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BBFs with Rich Ionospheric Oxygen Ions Observed by Cluster and Double Star

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Two Bursty Bulk Flows (BBFs) with predominant ionospheric O+ ions have been observed on November 8, 2004 by the Cluster and Double Star spacecraft during a strong magnetic storm time period with Dst = -373 nT. The oxygen densities in two BBFs are found to be 3-5 times larger than the hydrogen densities and the oxygen thermal pressures in the BBFs are 8 times larger than the hydrogen thermal pressure. Moreover, the dynamic ram pressure of the oxygen BBFs is 16 times larger than a normal BBF moving in the same speed because of the oxygen ions having 16 times larger mass. Thus, the braking region should be greatly pushed inside the usual pressure balance region when the BBF is dominated by oxygen ions. The observations made in this paper suggest that singly charged oxygen ions embedded in the BBFs may be carried into the ring current region by bursty flows during very intense magnetic storms. The Cluster - Double Star constellation offers a good opportunity to ascertain the evolutional signatures of fast moving plasma flow in the near Earth region.