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# Evolution of the Storm Magnetic Field Disturbance on Earth's Surface and the Associated Ring Current as Deduced from Multiple Ground Observatories

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Based on the continuous magnetic field measurements of the multiple ground observatories, the structure of the geomagnetic field disturbance and its temporal variations have been investigated, so as to deduce the evolution of the storm ring current. Assuming the geomagnetic field disturbance around Earth is linear in space, the gradient of the corrected H component is obtained from the multiple ground observations. It is found that, the maximum difference of the corrected H component around the Earth surface, as calculated by the gradient of the corrected H component multiplied by the Earth diameter, well represents the asymmetric index Asy-H, but is actually more sensitive to the substorm activities than the Asy-H index. The anti-direction of the gradient of the corrected H component may be regarded as pointing to the position of the maximum partial ring current. It is shown that, for the ordinary storms (Dst>-200nT) (which may be caused by CIRs, long lasting fast solar wind flows, or prolonged south IMF, etc), the maximum partial ring current is located around the duskside during the main phase and the earlier stage of the recovery phase. At the later stage of the recovery phase, the position of the maximum partial ring current keeps rotating eastward, indicating the energetic electrons may play a significant role and the main ring current carriers may be the electrons at this stage. For the severe storms (Dst<-200nT), the position of the maximum partial ring current is not so regular, and there is the evidence that the injected electrons may contribute significantly to the ring current during the main phase of supper storms. Based on physical considerations, this investigation also provides new definitions to the symmetric index Sym-H and asymmetric index Asy-H. It is made possible that, the symmetric index Sym-H and asymmetric index Asy-H may be deduced from the measurements of the geomagnetic observatories located at local but not global area on Earth.