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## A quasi-real time geomagnetic activity index from ground based measurements at geomagnetic observatories run by italian INGV for space weather nowcasting

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The geomagnetic observatories managed by INGV (Istituto Nazionale di Geofisica e Vulcanologia), both in Italy and Antarctica, send data to a server and the data are collected and stored in a MySQL database. The database has been operating for almost two decades and it is implemented on a local server which serves also as a web portal for the data display and distribution. By analyzing the data of all the INGV geomagnetic observatories at middle and polar latitudes, i.e. the values of the H, D and Z components, the F module and the K indices, the algorithm aims to distinguish the activity of the Earth's magnetic field in the following categories: "Quiet Period", "Local disturbance" and "Magnetic Activity", possibly distinguishing, within the latter, the level and the kind of event (sudden impulse, sudden ionospheric and magnetic disturbance driven by solar flare, magnetic storm or substorm). A preliminary automatic procedure allows to detect possible instrumental failure from a comparison between the vector components and the total field intensity in each observatory. A second level of check allows to discriminate local or regional against global features with the final goal to reject local noise, possibly of anthropic nature, eventually present in a single observatory through a majority logic based procedure. After these first filtering steps an automatic software procedure provides an empirical estimation of the current Magnetic Activity (nowcasting) organized according to the above three possible categories. The embedded algorithm in the procedure operates on the geomagnetic field element (H, D, Z and F) and the local K indices of all observatories. The operations that the algorithm performs are aimed to identify the impulsive components in the signal, which are caused by external events. The quiet field component is removed from the signal, leaving the impulsive components present in the signal almost unaltered. If in the residual field is present a significant activity (with respect to an appropriate threshold) a procedure is performed that distinguishes between an isolated impulse or a cluster of impulses, by using time windows of different sizes. The whole procedure allows us to generate two different geomagnetic activity indices, one at low and the other at high latitude. In a final step we compute a cross correlated geomagnetic index comparing processed data at low and high latitude to retrieve a large spatial scale index.