Magnetic activity indices

Ground based magnetometer measurements are used to derive several indices that describe magnetic activity in the Earth 's environment. See, e.g.

aa index

See Mayaud (1973).

AE index

AE index is an auroral electrojet index obtained from a number (usually greater than 10) of stations distributed in local time in the latitude region that is typical of the northern hemisphere auroral zone (Davis and Sugiura, 1966). For each of the stations the north-south magnetic perturbation H is recorded as a function of universal time. A superposition of these data from all the stations enables a lower bound or maximum negative excursion of the H component to be determined; this is called the AL index. Similarly, an upper bound or maximum positive excursion in H is determined; this is called the AU index. The difference between these two indices, AU-AL, is called the AE index. Notice that negative H perturbations occur when stations are under an westward-flowing current. Thus the indices AU and AL give some measure of the individual strengths of eastward and westward electrojets, while AE provides a measure of the overall horizontal current strength. Excursions in the AE index from a nominal daily baseline are called magnetospheric substorms and may have durations of tens of minutes to several hours.

Ak(Hel) index

The Ak(Hel) index measuring the geomagnetic activity was created by Nevanlinna and Ketola (1993). It has been adjusted with the aa index to form the longest uniform index of global geomagnetic activity, extending over the last 14 solar cycles (Nevanlinna and Kataja, 1993).

Kp index

The Kp index (Bartels et al., 1939) is obtained from a number of magnetometer stations at mid-latitudes. When the stations are not greatly influenced by the auroral electrojet currents, conditions are termed magnetically quiet. If the auroral zone expands equatorward, however, these stations can record the effects of the auroral electrojet current system and of the magnetospheric ring current and field-aligned currents that can connect it to the ionosphere. This occurs during so-called magnetically disturbed periods. The mid- latitude stations are rarely directly under an intense horizontal current system and thus magnetic perturbations can be dominant in either the H or D component. The Kp index utilizes both these perturbations by taking the logarithm of the largest excursion in H or D over a 3-h period and placing it on a scale from 0 to 9.

You can get Kp indices from the NGDC server, GFZ

Dst index

The hourly Dst index (Sugiura, 1964) is obtained from magnetometer stations near the equator but not so close that the E-region equatorial electrojet dominates the magnetic perturbations seen on the ground. At such latitudes the H (northward) component of the magnetic perturbation is dominated by the intensity of the magnetospheric ring current. Dst index is a direct measure of the hourly average of this perturbation. Large negative perturbations are indicative of an increase in the intensity of the ring current and typically appear on time scales of about an hour. The decrease in intensity may take much longer, on the order of several hours. The entire period is called a magnetic storm. During a storm it is usual to observe several isolated or one prolonged substorm signature in the AE index. Occasionally a specific high time resolution (5 min or so) version of the index has been calculated to study the relationship between storms and substorm.

Campbell (1996a,b) has recently reanalysed the Dst signatures and their connection to the ring current, and it appears that Dst is not, after all, a pure ring current index. Siscoe and Crooker (1996) have investigated the diurnal oscillation of Dst index.

Index Home page, the NGDC server.