



## Simultaneous observations of ULF waves in the Earth's magnetosphere, topside ionosphere and surface

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We have found a specific time interval during the Halloween 2003 magnetic storm, when the Cluster and CHAMP spacecraft were in good local time (LT) conjunction, and have examined the Pc3 (22-100 mHz) and Pc4-5 (1-22 mHz) ULF wave activity using data from Cluster, CHAMP and the CARISMA magnetometer network. We provide evidence for the first simultaneous observation of a Pc3 ULF wave event in the magnetosphere, in the topside ionosphere and on the ground, by Cluster, CHAMP and the Dawson (DAWS) magnetic station respectively at  $\sim$  13:00 LT. Moreover, we show the remarkably clear transition of the wave's frequency into a higher regime within the Pc3 range, simultaneously detected in the magnetosphere and topside ionosphere and on the Earth's surface. The commonly observed wave parameters (i.e. onset, duration and frequency content) at Cluster, CHAMP and DAWS provide evidence that we are, indeed, observing manifestation of the same phenomenon.

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