Solar cycle 23 witnessed numerous sporadic eruptions like solar flares, coronal mass ejections and associated SEP events during maximum and descending phase. Solar energetic particle (SEP) events are manifestations of intense solar activity characterized by particle acceleration occurring as a consequence of transient release of energy in association with solar transient eruptions depending on solar magnetic field instabilities and configuration. Most of the SEP events of cycle 23 were followed by moderate to severe geomagnetic storm activity. Associated ground geomagnetic signatures at low-latitudes following these eruptive events with background solar wind and interplanetary magnetic field conditions are investigated. Ground digital magnetic observations in conjunction with satellite data comprise the data set. Significant features related to the occurrence of multiple solar flares and several SEP events during the descending phase of this cycle are discussed. Ionic and elemental composition and variation during the SEPs and their influence on formulation and development of differing storm patterns are also examined.