aspects of Poisson statistics error estimations associated with the individual measurements for a typical POLAR apogee case are also now included on pages 17 and 19.

(2) We firmly believe that O^+ ions at 5000 km altitude are of cleft ion fountain origin, and we maintain this conclusion. The strongest evidence for cleft ion fountain control of the O^+ is actually the downward O^+ flow at 5000 km in the polar cap region, which has been indicated more clearly on page 23 in the revised version. However, there may be two H^+ sources (cleft and polar cap). It will be interesting to further distinguish the cleft ion fountain and solar illumination controlling influences on the H^+ polar wind in further data analyses, as well as modeling investigations.

(3) The POLAR floating potential is monitored by the Electric Field Instrument (EFI) [*Harvey et al.*, 1995]on POLAR, using three pairs of multi-element probes. Measurement of the resultant potential by EFI shows that the potential is stabilized at about +1.8 – 2.2 V, when PSI was turned on at POLAR apogee. We now described this point on page 16 of the revised

paper. More detail descriptions can be found in other references [c.f., *Moore et al.*, 1997; *Comfort et al.*, 1997].

(4) The O^+ ions due to the cleft ion fountain effect have been observed at 5000 km here by POLAR. However, the O^+ enhancement associated with the cleft ion fountain are also observed at altitudes at and below the regions of expected O^+–H charge exchange; for example, DE 2 measurements of O^+ upflows in the cleft in the 300 – 1000 km altitude range [e.g., *Loranc et al.*, 1991]. Hence the CIF control of the H^+ day-night density decline through O^+–H charge exchange is indeed possible. We have altered the wording in the paper to clarify the lower altitude range of where this might occur.

(5) & (6) The corrections have been made as per the referee's comments.