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Effect of Magnetic Activity on the Generation of Equatorial Spread F Irregularities

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Height of the post-sunset equatorial F layer is now known to be one of the most important factors to influence the generation of equatorial spread F (ESF) irregularities through growth of the Rayleigh-Taylor instability on the bottomside of the F-region. Effect of magnetic activity on the low-latitude ionospheric electric field is therefore expected to result in either suppression or enhancement of the development of these irregularities depending on the orientation of the imposed electric field. A shortcoming of several earlier studies of the effect of magnetic activity on the generation of ESF irregularities, using observations such as ionospheric scintillations, was that in these studies it was not known when the irregularities, which caused the observed scintillations, were generated, since irregularities generated several hours earlier to the west of the observation region, could also have drifted eastward onto the signal path at a later time. In any effort to establish a cause-effect relationship between magnetic activity and ESF irregularities, it is imperative to determine, even approximately, the time of generation of the plasma bubble. The decorrelation between scintillations on a radiowave signal, transmitted from a geostationary satellite and recorded by two spaced receivers, has proved to be a useful indicator of the 'age' of the irregularities. Using this idea, statistics of occurrence of fresh irregularities, which may be associated with magnetic activity, are studied for different seasons and strength of magnetic activity. Some of the results obtained are in broad agreement with theoretically calculated effects of magnetic activity on low-latitude ionospheric electric fields.