Study of the recovery phase of the extreme geomagnetic storms from 1859 to 1989

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The Dst index is used as a proxy of energy ring current content. In a storm event, the enhancement of the current appears as a depression of the index. To know in advance the minimum value that will reach the index and the time in which it will happen are usually the main aims in the forecasting scheme. However, the knowledge of the time remaining for the magnetosphere to reach again quiet time, or at least 'non-dangerous time' is an important input for many technological systems. These predictions are even more relevant for severe geomagnetic storms. In a previous study, we analyzed the recovery phase of intense geomagnetic storms (Dst $\leq$ - 100 nT) in the period 1963-2003 [Aguado et al., 2010]. The results obtained showed that the decay of the Dst index follows a hyperbolic law, which recovery time depends linearly on the intensity of the storm. Now, we study the recovery phase of the largest storms even recorded [Tsurutani et al., 2003]. These events provide an extraordinary opportunity for two goals: (1) to validate the hyperbolic model for disturbances at terrestrial surface as severe as the Carrington event, or that related to the Hydro-Quebec blackout, and (2) to check if the linear relationship between the recovery time and the intensity of the storm still remains.