A LONG-TERM STUDY OF LOW-LATITUDE IONOSPHERIC IRREGULARITIES AT AFRICAN LONGITUDES BY GROUND-BASED GPS OBSERVATIONS

F.D. Chu 1, W.S. Chen 2, C.C. LEE 3, and J.Y. Liu 4

1. National Standard Time and Frequency Laboratory, Telecommunication Laboratories, Chunghwa Telecom Co. Ltd., Yangmei, Taiwan, e-mail: cfd.chu@gmail.com
2. Institute of Space Science, National Central University, Jhongli, Taiwan, e-mail: wschen@jupiter.ss.ncu.edu.tw
3. General Education Center, Ching Yun University, Jhongli, Taiwan, e-mail: cclee@cyu.edu.tw
4. Institute of Space Science, National Central University, Jhongli, Taiwan, e-mail: jyliu@jupiter.ss.ncu.edu.tw

This study investigated a long-term climatology of nocturnal low-latitude F-region irregularities at African longitudes by ground-based observations of the global positioning system (GPS). The results of irregularity occurrence obtained by using GPS phase fluctuations showed that in both East and Middle Africa (1) the distributions of the occurrence of ionospheric irregularities are two-peak patterns which peak in equinox months with obviously shallow/deep dips in June/December solstice months during high solar activity period, and however, with slightly shallow/deep dips in June/December solstice months during low solar activity period; (2) the occurrence rates of irregularities are positively dependent on solar activity; (3) during some years of high solar activity period, the occurrence rates of moderate irregularities in June solstice months can surpass those in equinox months (especially in Middle Africa) although the occurrence rates of strong irregularities still achieve maxima in equinox months. Likewise, in West Africa, the occurrence rate of irregularities is also positively dependent on solar activity and reaches maximum in equinox months. However, the occurrence rate in December solstice is larger than that in June solstice, which is quite different from the results in both East and Middle Africa. There is an interesting longitudinal effect in solstice occurrences of irregularities, that is, ionospheric irregularities develop easier in June solstice months in both East and Middle Africa but develop easier in December solstice months in West Africa during high solar activity period. The results obtained by ground-based GPS observations are similar to those obtained by previous satellite-based observations.

equatorial ionosphere, ionospheric irregularity, equatorial plasma bubble

F.D. Chu, National Standard Time and Frequency Laboratory, Telecommunication Laboratories, Chunghwa Telecom Co. Ltd., No. 12, Lane 551, Sec. 5, Minzu Road, Yangmei,

326 Taiwan, e-mail: cfd.chu@gmail.com